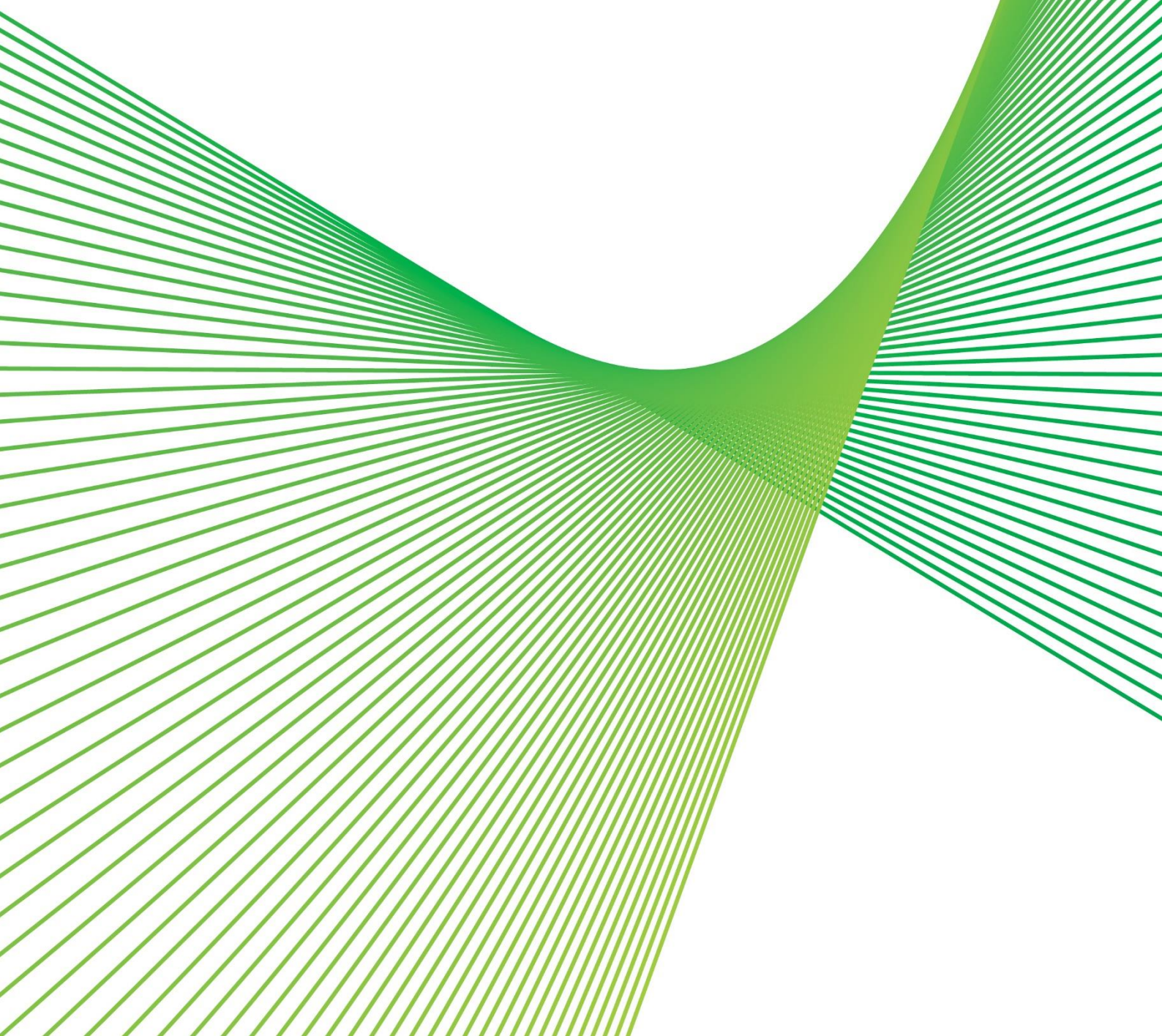


Maintaining safe and reliable operation of Sydney East, Wagga 132 kV, and Dapto substations

RIT-T Project Specification Consultation Report

Issue date: 8 April 2025



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Executive summary

We are applying the Regulatory Investment Test for Transmission (RIT-T) to options for mitigating the risk Transgrid, and its ultimate downstream consumers, face in terms of corroding gantries at the Sydney East, Wagga 132 kV, and Dapto substations. Publication of this Project Specification Consultation Report (PSCR) represents the first step in the RIT-T process.

Substation gantries are essential for the safe and reliable operation of the whole substation. The gantries at the Sydney East, Wagga 132 kV, and Dapto substations display evidence of corrosion, which, if unaddressed, may result in the failure of the steelwork, connection bolts, holding down bolts, or baseplates. The failure of the gantries may in-turn result in a loss of supply to end consumers, injury to staff and damage to other critical substation equipment. These events may also affect more than one system element at the same time, which would require significant time to rectify.

The purpose of this PSCR is to examine and consult in options to address the corrosion of the existing gantries at the Sydney East, Wagga 132 kV, and Dapto substations and reduce the likelihood of prolonged and involuntary load shedding across NSW.

Identified need: maintain safe and reliable operation of the Sydney East, Wagga 132 kV, and Dapto substations

The identified need for this project is to maintain the safe and reliable operation of the Sydney East, Wagga 132 kV, and Dapto substations and the broader transmission network in NSW by addressing the risk of gantry failure.

Condition assessments performed through our routine maintenance program has shown degradation in the condition of these gantries which will increase their risk of failure. Without intervention, other than ongoing business-as-usual maintenance, the assets are expected to deteriorate further and more rapidly. This will increase the risk of supply interruptions to our customers as well as safety, environmental and financial consequences.

Transgrid considers the proposed investment to be a ‘market benefits’ driven RIT-T as the proposed investment is for the purpose of maintaining network security at critical transmission substations, which is estimated to deliver significant benefits in terms of avoided involuntary load shedding (ie, compared to if nothing is done and corrosion worsens). The investment will also assist Transgrid to manage and mitigate safety risks that would otherwise arise from a failure in substation gantries¹.

