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Managing the risk of disconnector failure

RIT-T Project Assessment Conclusions Report

Issue date: 6 December 2024

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Executive summary

We are applying the Regulatory Investment Test for Transmission (RIT-T) to options for managing the risk of disconnector failure on the New South Wales (NSW) transmission network. Publication of this Project Assessment Conclusions Report (PACR) represents the final step in the RIT-T process.

High voltage disconnectors and associated earth switches (henceforth collectively referred to as disconnectors) earth and provide visible isolation for sections of Transgrid's high voltage network. Disconnectors are required within the network to facilitate maintenance of other high voltage equipment such as circuit breakers and transformers.

We consider it prudent and cost effective to manage this risk of disconnector failure through an asset replacement program during the 2024/25 and 2027/28 regulatory period.

Identified need: ensure the safe and reliable operation of our transmission network by managing the risk of disconnector failure

The identified need for this project is to ensure the safe and reliable operation of our transmission network by addressing the risk of failure of certain disconnectors that are approaching the end of their technical life.

There are 5180 disconnectors installed in Transgrid's network. Of this population, 30% will be over the nominal expected life of 40 years by 2027-28. With such a large ageing population, a strategic approach is required to plan investments over the coming years to manage these assets effectively and efficiently.

The disconnectors considered for replacement under this need are older disconnectors that have already reached their end of life (see Appendix C for further detail). The failure of a disconnector is expected to result in additional equipment outages to isolate the failed disconnector for repair. In case of bus disconnectors this additional outage is significant due to the isolation of all other services from the affective bus bar. The potential outages are expected to disrupt customer and distributor supplies and increase corrective maintenance costs.

Addressing the condition of the identified assets provides the economic benefit of avoided involuntary load shedding to the NEM. We have classified this RIT-T as a 'market benefits' driven RIT-T as the economic assessment is not being progressed specifically to meet a mandated reliability standard but by the net benefits that are expected to be generated for end-customers. This means that options assessed within this RIT-T must provide net economic benefits compared to the base case if they are to be pursued.

No submissions received in response to the Project Specification Consultation Report

We published a Project Specification Consultation Report (PSCR) on 6 August 2024 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. Option 1 remains the preferred option at this stage of the RIT-T process.

Credible options considered

We identified one credible network option that would meet the identified need from a technical, commercial, and project delivery perspective[1]. This option is summarised in Table E-1.

Table E-1 Summary of credible options, $2024/25

Option	Description	Capital costs ($m, 2024/25)
Option 1	This option fully addresses the identified need by replacing and refurbishing disconnectors.	21.46

Appendix CC presents a list of disconnectors identified by this need for replacement and refurbishment under the preferred option, Option 1.

Non-network options are not expected to assist in 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. Non-network options are not able to mitigate the risks associated with failure of disconnector assets that have reached or are approaching the end of their technical life. We did not receive any submissions from proponents of these solutions in response to the PSCR.

Conclusion: Replacing and refurbishing 136 disconnectors is optimal

This PACR finds that implementation of Option 1 is the preferred option at this final stage of the RIT-T process.

We have assessed that Option 1 is net beneficial under all three reasonable scenarios considered in this PACR. On a weighted basis, where each scenario is weighted equally, Option 1 is expected to deliver net benefits of approximately $1,397m.

The capital cost of this option is approximately $21.46 million (in $2024/25). The works are expected to be completed by 2028. All works will be completed in accordance with the relevant standards and components shall be replaced to have minimal modification to the wider transmission network. Necessary outages of relevant assets in service will be planned appropriately to complete the works with minimal network impact.

Next steps

This PACR represents the final step of the consultation process in relation to the application of the Regulatory Investment Test for Transmission (RIT-T) process undertaken by Transgrid. It follows a PSCR released in August 2024. No submissions were received in response to the PSCR.

The second step of the RIT-T process, production of a Project Assessment Draft Report (PADR), was not required as Transgrid considers its investment in relation to the preferred option to be exempt from that part of the RIT-T process under NER clause 5.16.4(z1). Production of a PADR is not required due to:

- the estimated capital cost of the preferred option being less than $54 million;
- the PSCR stating:
  - the proposed preferred option, together with the reasons for the proposed preferred option;
  - the RIT-T is exempt from producing a PADR; and

[1] As per clause 5.15.2(a) of the NER.

- 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 identifying additional credible options that could deliver a material market benefit; and
- the PACR addressing any issues raised in relation to the proposed preferred option during the PSCR consultation.

Parties wishing to raise a dispute notice with the AER may do so prior to 17 January 2025[2] (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 'Disconnector renewal program PACR'.

[2] Additional days have been added to cover public holidays

Contents

1. Introduction

This Project Assessment Conclusions Report (PACR) represents the final step in the application of the Regulatory Investment Test for Transmission (RIT-T) to options for managing the risk of disconnector failure on the NSW transmission network.

Disconnectors are required for the isolation of network elements to perform required routine and corrective maintenance. Ageing, along with a corrosive environment, has resulted in several disconnectors failing or having difficulty in performing their required function of opening and closing.

We consider it prudent and cost effective to manage this risk of disconnector failure through an asset replacement program during the 2024/25 and 2027/28 regulatory period.

1.1. Purpose of this report

The purpose of this PACR[3] is to:

- describe the identified need;
- 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 received in response to the Project Specification Consultation Report and there have been no material developments

We published a Project Specification Consultation Report (PSCR) on 6 August 2024 and invited written submissions on the material presented within the document. No submissions were received in response to the PSCR.

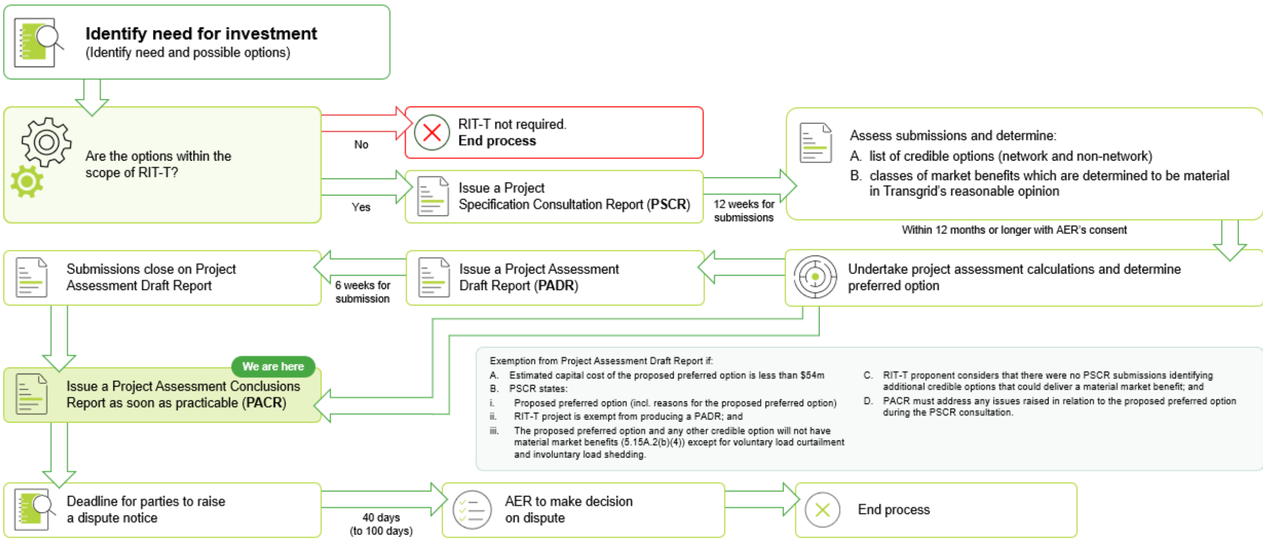
In addition, no additional credible options were identified during the consultation period following publication of the PSCR. No other material changes have occurred since the PSCR that have made an impact on the preferred option.