While the purpose of the proposed investment has similarities to those made under a reliability corrective action identified need (ie, to avoid involuntary load shedding), the scope of the current reliability standards applicable to Transgrid do not extend to multiple failures of transmission network elements that would be expected to result from a failure of substation gantries (e.g., damage to and failure of multiple busbar sections at the same substation). It follows that the proposed investment is driven by a ‘market benefits’ identified

¹ Transgrid manages and mitigates safety risk to ensure they are below risk tolerance levels or ‘As Low As Reasonably Practicable’ (‘ALARP’), in accordance with Transgrid’s obligations under the New South Wales *Electricity Supply (Safety and Network Management) Regulation 2014* and Transgrid’s Electricity Network Safety Management System (ENSMS). In particular, risks for Transgrid and its consumers are mitigated unless it is possible to demonstrate that the cost involved in further reducing the risk would be grossly disproportionate to the benefit gained.

need given the lack of externally imposed obligations relating to multiple failures of transmission network elements.

Credible options considered

We have considered that there is only one credible option from a technical, commercial, and project delivery perspective. This is summarised in Table E-1.

Table E-1 Summary of credible options

Option	Description	Capital costs (\$m, +/- 25%, Real 2024-25)	Operating costs (per year, Real \$2024-25)
Option 1	Steelwork replacement	27.93 (\pm 25%)	91,298

The preferred option is Option 1, as it has the highest weighted NPV result of the technically and commercially feasible options considered at this stage of the RIT-T process. In consideration of the delivery requirements and the economic benefit NPV analysis for the need, its optimal timing is 2026/27.

It is expected that the replacement works will be undertaken in various phases between January to December in both 2026 and 2031.

The total estimated capital cost is \$27.93m (\$2024-25). The breakdown of capital costs for each substation is listed below:

- Sydney East: \$4.78m
- Wagga 132 kV: \$8.04m
- Dapto: \$15.11m

It is expected that more accurate cost estimates will be provided in the Project Assessment Conclusion Report (PACR) as detailed scoping is progressed.

Two other options were considered but not progressed including on/offsite refurbishment and elimination of gantries by alternate methods. The reasons these options were not progressed are outlined in section 3.3 of this PSCR.

Non-network options are not expected to be able to assist in this RIT-T

We do not consider that non-network solutions can assist with meeting the identified need for this RIT-T. This is driven by the fundamental role that the identified gantries play in the transmission of electricity at a substation, the enduring need for the Sydney East, Wagga 132 kV, and Dapto substations.

The replacement works are found to deliver strong positive net benefits

The figure below provides a breakdown of estimated benefits, showing almost all of the benefits are derived from avoided involuntary load shedding, while other avoided costs contribute relatively small amounts to overall gross benefits.

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



The table below summaries the net market benefit in NPV terms across the three scenarios, as well as on a weighted basis. The table shows that replacement of the assets is found to have positive net market benefits for all scenarios investigated. On a weighted basis, this investment is expected to deliver approximately \$152.82 million in net market benefits.

Figure E-2 Present value of net benefits relative to the base case (\$m, PV)

Option/Scenario	Central	Low benefit	High benefit	Weighted
Option 1	\$152.82	\$110.44	\$195.201	\$152.82

Draft conclusion

Replacement works on the identified assets is the preferred option at this draft stage. In particular, this involves the replacement of substation gantries at Transgrid's Sydney East, Wagga 132 kV, and Dapto substations, including the replacement of insulators and conductor fittings. By undertaking the replacement works, the life of the affected substation gantries at the Sydney East, Wagga 132 kV, and Dapto substations are expected to be extended by approximately 45 years.

Option 1 is found to have positive net benefits under all scenarios investigated and, on a weighted basis, will deliver \$152.82 million in net economic benefits over the assessment period.

The estimated capital expenditure associated with this option is \$27.93 million. The work is being executed in two stages:

- Stage One: Planning, design, development and procurement (including completion of the RIT-T) will occur between 2023/24 and 2025/26, while project delivery and construction will occur in 2025/26 and 2026/27. All works are expected to be completed by 2026/27.
- Stage Two: Planning, design, development and procurement will occur between 2028/29 and 2030/31, while project delivery and construction will occur in 2030/31 and 2031/32. All works are expected to be completed by 2031/32.

Routine operating and maintenance costs across both stages are estimated at approximately \$91,298 per annum (in \$2024/25).

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.

Exemption from preparing a PADR

Subject to the identification of additional credible options during the consultation period, publication of a Project Assessment Draft Report (PADR) is not required for this RIT-T as we consider that the conditions in clause 5.16.4(z1) of the NER exempting RIT-T proponents from providing a PADR have been met.

Specifically, production of a PADR is not required because:

- the estimated capital cost of the preferred option is less than \$54 million;²
- we have identified in this PSCR our preferred option and the reasons for that option, and noted that we will be exempt from publishing the PADR for our preferred option; and
- we consider that the preferred option and any other credible options do not have a material market benefit (other than benefits associated with changes in voluntary load curtailment and involuntary load shedding).

If an additional credible option that could deliver a material market benefit is identified during the consultation period, then we will produce a PADR that includes an assessment of the net economic benefit of each additional credible option.

If no additional credible options with material market benefits are identified during the consultation period, then the next step in this RIT-T will be the publication of a Project Assessment Conclusions Report (PACR) that addresses all submissions received, including any issues in relation to the proposed preferred option raised during the consultation period.³

Submissions and next steps

We welcome written submissions on materials contained in this PSCR. Submissions are due on 10 July 2025⁴.

² Varied from to \$54m based on the [AER Final Determination: Cost threshold review](#), November 2024.

³ In accordance with NER clause 5.16.4(z2).

⁴ Consultation period is for 12 weeks, additional days have been added to cover public holidays.

Submissions should be emailed to our Regulation team via regulatory.consultation@transgrid.com.au.⁵ In the subject field, please reference 'Steelworks Remediation Program PSCR'.

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

Subject to additional credible options being identified during consultation, we anticipate publication of a PACR by August 2025.

⁵ We are bound by the *Privacy Act 1988 (Cth)*. In making submissions in response to this consultation process, we will collect and hold your personal information such as your name, email address, employer and phone number for the purpose of receiving and following up on your submissions. If you do not wish for your submission to be made public, please clearly specify this at the time of lodgement. See Privacy Notice within the Disclaimer for more details.

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1. Introduction

This Project Specification Consultation Report (PSCR) represents the first step in the application of the Regulatory Investment Test for Transmission (RIT-T) to options for mitigating the risks caused by the corroding steelwork on gantry structural members located at Transgrid's Sydney East, Wagga 132 kV, and Dapto substations.

More specifically, the gantries at the Sydney East, Wagga 132 kV, and Dapto substations display evidence of corrosion in recent inspections. The corrosion ranges from initial development to the commencement of loss of member thickness and, if unaddressed, may result in the failure of the steelwork, connection bolts, holding down bolts or baseplates. The failure of the steelwork may in-turn result in a loss of supply to end consumers, injury to staff and damage to equipment. The primary mode of failure of these gantries is from high wind exposure, which can result in multiple gantry failures. Given a multiple gantry failure, the asset restoration time would likely be three months which is deemed to be significant.

Further condition deterioration of the affected assets is due to corrosion. If left untreated, corrosion of some of the vital components of the steel towers could result in incidents such as conductor drop and gantry collapse.

Transgrid routinely assesses the condition of, and timing of ultimate replacement for its assets as part of its ongoing asset management processes. Asset condition assessments in the last few years have identified a number of corrosion related issues at the Sydney East, Wagga 132 kV, and Dapto substations and a plan has been developed to renew the affected steelwork. An allowance has been made for addressing substation gantry corrosion in Transgrid's 2023-28 Revenue Proposal to the Australian Energy Regulator.

1.1. Purpose of this report

The purpose of this PSCR⁶ is to:

- set out the reasons why we propose that action be undertaken (the 'identified need');
- present the options that we currently consider address the identified need;
- outline the technical characteristics that non-network options would need to provide (although we note that non-network options are unlikely to be able to contribute to meeting the identified need for this RIT-T);
- present the economic assessment of all credible options, as well as the assumptions feeding into the analysis, and identify a preferred option at this draft stage of the RIT-T; and
- allow interested parties to make submissions and provide inputs to the RIT-T assessment.

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 PSCR, and the RIT-T more broadly, is to provide interested stakeholders the opportunity to review the analysis and assumptions, provide input to the process, and have certainty and confidence that the preferred option has been robustly identified as optimal.

⁶ See Appendix A for the National Electricity Rules requirements.

1.2. Exemption from preparing a PADR

Subject to the identification of additional credible options during the consultation period, publication of a Project Assessment Draft Report (PADR) is not required for this RIT-T as we consider that the conditions in clause 5.16.4(z1) of the NER exempting RIT-T proponents from providing a PADR have been met.

Specifically, production of a PADR is not required because:

- the estimated capital cost of the preferred option is less than \$54 million;⁷
- we have identified in this PSCR our preferred option and the reasons for that option, and noted that we will be exempt from publishing the PADR for our preferred option; and
- we consider that the preferred option and any other credible options do not have a material market benefit (other than benefits associated with changes in voluntary load curtailment and involuntary load shedding).

If an additional credible option that could deliver a material market benefit is identified during the consultation period, then we will produce a PADR that includes an assessment of the net economic benefit of each additional credible option.

If no additional credible options with material market benefits are identified during the consultation period, then the next step in this RIT-T will be the publication of a Project Assessment Conclusions Report (PACR) that addresses all submissions received, including any issues in relation to the proposed preferred option raised during the consultation period.⁸

1.3. Submissions and next steps

We welcome written submissions on materials contained in this PSCR. Submissions are due on 10 July 2025⁹.

Submissions should be emailed to our Regulation team via regulatory.consultation@transgrid.com.au.¹⁰ In the subject field, please reference 'Steelworks Remediation Program PSCR'.

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

Should we consider that no additional credible options were identified during the consultation period, we intend to produce a Project Assessment Conclusions Report (PACR) that addresses all submissions received, including any issues in relation to the proposed preferred option raised during the consultation period, and presents our conclusion on the preferred option for this RIT-T.¹¹ Subject to additional credible options being identified, we anticipate publication of a PACR by August 2025.

⁷ Varied to \$54m based on the [AER Final Determination: Cost threshold review](#), November 2024.

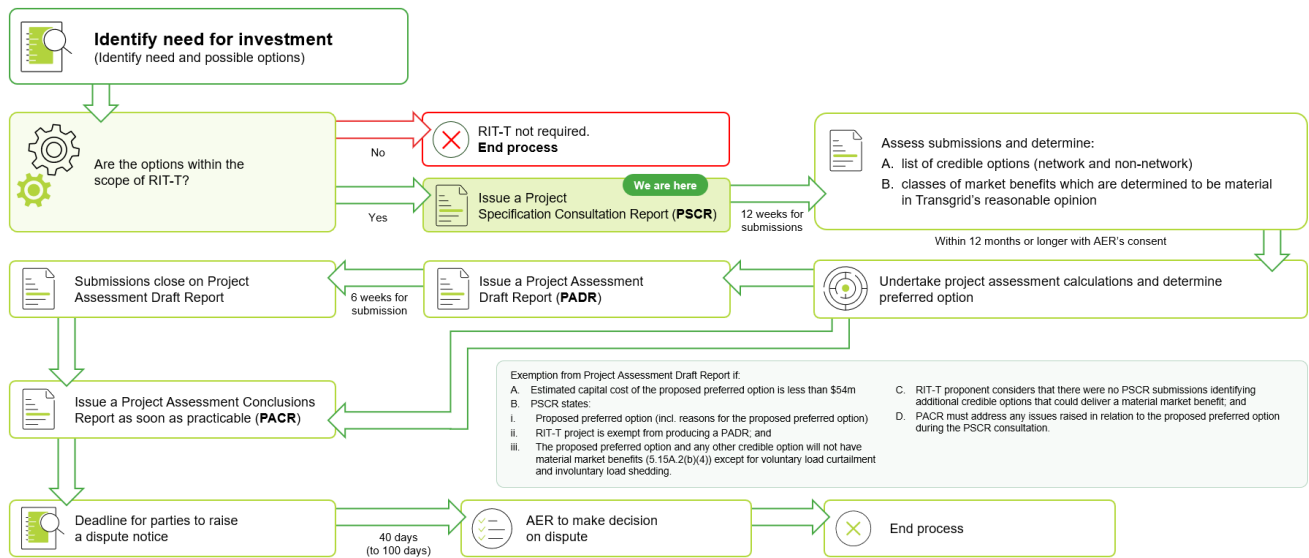
⁸ In accordance with NER clause 5.16.4(z2).