1.3. Next steps

As outlined in Figure 1-1 below, this PACR represents the final step of the consultation process in relation to the application of the RIT-T process undertaken by Transgrid.

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

Figure 1-1 This PACR is the final stage of the RIT-T process[4]



Parties wishing to raise a dispute notice with the AER may do so prior to 17 January 2025[5] (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 'Disconnector renewal program PACR'.

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

[5] Additional days have been added to cover public holidays.

2. The identified need

2.1. Background to the identified need

There are 5180 disconnectors installed in Transgrid's network. Of this population, 30% will be over the nominal expected life of 40 years by 2027-28. With such a large ageing population, a strategic approach is required to plan investments over the coming years to manage these assets effectively and efficiently.

The disconnectors considered for replacement under this need are older disconnectors that have already reached their end of life (see Appendix C for further detail). The following inputs are considered in decision making for end-of-life replacement:

- Age;
- Selective condition assessments;
- Location-based corrosive vs non-corrosive;
- Known type and site issues;
- Defect data with consideration;
- Engineering assessment and field staff's experience of working with these disconnectors.

The scope of the condition assessments included a sample of disconnectors which will be over 40 years of age by 2027-28. They are ALM, Essantee, ASEA and Stanger type disconnectors at various voltage levels, which are common types of disconnectors in Transgrid's network.

2.2. Description of the identified need

Disconnectors are required for the isolation of network elements to perform required routine and corrective maintenance. Ageing, along with a corrosive atmosphere, has resulted in disconnectors often failing or having difficulty in performing their required function of opening and closing. The failure of a disconnector is expected to result in additional equipment outages to isolate the failed disconnector for repair. In case of bus disconnectors this additional outage is significant due to the isolation of all other services from the affective bus bar. The potential outages are expected to disrupt customer and distributor supplies and increase corrective maintenance costs.

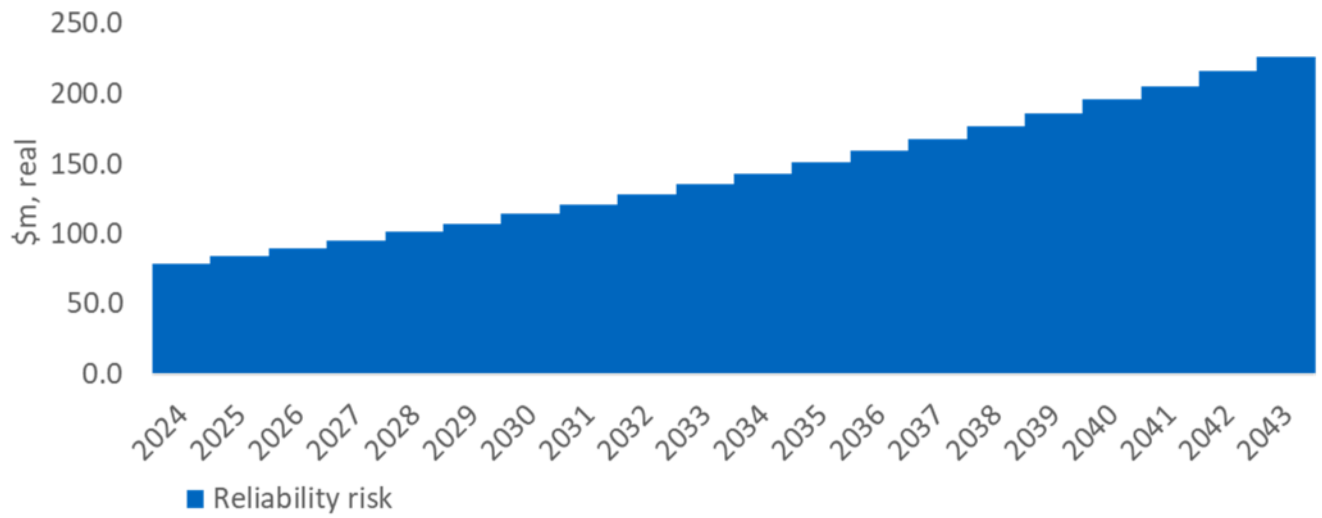
We have classified this RIT-T as a 'market benefits' driven RIT-T as the economic assessment is not being progressed specifically to meet a mandated reliability standard but by the net benefits that are expected to be generated for end-customers. Given the high population of disconnectors that have been identified for replacement, we consider it prudent and cost effective to manage this risk through a single asset replacement program. This replacement will help limit the amount of in-service failures that occur (along with the associated interruptions to customer load, and safety and environmental consequences).

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.

Figure 2-1 summarises the increasing risk costs over the under the base case and our central scenario of asset failure risk.

Figure 2-1 Estimated risk costs under the base case (Central scenario)



This section describes the assumptions underpinning our assessment of the risk costs, i.e., the value of the risk avoided by undertaking each of the credible options. The aggregate risk cost under the base case is currently estimated at around $78.96m in 2024, and it is expected to increase going forward if action is not taken (reaching approximately $226.01m in 2043 by the end of the 20-year assessment period).

2.3.1. Assessment of asset health

The health assessment outcome for a disconnector is dependent on the asset serviceability factors outlined below.

Spares and Support: Due to the proprietary nature of disconnector assets, an evaluation of manufacturer support and/or spares availability is critical for ensuring the continuing operability of these assets. This figure represents the ability to repair or replace an in-service failed asset.

Historical defect rates: A key factor into asset health is the historical rate of defects experienced across individual models. A 3-year average is utilised to minimise bias to peaks and troughs. This figure represents the potential underlying issues with a particular model.

Asset type: The type of technology on which the asset is based affects the overall health index of the asset. Older technologies such as electromechanical and discrete component assets suffer from degradation over time, being effectively mechanical devices. These also lack self-monitoring capabilities and as such can fail between maintenance testing cycles. Modern microprocessor-based devices do not suffer from degradation in a similar manner and have the ability to self-monitor and alarm on failure (watchdog).

Natural age: A disconnector asset's natural age is calculated from its first install date. This age contributes to the overall health index.

2.3.2. Reliability risk

We have considered the risk of unserved energy for customers following a failure of the disconnectors identified in this PSCR. The likelihood of a consequence considers the likelihood of contingent planned/unplanned outages, the anticipated load restoration time (based on the expected time to undertake repair), and the load at risk (based on forecast demand). The monetary value is based on an assessment of the value of lost load, which measures the economic impact to affected customers of a disruption to their electricity supply.

Reliability risk makes up 100 per cent of the total estimated risk cost in present value terms. As the assets continue to age the probability of one or more disconnectors failing increases. This increased probability of failure combined with a long load restoration time and the interruption to large industrial loads, means that there are likely to be significant amounts of unserved energy over the assessment period without the replacement of the assets.