⁹ Consultation period is for 12 weeks.

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¹¹ In accordance with NER clause 5.16.4(z2).

Figure 1-1 This PSCR is the first stage of the RIT-T process¹²



¹² Australian Energy Market Commission. “[Replacement expenditure planning arrangements, Rule determination](#)”. Sydney: AEMC, 18 July 2017.

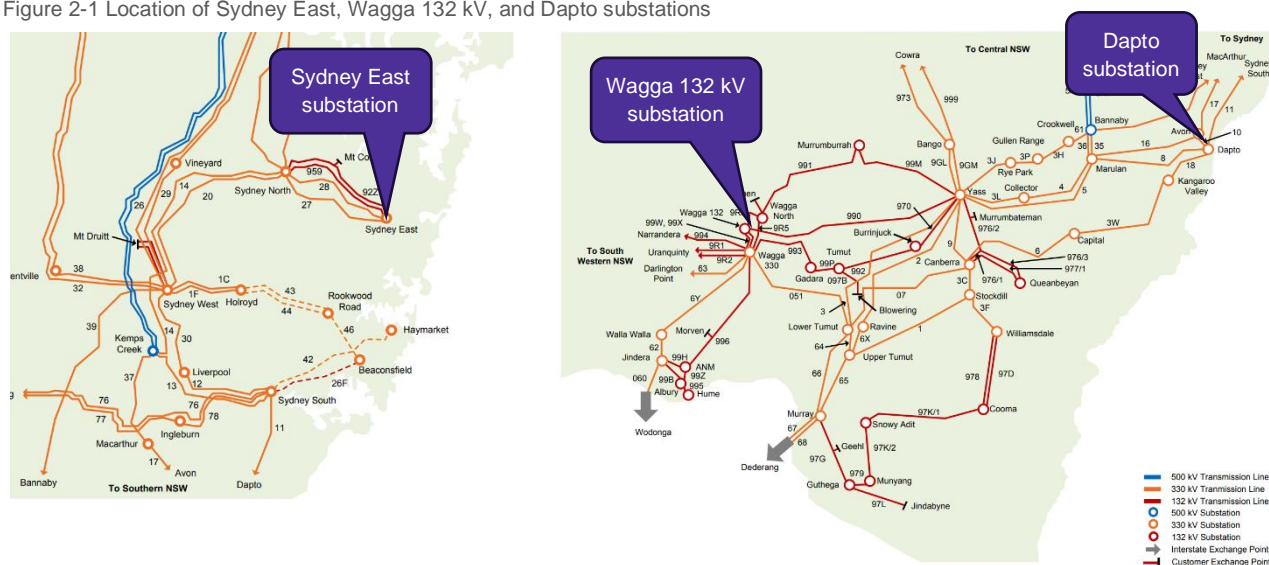
2. The identified need

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 the Sydney East, Wagga 132 kV, and Dapto substations.

2.1. Background to the identified need

- **Sydney East substation** (330/132 kV) was established in 1974 and is located north of the Sydney Central Business District. It plays a critical role in supplying areas north of Sydney Harbour including North Sydney, Ryde, Macquarie Park, Chatswood, and the suburbs along the Northern Beaches. The substation is supplied by two 330 kV lines (Line 27 and Line 28) from Sydney North and has three 330 kV transformers.
- **Wagga 132 kV substation** (132/66 kV) supplies load to the Wagga Wagga area at 66 kV. Supply is taken from the Wagga North, Yass 330/132 kV and Wagga 330/132 kV substations through four 132 kV lines. Two 60 MVA transformers substation supply load to seven 66 kV feeder bays. The substation was commissioned in 1955.
- **Dapto substation** (330/132 kV) is supplied by four 330 kV lines from Kangaroo Valley, Avon, Marulan and Sydney South. It was built in 1962 and supplies residential and industrial loads such as Bluescope Steel and also connects Tallawarra Power Station to the 330 kV network.

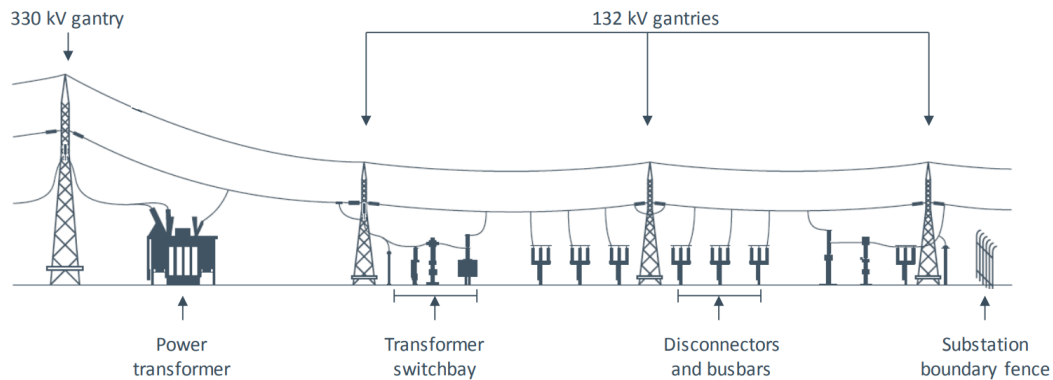
Figure 2-1 Location of Sydney East, Wagga 132 kV, and Dapto substations



Gantries support the high voltage connections between switchbays and busbars. They are mainly used to support conductors in both directions between the transmission tower closest to the substation and the equipment within the substation via the use high voltage insulators. Gantries are connected to concrete footings by concrete plinths, holding down bolts and baseplates. They also support overhead earthwires

that protect the substation equipment from direct lightning strikes and are essential for the safe and reliable operation of the substation. Figure 2-2 below, illustrates the role of gantries in the substation.