3. Potential credible options

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

We consider that there are one credible network options that can meet the identified need. These options are summarised in Table 3-1. We do not consider non-network options to be commercially and technically feasible to assist with meeting the identified need for this RIT-T.

All costs and benefits presented in this PACR are in 2024/25 dollars, unless otherwise stated.

Table 3-1 Summary of credible options

Option	Description	Capital costs ($m, 2024/25)
Option 1	This option fully addresses the identified need by replacing and refurbishing disconnectors	21.46

3.1. Base case

Consistent with the RIT-T requirements, the assessment undertaken in this PACR compares the costs and benefits of each credible option to a 'do nothing' base case. The base case is the (hypothetical) projected case if no action is taken, i.e.:

> *"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'. 'BAU activities' are ongoing, economically prudent activities that occur in absence of a credible option being implemented"*

Under the base case, no replacement strategy is implemented for the assets evaluated under this need. This is a 'run to fail' scenario that involves an increase in the identified risks, the eventual failure of the assets and the realisation of the expected consequences. This case is only considered as a last resort should neither credible option be deemed viable through the economic evaluation process.

Increased operating and maintenance activity costs are included as an opex cost against the assets in the base case. This increased cost is modelled based on historical breakdown (corrective) repair costs and represents an avoided operating cost increase benefit when mitigated through replacement.

3.2. Option 1 – Replace with new disconnectors

Option 1 considers the replacement of an existing disconnector with a new unit or refurbishment. This option fully addresses the identified need by replacing and refurbishing disconnectors.

The replacement and refurbishment work may include the following, and detailed in Appendix C:

- High voltage and civil design work
- Secondary system design work
- Plant procurement and transportation
- Civil work (e.g. footing replacement or modifications as required)
- Site work and commissioning

The work will be undertaken over a 5-year period with all works expected to be completed by 2028. The capital cost of this option is approximately $21.46m (in $2024/25). This capital cost is comprised of:

- $15.1m in labour costs;
- $3.5m in materials costs; and
- $2.8m in expenses

There are no annual routine operating and maintenance costs tied to the replacement program.

Table 3-2 Option 1 Capital Cost ($m, 2024/25)

Year	Capital expenditure ($m, 2024/25)
2025	5.36
2026	5.36
2027	5.36
2028	5.36
2029	
2030	-
2031	-
2032	-
2033	-
2034	-
2035	-
2036	-
2037	-
2038	-
2039	-
2040	-
2041	-

All works will be completed in accordance with the relevant standards and components shall be replaced and refurbished to have minimal modification to the wider transmission network. Necessary outages of relevant assets in service will be planned appropriately to complete the works with minimal network impact.

Following the implementation of Option 1, the costs associated with reliability risks are significantly reduced.

3.3. Options considered but not progressed

We have also considered whether other options could meet the identified need. Reasons these options were not progressed are summarised in Table 3-3.

Table 3-4 Options considered but not progressed

Option	Reason(s) for not progressing
Increased inspections	The condition issues have already been identified and cannot be rectified through increased maintenance or inspections, and therefore is not technically feasible or financially sustainable to address the need.
Elimination of all associated risk	This can only be achieved by retiring the assets, which is not technically feasible due to the requirement to maintain the existing network reliability.
Non-network solution	We do not consider non-network options to be commercially and technically feasible to assist with meeting the identified need for this RIT-T. Non-network options are not able to mitigate the risks associated with failure of disconnector assets that have reached or are approaching the end of their technical life.

3.4. No material inter-network impact is expected

We have considered whether the credible option listed above is expected to have material inter-regional impact.[6] 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-network impact is that it satisfies the following:[7]

- 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 Option 1 satisfies these conditions as it does not modify any aspect of electrical or transmission assets. By reference to AEMO's screening criteria, there are no material inter-network impacts associated with Option 1.

6 As per clause 5.16.4(b)(6)(ii) of the NER.
7 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 21 October 2024. https://www.aemo.com.au/-/media/Files/PDF/170-0035-pdf

4. Materiality of market benefits

This section outlines the classes of market benefits prescribed in the National Electricity Rules (NER) and whether they are considered material for this RIT-T.[8]

Many of the expected benefits associated with the credible options are captured in the expected costs avoided by the options (i.e., the avoided expected costs compared to the base case). These include avoided costs associated with routine maintenance and avoided risk costs. Of these avoided costs, only unserved energy through involuntary load shedding is considered a market benefit class under the NER, as discussed further below.

4.1. Avoided unserved energy is material

We consider that changes in involuntary load shedding are expected to be material for the credible options outlined in this RIT-T assessment. In the base case, involuntary load shedding would be expected to occur following a failure of disconnectors on our network. The probability of asset failure is expected to increase over time as the condition of the assets continue to deteriorate.

We have estimated expected load shedding under the base case and each option. These forecasts are based on probabilistic planning studies of failure rates and repair times. The avoided unserved energy for each credible option is calculated as the difference between the expected load shedding under the base case and the expected load shedding under each option.

4.2. 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.[9]

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 no impact on pool price);
- changes in costs for parties other than the RIT-T proponent;
- changes in ancillary services costs; and
- competition benefits.

8 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.

9 Australian Energy Regulator. "*Application guidelines Regulatory Investment Test for Transmission – November 2024*." Melbourne: Australian Energy Regulator.

4.3. 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 4-1, 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 in Table 4-1.

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

Market benefits	Reason
Differences in the timing of unrelated network expenditure	The credible options considered 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 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.[10] 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.[11] We do not consider there to be any option value with the options considered in this PSCR. Additionally, a significant modelling assessment would be required to estimate the option value benefits which would be disproportionate to the potential additional benefits for this RIT-T. Therefore, we have not estimated additional option value benefit.
Changes in network losses	We do not expect any material difference in transmission losses between options.
Changes in Australian greenhouse gas emissions	The credible option assessed within this RIT-T is not expected to induce a material change in Australia's greenhouse gas emissions.

[10] AER, *Regulatory Investment Test for Transmission Application Guidelines,* November 2024.
[11] AER, *Regulatory Investment Test for Transmission Application Guidelines,* November 2024.

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. Assessment against the base case

The costs and benefits of each option in this document are compared against a ‘do nothing’ base case. Under this base case, no investment is undertaken to replace existing disconnector which are run until they fail.

The condition of the disconnectors that have been identified for replacement will continue to deteriorate and age, increasing the probability of a failure in the transmission network. This is expected to result in unserved energy of approximately 1546 MWh in 2024 and 4424 MWh in 2043.[12]

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.[13]

5.2. Assessment period and discount rate

The RIT-T analysis considers a 20-year assessment period from 2024 to 2043. A 20-year period takes into account the size, complexity and expected asset life of the disconnectors and provides a reasonable indication of the costs and benefits over a long outlook period.

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 have been calculated based on the undepreciated value of capital costs at the end of the analysis period and expected operating and maintenance cost for the remaining asset life. As a conservative assumption, we have effectively assumed that there are no additional cost and benefits after the analysis and 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 AEMO's Inputs Assumptions and Scenarios Consultation Report[14] and the assumptions adopted in AEMO’s 2024 Integrated System Plan (ISP).[15] The RIT-T requires that sensitivity testing be conducted on the discount rate and that the regulated weighted average cost of capital (WACC) be used as the lower bound. We have therefore tested the sensitivity of the results to a lower

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12 Yearly figures for unserved energy.

13 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. (See: AER, *Application guidelines Regulatory Investment Test for Transmission,* November 2024)

14 AEMO '2023 Inputs, Assumptions and Scenarios Report', July 2023, p 123.

15 AEMO, *2022 Integrated System Plan, June 2022*, p 91.

bound discount rate of 3.63 per cent.[16] We have also adopted an upper bound discount rate of 10.5 per cent (ie, AEMO's 2023 Inputs Assumptions and Scenarios Report).[17]

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 'P50' portfolio value for a total program of works (i.e., there is an equal likelihood of over- or under-spending the estimate total).[18]

All work is within existing substations. No allowance for additional access or special foundations have been made.

We estimate that the actual cost is within +/- 25 per cent of the central capital cost. An accuracy of +/-25 per cent 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.

Routine operating and maintenance costs are based on works of similar nature. Given that there is an incremental routine operating and maintenance costs saving in the options compared to the base case, this is a net benefit in the assessment.

5.4. Value of customer reliability

We have applied a NSW-wide VCR value based on the estimates developed and consulted on by the AER.[19] The options considered involve the replacement of disconnectors across our network. As a result, we consider that a state-wide VCR is likely to reflect the weighted mix of customers that will be affected by these options.

5.5. The options have been assessed against three reasonable scenarios

The credible options are assessed against three different scenarios within this PSCR. The scenarios differ by the assumed level of risk costs, given that these are the key parameters that may affect the ranking of the credible options. As wholesale market benefits are not relevant for this RIT-T, the three scenarios assume the most likely scenario from AEMO's Integrated System Plan (ISP, i.e. the 'Step Change' scenario). Risk cost assumptions do not form part of AEMO's ISP assumptions and have been based on Transgrid's analysis.

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[16] This is equal to WACC (pre-tax, real) in the latest final decision for a transmission business in the NEM (Transgrid) as of the date of this analysis, see: AER, TasNetworks – 2024-29 – Final decision – PTRM, April 2024, WACC sheet.
[17] AEMO '2023 Inputs, Assumptions and Scenarios Report', July 2023, p 123.
[18] For further detail on our cost estimating approach refer to section 6 of our Repex Overview Paper submitted with our 2023-28 Revenue Proposal.
[19] This VCR is equal to the $49,216 within AEMO's July 2023 2023 Inputs, Assumptions and Scenarios Report inflated to September 2024.

Table 5-1 Summary of scenarios

Variable / Scenario	Central scenario	Low risk costs scenario	High risk costs scenario
Scenario weighting	33%	33%	33%
Discount rate	7%	7%	7%
VCR ($2024-25)	51,196/MWh	51,196/MWh	51,196/MWh
Network capital costs	Base estimate	Base estimate	Base estimate
Avoided unserved energy	Base estimate	Base estimate - 25%	Base estimate + 25%
Safety, environmental and financial risk benefit	Base estimate	Base estimate - 25%	Base estimate + 25%
Avoided routine operating and maintenance costs	Base estimate	Base estimate	Base estimate

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

5.6. 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:

- Optimal timing of the project
- Alternate scenario weights
- Higher or lower VCRs
- Higher or lower network capital costs of the credible options
- 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.

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 each credible option to the base case. The benefits of each 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 2024/25 dollars.

6.1. Estimated gross benefits

The table below summarises the present value of the gross benefit estimates for each credible option relative to the base case. The results have been presented separately for each reasonable scenario, and on a weighted basis. The sole benefit included within this assessment is avoided involuntary load shedding.

Table 6-1 NPV of gross economic benefits relative to the base case ($2024/25 m)

Option	Central	Low risk costs scenario	High risk costs scenario	Weighted scenario
Scenario weighting	1/3	1/3	1/3	
Option 1	1412.90	1059.68	1766.13	1412.90

6.2. Estimated costs

The table below summarises the present value of capital costs of each credible option relative to the base case. The results have been presented separately for each reasonable scenario, and on a weighted basis.

Table 6-2 NPV of capital relative to the base case ($2024/25 m)

Option	Central	Low risk costs scenario	High risk costs scenario	Weighted scenario
Scenario weighting	1/3	1/3	1/3	
Option 1	15.42	15.42	15.42	15.42

6.3. Estimated net economic benefits

The net economic benefits calculated as the estimated gross benefits less the estimated costs plus the terminal value. The table below summarises the present value of the net economic benefits for each credible option relative to the base case. The results have been presented separately for each reasonable scenario, and on a weighted basis. The table also shows a ranking of the options, where options with a higher net economic benefit under the weighted scenario are accorded a higher rank.

Table 6-3 NPV of net economic benefits relative to the base case ($2024/25 m)

Option	Central	Low risk costs scenario	High risk costs scenario	Weighted scenario
Scenario weighting	1/3	1/3	1/3	
Option 1	1397.48	1044.26	1750.71	1397.48

6.4. Sensitivity testing

We have considered the robustness of the RIT-T assessment by undertaking a range of sensitivity testing. The purpose of this testing is to examine how the net economic benefit of the credible options changes with respect to changes in key modelling assumptions. The factors tested as part of the sensitivity analysis for this PSCR are:

- Optimal timing of the project;
- Alternate scenario weights;
- Higher or lower VCRs;
- Higher or lower capital costs of the credible options;
- Alternate commercial discount rate assumptions

The sensitivity testing was undertaken against the central scenario. Specifically, we individually varied each factor identified above and estimated the net economic benefit in that scenario relative to the base case while holding all other assumptions under the central scenario constant. The results of the sensitivity tests are set out in the sections below.

In addition, we have also sought to identify the 'boundary value' for key variables beyond which the outcome of the analysis would change.

6.4.1. Optimal timing of the project

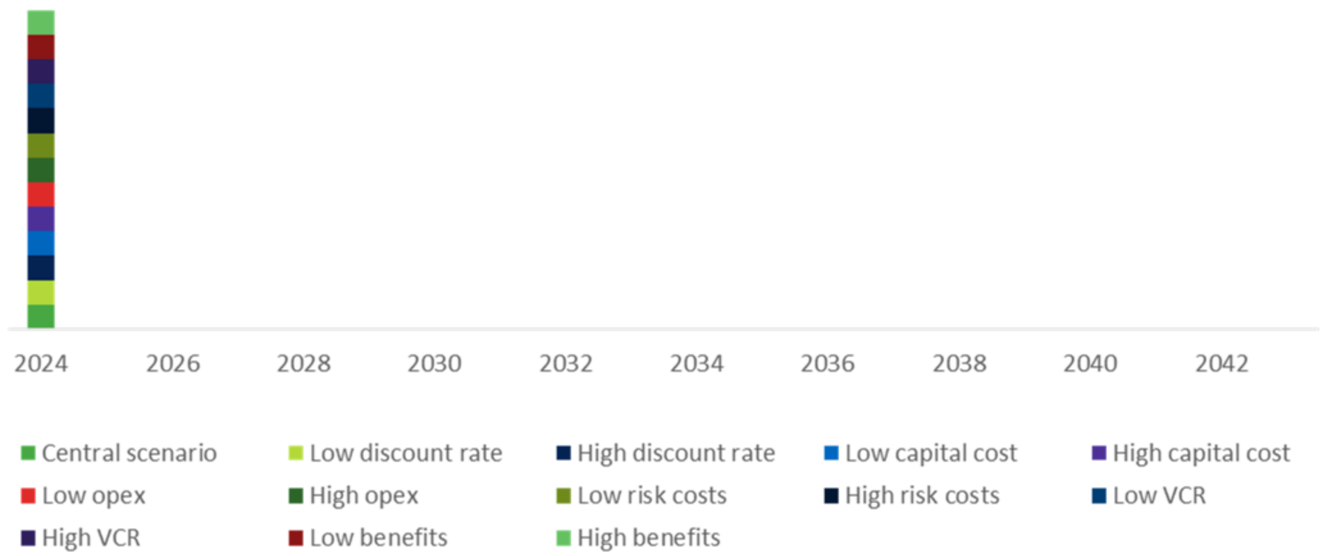
We have estimated the optimal timing for the preferred option. The optimal timing of an investment is the year when the annual benefits (avoided risk costs) from implementing the option become greater than the annualised investment costs. The analysis was undertaken under the central set of assumptions and a range of alternative assumptions for key variables. The purpose of the analysis is to examine the sensitivity of the commissioning year to changes in the underlying assumptions.