Figure 2-2 Simplified diagram of substation elements highlighting the role that gantries play



Gantry structural members across the remediation sites exhibit evidence of corrosion that has resulted in loss of thickness in gantry steelwork, commonly referred to as members and bolts. The loss of thickness in members and bolts reduces the structural integrity of gantry structures, which over time leads to increasing risk of structural failure, particularly during high wind events and short circuit scenarios. Examples of corrosion on gantry structural members are shown in the Figure 2-3.

Figure 2-3 Typical gantry steel members showing corrosion



Figure 2-4 show examples of holding down bolts, base plates and member connection bolts displaying advanced stages of corrosion that Transgrid consider need to be addressed as a matter of urgency as some have already reached the end of their lives.

Figure 2-4 Typical corrosion to holding down bolts and baseplates



The proposed investment to address the corroded gantries and holding down bolts has significant benefits as the investment will avoid the likelihood of prolonged and involuntary load shedding across the areas supplied by Sydney East, Wagga 132 kV, and Dapto substations.

In addition, the increased risk of failure presents a safety risk which Transgrid is obligated to manage.

Rectifying the worsening condition of the gantries and holding down bolts will reduce safety risks, as well as lower planned and unplanned corrective maintenance costs.

The key economic benefits associated with addressing this need are summarised as:

Reduction of risk as quantified as a direct impact to Transgrid and consumers including:

- Involuntary load shedding
- Safety and environmental hazards associated with a catastrophic failure.

Avoided operating expenditure related to an increase in corrective maintenance for the relevant assets.

2.2. Description of the identified need

Transgrid considers the proposed investment a 'market benefits' driven RIT-T as the proposed investment is for the purpose of maintaining network security at critical transmission substations, which is estimated to deliver significant benefits in terms of avoided involuntary load shedding (ie, compared to if nothing is done and corrosion worsens). The investment will also assist Transgrid to manage and mitigate safety risks that would otherwise arise from a failure in substation gantries¹³.

Investments made under a 'market benefits' identified need differs from those undertaken under a 'reliability corrective action' identified need in that market benefits driven investments are not made to meet externally imposed obligations on the network business and, consequently the preferred option must have positive net market benefits.

While the purpose of the proposed investment has similarities to those made under a reliability corrective action identified need (ie, to avoid involuntary load shedding), the scope of the current reliability standards applicable to Transgrid do not extend to multiple failures of transmission network elements that would be

¹³ Transgrid manages and mitigates safety risk to ensure they are below risk tolerance levels or 'As Low As Reasonably Practicable' ('ALARP'), in accordance with Transgrid's obligations under the New South Wales *Electricity Supply (Safety and Network Management) Regulation 2014* and Transgrid's Electricity Network Safety Management System (ENSMS). In particular, risks for Transgrid and its consumers are mitigated unless it is possible to demonstrate that the cost involved in further reducing the risk would be grossly disproportionate to the benefit gained.

expected to result from a failure of substation gantries (eg, damage to and failure of multiple busbars at the same substation). It follows that the proposed investment is driven by a 'market benefits' identified need given the lack of externally imposed obligations relating to multiple failures of transmission network elements.

Overall, we consider that the option proposed in this PSCR will enable Transgrid to appropriately manage the risk associated with substation gantries at the Sydney East, Wagga 132 kV, and Dapto substations going forward, which is expected to realise strongly positive net market benefits. The approach to determining this, and the assessment itself, is presented in this PSCR.

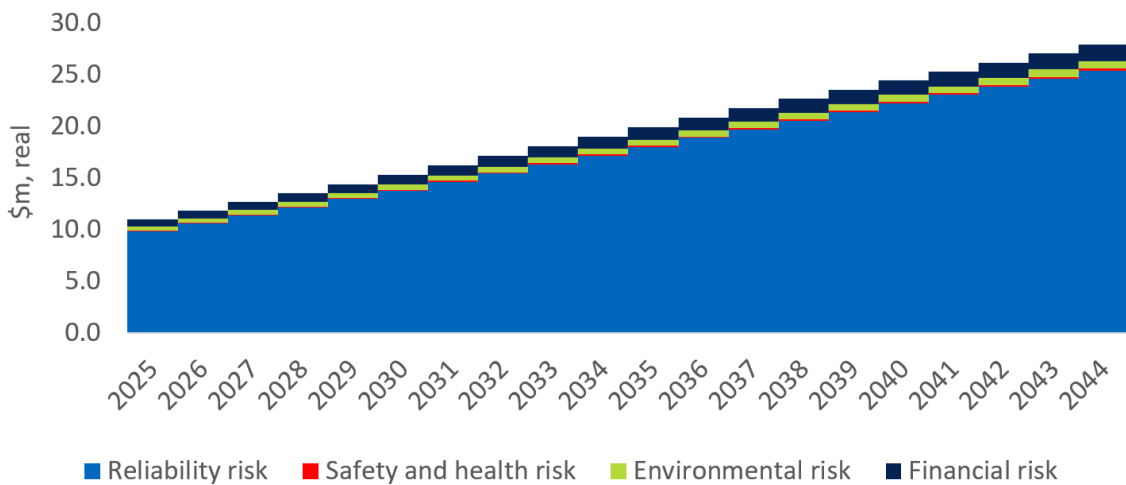
2.3. Assumptions underpinning the identified need

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

Figure 2-2 Estimated risk costs under the central scenario (\$m, real 2024/25)



This section describes the assumptions underpinning our assessment of the base case risk costs, ie, the value of the risk avoided by undertaking the credible options below. The aggregate risk cost is estimated at around \$11.03 million/year currently in 2024/25, and it is expected to increase going forward if action is not taken and the lines are left to deteriorate further (reaching approximately \$27.88 million/year by 2043/44).