The sensitivities we considered are:

- a 25% increase / decrease in capital costs
- a 25% increase / decrease in demand
- a lower discount rate of 3.63% and a higher discount rate of 10.5%
- a 30% increase / decrease in the VCR
- a 25% increase / decrease in safety, environmental and financial risk costs

Figure 6-1 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 2024 for the balance of sensitivities investigated.

Figure 6-1 Distribution of optimal timing under a range of different key assumptions



6.4.2. Scenario weights

As we have identified only one credible option, and since we have assessed this option to be net beneficial under all three reasonable scenarios, there are no alternative scenario weights that will change the RIT-T outcome (i.e., lead to the identification of a different preferred option, or no preferred option).

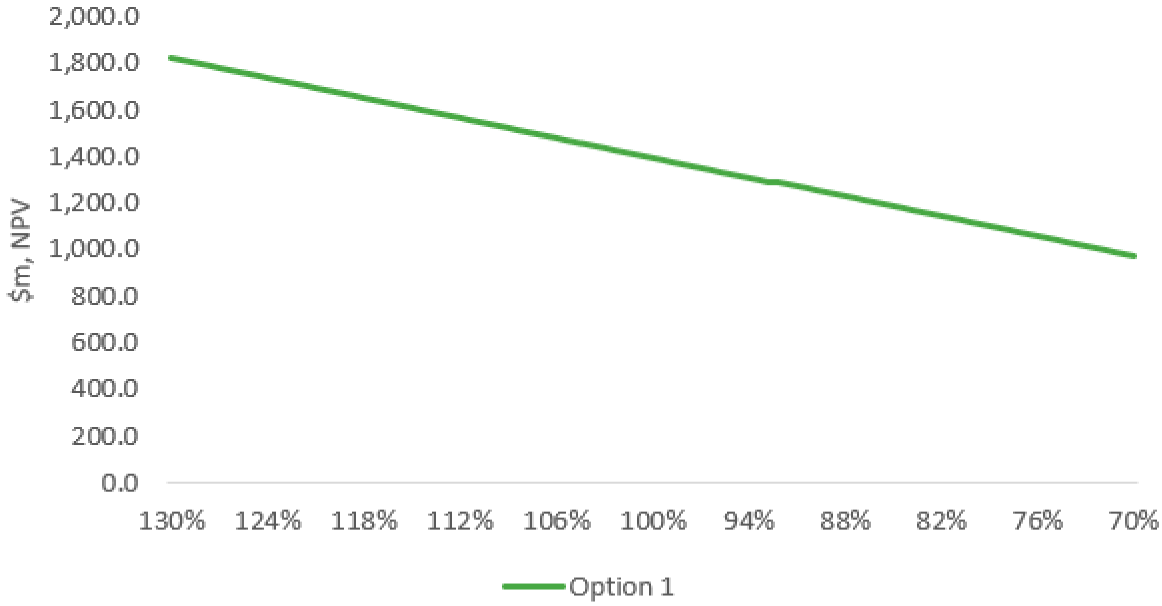
6.4.3. Sensitivity analysis on the VCR

We estimated the net economic benefit of the option by adopting a VCR that is 30% higher (the 'High VCR' scenario) and 30% lower (the 'Low VCR' scenario) than the estimate of VCR adopted in our central scenario. The results of this analysis are presented in the table and figure below.

Table 6-4 NPV of net economic benefits relative to the base case under a lower and higher VCR ($2024/25 m)

Option/scenario	Low VCR	High VCR
Sensitivity	*Central estimate - 30%*	*Central estimate + 30%*
Option 1	973.61	1821.35

Figure 6-2 NPV of net economic benefits relative to the base case under a lower and higher VCR ($2024/25 m)



We have also undertaken a threshold analysis to identify the change in risk costs that would need to occur for the one credible option to have a zero net benefit. The result of this analysis was that risk costs for Option 1 would need to decrease by more than 99 per cent for the net benefits to become negative. Such a change in risk costs is outside the expected range of costs and, as such, this result of Option 1 being expected to provide positive net benefits is robust to reasonable risk cost sensitivities.

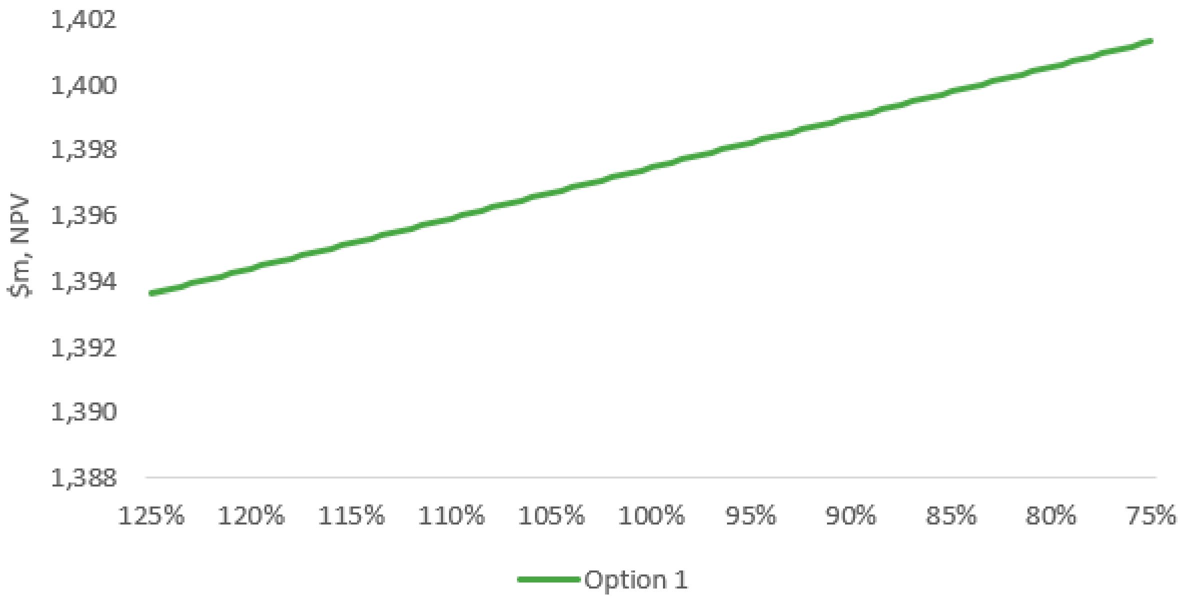
6.4.4. Sensitivity analysis on network capital costs

We estimated the net economic benefit of the option by adopting a capital cost that is 25% higher (the 'High capex' scenario) and 25% lower (the 'Low capex' scenario) than the estimate adopted in our central scenario. The results of this analysis are presented in the table and figure below.

Table 6-5 NPV of net economic benefits relative to the base case under lower and higher capital costs ($2024/25 m)

Option/scenario	Low capex	High capex
Sensitivity	*Central estimate - 25%*	*Central estimate + 25%*
Option 1	1401.34	1393.63

Figure 6-3 NPV of net economic benefits relative to the base case under lower and higher capital costs ($2024/25 m)



We have also undertaken a threshold analysis to identify the change in capital cost estimates that would need to occur for the credible option to have a zero net benefit. Specifically, we analyse the extent to which capital costs would need to change. The result of this analysis was that the capital cost would need to increase by more than a rate that's within the thresholds for the net benefits to become negative. Such a change in capital costs is outside the expected range. As a result, the expectation of Option 1 providing positive net benefits is considered robust to reasonable capital cost sensitivities.

6.4.5. Sensitivity on the discount rate

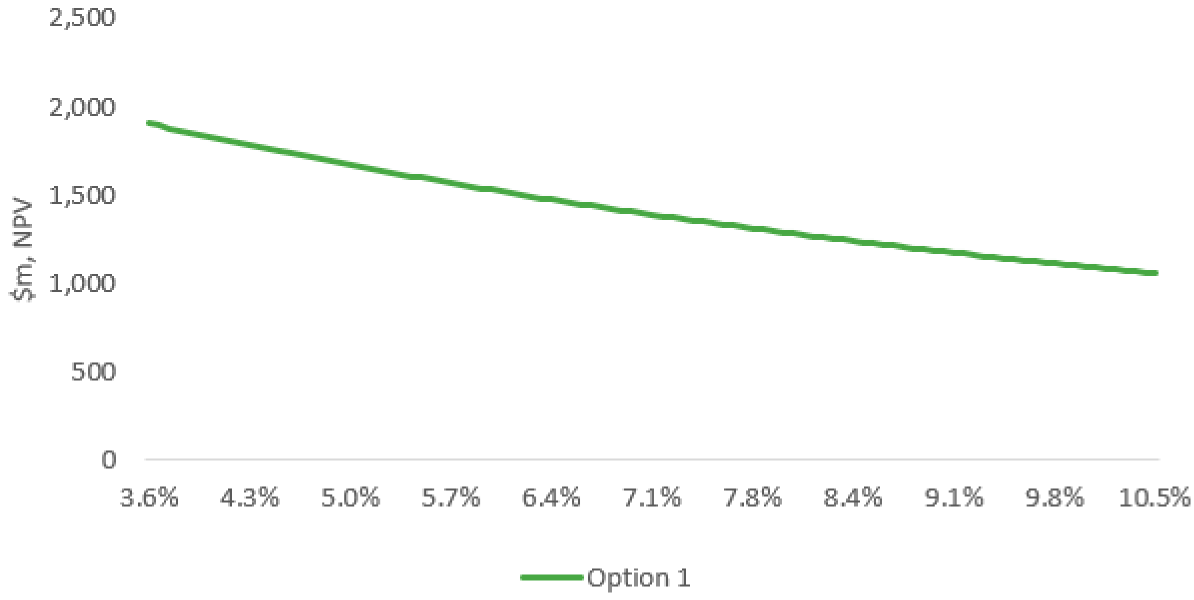
We estimated the net economic benefit of the option by adopting a low discount rate of 3.63% which is consistent with the AER's latest final determination for a TNSP (the 'Low discount rate' scenario),[20] and a high discount rate of 10.5% which aligns with the high discount rate scenario in the 2023 IASR (the 'High discount rate' scenario).[21] The results of this analysis are presented in the table and figure below.

Table 6-6 NPV of net economic benefits relative to the base case under a lower and higher discount rates ($2024/25 m)

Option/scenario	Low discount rate	High discount rate
Sensitivity	*3.63%*	*10.5%*
Option 1	1905.95	1057.70

[20] This is equal to WACC (pre-tax, real) in the latest final decision for a transmission business in the NEM (Transgrid) as of the date of this analysis, see: AER, TasNetworks – 2024-29 – Final decision – PTRM, April 2024, WACC sheet.
[21] AEMO '2023 Inputs, Assumptions and Scenarios Report', July 2023, p 123.

Figure 6-4 Net economic benefits relative to the base case under a lower and higher discount rates ($2024/25 m)



We have also undertaken a threshold analysis to identify the change in the discount rate that would need to occur for the credible option to have a zero net benefit. Our approach involved solving for the discount rate that would result Option 1 having a net benefit of zero. Our results suggests that there is no reasonable discount rate 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 discount rate sensitivities.

7. Final conclusion on the preferred option

The analysis in this PACR finds that Option 1 (disconnector replacement program) is the preferred option to address the identified need. Moving forward with this option is the most prudent and economically efficient solution to manage the disconnector risks to ALARP.

The estimated capital expenditure associated with this option is $21.46 million in $2024/25 over the assessment period. Option 1 is found to have positive net benefits under all scenarios investigated and, on a weighted basis, will deliver $1397.48 million in net economic benefits. All works are expected to be completed by 2028.

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.

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 220.

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); and	See below.
	(2) a summary of, and the RIT-T proponent's response to, submissions received, if any, from interested parties sought under paragraph (q).	NA
5.16.4(k)	The project assessment draft report 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;	NA
	(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 & 6
	(4) a detailed description of the methodologies used in quantifying each class of material market benefit and cost;	4 & 5
	(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);	NA
	(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;	7
	(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:	NA

	(i) if the estimated capital cost of the proposed preferred option is greater than $103 million (as varied in accordance with a cost threshold determination); and (ii) AEMO is not the sole RIT-T proponent, The RIT-T reopening triggers applying to the RIT-T project.	

In addition, the table below outlines a separate compliance checklist demonstrating compliance with the binding guidance in the latest AER RIT-T guidelines.