2.3.1. Asset health and the probability of failure

Steelwork inspections were carried out to collect condition data on beams, columns, footings, baseplates and holding down bolts. The condition of each component was assessed on visual corrosion, galvanic and rust thickness. Structural models were developed for each substation using the collected condition data. The individual gantry's annual probability of capacity exceedance is calculated under wind loading conditions to determine the annual probability of failure (PoF). This is the same methodology as other transmission line structures. The model also considers the current condition of the steelwork and forecast

corrosion over the next 30 years to predict the rate of degradation and its effect on the structural capacity. Short circuit forces under the ultimate design are used in utilisation calculations but it is not used in the capacity exceedance and PoF calculations. Using the capacity of exceedance for each gantry and Transgrid's Network Asset Risk Assessment Methodology (NRAM) the risk associated with the failure of each gantry is calculated as follows:

- Safety, environmental, reputational and reliability risk is calculated based on the asset that has the highest impact due to the failure of the gantry regardless of the number of services and assets that is serviced by the gantry.
- Financial risk is calculated based on the failure of the gantry and all of the high voltage equipment that is serviced by the gantry.
- Restoration of services after a failure of 30 days which is the minimum expected time due to extent of damage to associated high voltage assets and the design and procurement of a new gantry

Table 2-1 provides an overview of the total number of gantries at each substation and the portion which are considered for replacement based on condition assessment, structural modelling, and investment evaluation.

Table 2-1 Gantry planned remediation

Substation	Total	Stage One		Stage Two	
		Planned Remediation	Stage Percentage (%)	Future Remediation	Stage Percentage (%)
Sydney East	25	2	8%	1	4%
Wagga 132 kV	16	1	6%	-	-
Dapto	18	1	6%	4	22%

General asset health issues identified on steelwork gantries and their consequences are summarised in Table 2-2.

Table 2-2 Asset health issues and their consequences

Issue	Consequences if not remediated
Corrosion of gantry steel bolts and members	Structural failure, leading to safety, reliability and financial risks
Corrosion of foundation interfaces	
Corrosion and deterioration of insulators	Conductor drop, leading to safety, reliability and financial risks
Corrosion of conductor attachment fittings	
Conductor spacers and corona rings	
Damaged earthwire bonding connection	
Corrosion of earthwire attachment fittings	

2.3.2. Reliability risk

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

Reliability risk makes up approximately 91 per cent of the total estimated risk cost in present value terms.

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

2.3.4. Environmental risk

This refers to the environmental consequence (including bushfire risk) to the surrounding community, ecology, flora and fauna of an asset failure. The likelihood of a consequence takes into account the location of the site and sensitivity of surrounding areas, the volume and type of contaminant, the effectiveness of control mechanisms, and the likelihood and impact of bushfires. The monetary value takes into account the cost associated with damage to the environment including compensation, clean-up costs, litigation fees, fines and any other related costs.

Environmental risk makes up 3 per cent of the total estimated risk cost in present value terms.

2.3.5. Safety risk

This refers to the safety consequence to staff, contractors and/or members of the public of an asset failure. The likelihood of a consequence takes into account the frequency of workers on-site, the duration of maintenance and capital work on-site, and the probability and area of effect of an explosive asset failure. The monetary value takes into account the cost associated with fatality or injury compensation, loss of productivity, litigation fees, fines and any other related costs.

Consistent with our ALARP obligations, we apply a disproportionality factor of 'three' to the worker safety component of safety risk.¹⁴

Safety risk makes up less than 1 per cent of the total estimated risk cost in present value terms.

¹⁴ Refer to Section 6.2.5 of the [Network Asset Risk Assessment Methodology](#)

3. Potential credible options

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

We consider that there is only one feasible option from a technical, commercial, and project delivery perspective that can be implemented in sufficient time to meet the identified need. Two other options were considered but not progressed for reasons that are outlined in Table 3-2.

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

3.1. Base case

Under the 'Base Case' scenario, there is no consideration for planned replacement of the gantries or holding down bolts. This is a 'run to fail' scenario and will lead to an increase in the identified risks, the gantry's eventual failure, and the materialisation of the expected consequences. This case shall only be considered as a last resort should no option be deemed viable through the economic evaluation process.

Replacement of a failed gantry is expensive and requires at least 30 days to restore capacity. Key considerations affecting the base case are:

- Transgrid does not hold spare gantries at any voltage as gantries are typically bespoke and a specific design to each site. Gantries would need to be designed and manufactured; this is expected to take between 2-3 weeks.
- If the gantry failure has caused catastrophic failure of HV equipment, there is substantial clean up and disposal costs especially for oil-filled equipment such as transformers and reactors, this is likely to take 1-2 weeks.
- Damaged equipment such as circuit breakers, instrument transformers and busbar equipment will also need replacement with suitable spares from inventory and may require design and civil modifications to suit.
- Constructing the gantries on-site and reinstating the high voltage conductors and earth wires will require outage planning and execution to minimise further load shedding.

These factors will increase the risk of prolonged and frequent involuntary load shedding for end-customers. We have estimated that the cost of involuntary load shedding due to asset failure will increase from approximately \$9.85 million in 2024/25 to approximately \$25.42 million in 2043/44 (in \$2024/25). The above factors will also expose us and our end-customers to greater environmental, safety and financial risks associated with catastrophic asset failure, such as increased risk of explosive failure resulting in injury to nearby people and collateral damage to nearby assets.

3.2. Option 1 – Steelwork Replacement

This option involves replacing the gantries and remediating holding down bolts which have reached end of life. The option will address the identified need by installing new gantries leading to a very low probability of failure, marked reduction in associated risks and lower operating costs.