<table>
<tr><th>Guidelines section</th><th>Summary of the requirements</th><th>Section in the PSCR</th></tr>
<tr><td>3.5A.1</td><td>Where the estimated capital costs of the preferred option exceeds $103 million (as varied in accordance with a cost threshold determination), a RIT-T proponent must, in a RIT-T application:
i. outline the process it has applied, or intends to apply, to ensure that the estimated costs are accurate to the extent practicable having regard to the purpose of that stage of the RIT-T
ii. for all credible options (including the preferred option), either
• apply the cost estimate classification system published by the AACE, or
• if it does not apply the AACE cost estimate classification system, identify the alternative cost estimation system or cost estimation arrangements it intends to apply, and provide reasons to explain why applying that alternative system or arrangements is more appropriate or suitable than applying the AACE cost estimate classification system in producing an accurate cost estimate</td><td>NA</td></tr>
<tr><td>3.5A.2</td><td>For each credible option, a RIT-T proponent must specify, to the extent practicable and in a manner which is fit for purpose for that stage of the RIT-T:
i. all key inputs and assumptions adopted in deriving the cost estimate
ii. a breakdown of the main components of the cost estimate
iii. the methodologies and processes applied in deriving the cost estimate (e.g. market testing, unit costs from recent projects, and engineering-based cost estimates)
iv. the reasons in support of the key inputs and assumptions adopted and methodologies and processes applied
v. the level of any contingency allowance that have been included in the cost estimate, and the reasons for that level of contingency allowance</td><td>6.2</td></tr>
<tr><td>3.5.3</td><td>The RIT-T proponent is required to provide the basis for any social licence costs in their RIT-T reports, and may choose to refer to best practice from a reputable, independent and verifiable source.</td><td>NA[22]</td></tr>
<tr><td>3.8.2</td><td>Where the estimated capital cost of the preferred option exceeds $103 million (as varied in accordance with an applicable cost threshold determination), a RIT-T proponent must undertake sensitivity analysis on all credible options, by varying one or more inputs and/or assumptions.</td><td>NA</td></tr>
<tr><td>3.9.4</td><td>If a contingency allowance is included in a cost estimate for a credible option, the RIT-T proponent must explain:
• the reasons and basis for the contingency allowance, including the particular costs that the contingency allowance may relate to, and
• how the level or quantum of the contingency allowance was determined.</td><td>NA</td></tr>
<tr><td>4.1</td><td>RIT-T proponents are required to describe in each RIT-T report
• how they have engaged with local landowners, local council, local community members, local environmental groups or traditional owners and sought to address any relevant concerns identified through this engagement
• how they plan to engage with these stakeholder groups, or
• why this project does not require community engagement</td><td>NA[22]</td></tr>
</table>

[22] These are new requirements stipulated in revised RIT-T Application Guidelines released by the AER, which came into effect on 21 November 2024. For compliance purposes, the AER only have regard to the guidance that was in effect when Transgrid initiated the RIT-T in question. In this context, initiated means from the publication of a project specification consultation report (PSCR). As the PSCR was published prior to 21 November 2024, these new requirements are not applicable to this RIT-T.

Appendix B Risk Assessment Methodology

Summary of methodology

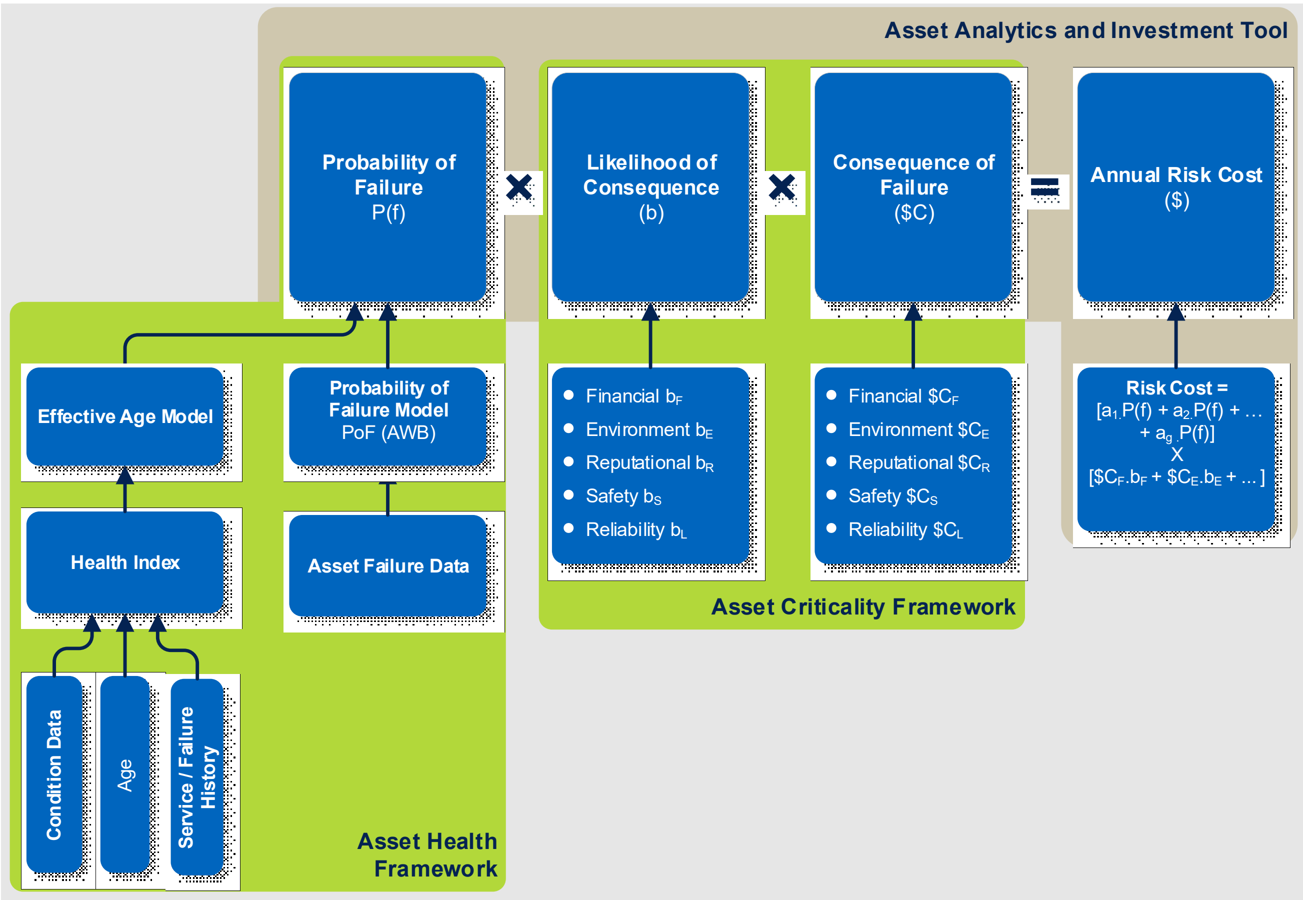
This appendix summarises our network risk assessment methodology that underpins the identified need for this RIT-T. Our risk assessment methodology is aligned with the AER's Asset Replacement Planning guideline and its principles.[23]

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).

The figure 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



23 Industry practice application note - Asset replacement planning, AER July 2024

Economic justification for replacement expenditure to address an identified need is provided where the risk reduction benefit (ie the value of avoided risk costs) is greater than the costs of the project or program. The major quantified risks we apply for replacement expenditure justifications include asset failures that materialise as:

- 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.

Asset health and Probability of Failure

The first step in calculating the Probability of Failure (PoF) of an asset is determining the asset health and associated effective age,[24] 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 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 the table below.

Further details are available in our Network Asset Health Methodology.

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

Table B-1 Weibull parameters for asset components

Asset component	Weibull parameters	
	η	β
Disconnectors	67	4.8

Asset criticality

Asset criticality is the relative risk of the consequences of an undesired outcome. Asset criticality considers the severity of the consequences of the asset failure occurring and the likelihood the consequence will eventuate. Our approach to determining these factors for each relevant risk category is set out in our Network Asset Criticality Framework. The analysis leverages data from past events, relevant research / publications and technical insights, to determine an economic value of the impact.

Appendix C Disconnectors identified for replacement and refurbishment

Table B-1 presents a list of the disconnectors identified by this need and the proposed replacement and refurbishment approach under the preferred option (Option 1).

Table B-1 Disconnectors considered under this RIT-T

Substation Name	Disconnector	Option 1 Replacement / Refurbishment
ARMIDALE	EC00008297	Refurbishment
BERYL	B01309/3	Replacement
BERYL	B01309/5	Replacement
BERYL	B01309/6	Replacement
BERYL	B01309/7	Replacement
BERYL	B01309/8	Replacement
BROKEN HILL	EC00017710	Replacement
CANBERRA	EC00001373	Replacement
CANBERRA	EC00001379	Replacement
COWRA	A01124/2	Replacement
COWRA	A01124/4	Replacement
COWRA	A01124/5	Replacement
COWRA	A01124/6	Replacement
COWRA	A01134/1	Replacement
COWRA	A01134/2	Replacement
COWRA	A01134/3	Replacement
COWRA	A01134/4	Replacement
COWRA	A01134/5	Replacement
COWRA	A01134/6	Replacement
COWRA	A01134/7	Replacement
COWRA	A01134/9	Replacement
COWRA	A01135/2	Replacement
COWRA	A01135/4	Replacement
COWRA	A01135/5	Replacement
COWRA	A01135/6	Replacement
COWRA	A01135/8	Replacement
FORBES	A01202/5	Replacement
FORBES	A01202/7	Replacement
FORBES	A01202/8	Replacement
FORBES	A01203/1	Replacement
FORBES	A01203/2	Replacement
FORBES	A01203/3	Replacement
FORBES	A01203/4	Replacement
FORBES	A01203/5	Replacement
FORBES	A01203/6	Replacement
FORBES	A01203/7	Replacement
FORBES	A01204/2	Replacement
FORBES	A01223/1	Replacement

Substation Name	Disconnector	Option 1 Replacement / Refurbishment
FORBES	A01223/2	Replacement
FORBES	A01223/3	Replacement
FORBES	A01223/4	Replacement
FORBES	A01223/5	Replacement
FORBES	EC00009953	Replacement
MURRUMBURAH	EC00012063	Refurbishment
MURRUMBURAH	EC00012064	Refurbishment
MURRUMBURAH	EC00012065	Refurbishment
MURRUMBURAH	EC00012066	Refurbishment
MURRUMBURAH	EC00012067	Refurbishment
MURRUMBURAH	EC00012068	Refurbishment
SYDNEY EAST	A02025/1	Refurbishment
SYDNEY EAST	A02025/4	Refurbishment
SYDNEY EAST	A02027/2	Refurbishment
SYDNEY EAST	A02027/4	Refurbishment
SYDNEY EAST	A02027/5	Refurbishment
SYDNEY EAST	A02027/6	Refurbishment
SYDNEY EAST	A02027/8	Refurbishment
SYDNEY EAST	A02028/1	Refurbishment
SYDNEY EAST	A02028/3	Refurbishment
SYDNEY EAST	A02028/4	Refurbishment
SYDNEY EAST	A02029/3	Refurbishment
SYDNEY EAST	A02029/7	Refurbishment
SYDNEY EAST	A02029/9	Refurbishment
SYDNEY EAST	A02030/7	Refurbishment
SYDNEY EAST	A02031/1	Refurbishment
SYDNEY EAST	A02031/3	Refurbishment
SYDNEY EAST	A02031/7	Refurbishment
SYDNEY SOUTH	EC00001458	Refurbishment
SYDNEY SOUTH	H70591/1	Replacement
SYDNEY SOUTH	H70599/1	Replacement
SYDNEY SOUTH	H70601/2	Replacement
SYDNEY SOUTH	H70603/1	Replacement
SYDNEY SOUTH	H70613/1	Replacement
SYDNEY SOUTH	H70614/1	Replacement
SYDNEY SOUTH	H70618/1	Replacement
SYDNEY SOUTH	H70619/1	Replacement
SYDNEY SOUTH	H70620/1	Replacement
SYDNEY SOUTH	H70623/1	Replacement
SYDNEY SOUTH	H70628/3	Replacement
SYDNEY SOUTH	H70629/1	Replacement
SYDNEY SOUTH	H70629/2	Replacement
SYDNEY SOUTH	H70630/3	Replacement

Substation Name	Disconnector	Option 1 Replacement / Refurbishment
SYDNEY SOUTH	H70631/2	Replacement
SYDNEY SOUTH	H70632/1	Replacement
SYDNEY SOUTH	H70632/3	Replacement
SYDNEY SOUTH	H70633/1	Replacement
SYDNEY WEST	A03010/6	Replacement
SYDNEY WEST	A03011/1	Replacement
SYDNEY WEST	A03063/3	Replacement
SYDNEY WEST	A03063/4	Replacement
SYDNEY WEST	A03064/1	Replacement
SYDNEY WEST	A03080/5	Replacement
SYDNEY WEST	A03080/7	Replacement
SYDNEY WEST	A03082/1	Replacement
SYDNEY WEST	A03082/3	Replacement
SYDNEY WEST	EC00007668	Refurbishment
TAMWORTH	EC00003047	Refurbishment
TAMWORTH	EC00003051	Refurbishment
TUGGERAH	EC00009225	Refurbishment
TUGGERAH	EC00009226	Refurbishment
TUGGERAH	EC00009227	Refurbishment
TUGGERAH	EC00009247	Replacement
TAREE	A09069/1	Refurbishment
TAREE		Replacement
TAREE	A09069/2	Replacement
TAREE	A09069/6	Replacement
TAREE	A09069/8	Replacement
TAREE	A09069/9	Replacement
TAREE	A09070/1	Replacement
TAREE	A09070/2	Replacement
TAREE	A09070/3	Replacement
TAREE	A09070/7	Replacement
TAREE	A09071/1	Replacement
TAREE	A09071/2	Replacement
TAREE	A09071/3	Replacement
TAREE	A09071/5	Replacement
TAREE	A09072/4	Replacement
TAREE	EC00014254	Replacement
TUMUT	A07248/2	Replacement
TUMUT	A07248/3	Replacement
TUMUT	A07248/4	Replacement
TUMUT	A07248/6	Replacement
TUMUT	A07248/7	Replacement
TUMUT	A07248/8	Replacement
TUMUT	A07248/9	Replacement

Substation Name	Disconnector	Option 1 Replacement / Refurbishment
TUMUT	A07249/1	Replacement
TUMUT	A07249/2	Replacement
TUMUT	A07249/4	Replacement
TUMUT	A07249/5	Replacement
TUMUT	A07249/8	Replacement
TUMUT	A07252/2	Replacement
TUMUT	A07252/3	Replacement
TUMUT	A07252/4	Replacement
TUMUT	A07252/5	Replacement
TUMUT	A07252/6	Replacement
TUMUT	A07252/8	Replacement
TUMUT	A07252/9	Replacement
YANCO	A07440/5	Replacement