This option involves:

Remediating the holding down bolts and base plates by:

- Exposing and removal of concrete plinths
- Removal of corrosion, painting and repair of holding down bolts and base plates
- Reinstatement of concrete plinths

Replacing the gantry:

- Removal and replacement of existing corroded gantry structures with new gantries.
- Removal of gantries that are not essential to the future operation of the substation.

Insulator & Fittings

- Replacement of insulators and fittings which have reached end of life or have corrosion

Gantry replacement and holding down bolt remediation is likely to be staged across multiple regulatory periods due to outage constraints.

The estimated total capital expenditure for addressing the gantries at each substation is \$27.93m with an expected asset life of 45 years. Routine operating and maintenance costs are estimated at \$92,011 per year.

The table below provides a breakdown of the expected capital expenditure by substation and expense type:

Table 3-1 Breakdown of capital expenditure by substation and expense type, \$m (2024/25)

	Stage 1 <i>(current regulatory period)</i>			Stage 2 <i>(future regulatory period)</i>		
	Sydney East	Wagga 132 kV	Dapto	Sydney East	Dapto	Total
Labour	1.87	5.23	4.00	1.24	5.82	18.15
Material	0.57	1.61	1.23	0.38	1.79	5.59
Expenses	0.43	1.21	0.92	0.29	1.34	4.19
Total	2.87	8.04	6.16	1.91	8.95	27.93
	17.07			10.86		

This program has been split into two stages, largely due to the different asset risk presented by each stage. Stage One assets are deemed higher risk and require attention within this regulatory period (2024-2028).

The program will be delivered in the following two stages:

- **Stage One:** The works are expected to be undertaken between 2023/24 and 2026/27. Planning, design, development and procurement (including completion of the RIT-T) will occur between

2023/24 and 2025/26, while project delivery and construction will occur from 2025/26. Project completion is assumed by 2026/27.

- **Stage Two:** The works are expected to be undertaken between 2028/29 and 2031/32. Planning, design, development and procurement will occur between 2028/29 and 2030/31, while project delivery and construction will occur from 2030/31. Project completion is assumed by 2031/32.

3.3. Options considered but not progressed

Table 3-2 summarises the reasons the following credible options were not progressed further.

Table 3-2 Options considered but not progressed

Description	Reason(s) for not progressing
Onsite or off-site Refurbishment	<p>This option involves in-situ renewal of the steelwork by grit blasting to remove corrosion, painting and replacement of components and is expected to extend the steelwork life by 10-15 years depending on the local environment.</p> <p>Transgrid has undertaken investigations to refurbish steelwork and utilised multiple blasting techniques on site. The field trials demonstrated:</p> <ul style="list-style-type: none"> • Grid blasting in a live switchyard takes significantly longer than originally anticipated primarily due to network outage constraints • Blasting requires extensive outages of all nearby high voltage plant due to garnet overspray • There are safety risks and cost impacts of blasting steelwork with lead contaminated paint <p>Due to the issues described above and the cost of refurbishment being equivalent to replacement, this option was not progressed as it is not economically feasible.</p>
Elimination of gantries by alternate methods such as Gas Insulated Switchgear (GIS) or PASS (Plug and Switch System)	<p>Gantries cannot be eliminated within a substation with GIS or PASS. Gantries would still be required as a landing structure to function as a transition point between the substation and the transmission lines.</p> <p>To eliminate the need for gantries, the overhead conductors would need to be replaced with either HV underground cables or with Gas Insulated Lines (GIL).</p> <p>This option was not progressed as it is not technically feasible to eliminate gantries without requiring additional technologies such as cables and GIL.</p>
Non-Network Solutions	<p>We do not consider that non-network solutions can assist with meeting the identified need for this RIT-T. This is driven by the fundamental role that the identified gantries play in the transmission of electricity at a substation and the enduring need for the Sydney East, Wagga 132 kV, and Dapto Substations.</p>

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.¹⁵ 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:¹⁶

- 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. As a consequence, by reference to AEMO’s screening criteria, there are no material internetwork impacts associated with Option 1.

3.5. Community engagement

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

Transgrid is not proposing to undertake specific community engagement (in addition to the publication of the RIT-T consultation reports) in relation to this project. The proposed project relates to infrastructure within an existing substation, and as such there will be no additional impact on communities located close to the current transmission infrastructure, apart from construction activities. Transgrid will ensure that all construction works associated to the project are conducted in a manner that causes the least disruption to communities and notes that the construction activities will be subject to separate environmental approval.

As a result, Transgrid does not consider that there is a need for additional community engagement as part of this RIT-T process. We will still engage with community as part of our project’s construction works notifications and welcome any submissions from community members to this PSCR.

¹⁵ As per clause 5.16.4(b)(6)(ii) of the NER.

¹⁶ 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 11 February 2025. https://aemo.com.au/-/media/files/electricity/nem/network_connections/170-0035-pdf.pdf

4. Non-network options

We do not consider that non-network solutions can assist with meeting the identified need for this RIT-T. This is driven by the fundamental role that the identified gantries play in the transmission of electricity at a substation and the enduring need for the Sydney East, Wagga 132 kV, and Dapto substations.

5. 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.

5.1. Wholesale electricity market benefits are not material

The AER has recognised that if the credible options considered will not have an impact on the wholesale electricity market, then a number of classes of market benefits will not be material in the RIT-T assessment, and so do not need to be estimated.¹⁷

Option 1 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 Australia's greenhouse gas emissions
- 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; and
- competition benefits.

5.2. No other classes of market benefits are material

In addition to the classes of market benefits identified above, the NER also requires us to consider the following classes of market benefits, listed in Table 5-1, arising from each credible option.¹⁸ We consider that none of the classes of market benefits listed are material for this RIT-T assessment for the reasons in Table 5-1.

¹⁷ AER, *Regulatory Investment Test for Transmission Application Guidelines*, November 2024, p.57-58.

¹⁸ NER, clause 5.15A.2(b)(4)-(6).

Table 5-1 Reasons non-wholesale electricity market benefits are considered immaterial

Market benefits	Reason
Differences in the timing of expenditure	Option 1 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 Option 1 considered.
Option value	<p>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.¹⁹</p> <p>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.</p> <p>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.</p>
Changes in Australian greenhouse gas emissions	Option 1 is not expected to affect direct emissions in the NEM (from generation and network infrastructure). No material indirect emissions were also identified. Accordingly, this benefit has not been estimated.
Changes in network losses	As there is no change to the transmission lines or the destination of the line under any of the options considered, there will not be any material market benefits associated with changes to network losses.

¹⁹ AER, *Regulatory Investment Test for Transmission Application Guidelines*, November 2024, p.57-58.

6. Overview of the assessment approach

This section outlines the approach that we are proposing to apply in assessing the net benefits associated with the credible options.

6.1. 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 PSCR, consistent with the assumptions adopted in AEMO's 2024 Integrated System Plan (ISP).²⁰ 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 bound discount rate of 3.63 per cent.²¹ We have adopted an upper bound discount rate of 10.50 per cent (ie, AEMO's 2023 Inputs, Assumptions and Scenarios Report).²²

6.2. 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).²³

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

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

²⁰ AEMO, 2024 Integrated System Plan, June 2024, p 92.

²¹ 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.

²² AEMO '2023 Inputs, Assumptions and Scenarios Report', July 2023, p 123.

²³ 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.

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

Construction works are planned to occur within existing Transgrid substations and their adjacent easements, where access is expected to be available. Work extending outside substation boundary fences involves temporarily removing landing spans from Transgrid and/or Distributor transmission lines, as well as laydown areas within Transgrid property boundaries. Only minor access track upgrades have been assessed as part of the desktop assessment.

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 landholders' payments, as applicable.

We acknowledge this important change to the RIT-T guidelines and will continue to engage with community to identify opportunities to address social impacts and reduce the need for compensation due to project impact. We will take into account any additional social licence considerations identified (including those identified through ongoing community engagement, as outlined in section 3.5) and accordingly update the cost and timing of the preferred option in the PACR, where appropriate.

6.3. Value of customer reliability

Consistent with the AER's RIT-T Guideline, we have developed VCR estimates that are based on the estimates developed and consulted on by the AER, weighted to reflect the mix of customers that are likely to be affected by the options.

We have applied a NSW-wide VCR value of \$31,536/MWh based on the estimates developed and consulted on by the AER.²⁴ We have used this VCR as we consider this reasonably reflects the mix of customers supplied from the Sydney East, Wagga 132 kV, and Dapto substations, which includes residential, agricultural and industrial customers.

6.4. Three different scenarios have been modelled

The RIT-T must include any of the ISP scenarios from the most recent IASR that are relevant unless:²⁵

²⁴ AER, *Values of Customer Reliability, Final Report on VCR Values*, December 2024. Escalated to a \$2024/25 estimate using implied 6-month escalation rate of 1.96% derived from RBA February 2025 CPI forecast of 2.4% for the year end June 2025

²⁵ AER, *Regulatory investment test for transmission – Application guidelines*, November 2024, p 42-44.

- the RIT–T proponent demonstrates why it is necessary to vary, omit or add a reasonable scenario to what was in the most recent IASR, and
- the new or varied reasonable scenarios are consistent with the requirements for reasonable scenarios set out in the RIT–T instrument.

The AER’s RIT-T Guidelines clarifies that the number and choice of reasonable scenarios must be appropriate to the credible options under consideration, and that the choice of reasonable scenarios must reflect any variables or parameters that are likely to affect the ranking or sign of the net benefit of any credible option.²⁶

For the purposes of this RIT-T, we consider that the ISP scenarios are not relevant. The key input parameter that is likely to affect the ranking or sign of the net market benefits of the credible options is the probability of failure and consequence of failure of the assets at Inverell substation. The probability and consequence is assessed by reference to the condition of the asset under consideration and the reliability, safety, environmental and financial consequences. These are independent from the assumptions underpinning the ISP scenarios. It follows that adopting the ISP scenarios would not be consistent with adopting scenarios that reflect parameters that could reasonably change the ranking or sign of the net market benefits of the credible options.

In line with the RIT-T Guideline, we have constructed reasonable alternative scenarios. To do this, we developed a **Central Scenario** which reflects our best estimate of each of the modelling parameters, including the asset risk (probability of failure and consequence of failure), expected unserved energy, and capital and operating costs. We developed the Central Scenario around a static model of demand scenarios, described further in our 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 sign or ranking of the credible options.

As indicated above, we consider that the key input parameter that is likely to affect the ranking or sign of the net market benefits of the credible options is the asset failure risk of the identified high voltage and secondary systems assets. We do not consider that variations in other parameters of the Central Scenario are likely to affect the outcome of the RIT-T assessment. In view of this, we have developed additional reasonable scenarios that reflect variations in the asset risk while holding other parameters the same as the Central Scenario.

Specifically, we have developed the following additional scenarios:

- A **High Risk Costs Scenario**, where the asset failure risk is 25% higher than in the Central Scenario. This higher risk would be expected to increase the frequency and duration of outages, and safety, environmental and financial risk costs, in the base case (as compared with the Central Scenario). We have modelled this scenario by increasing our estimate of gross benefits associated with avoided unserved energy and risk costs in this scenario by 25%.
- A **Low Risk Costs Scenario**, where the asset failure risk is 25% lower than in the Central Scenario. This lower failure risk would be expected to reduce the frequency and duration of outages, and safety, environmental and financial risk costs, in the base case (as compared with the Central Scenario). We have modelled this scenario by reducing our estimate of gross benefits associated with avoided unserved energy and risk costs in this scenario by 25%.

²⁶ AER, *Regulatory investment test for transmission: Application guidelines*, November 2024, p.42-44.

The NPV results in this PSCR are reported for each scenario, as well as on a weighted basis. As we have no evidence or rationale for assigning a higher probability for one reasonable scenario over another, we have weighted each reasonable scenario equally.²⁷

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

Table 6-1 Summary of scenarios

Variable / Scenario	Central scenario	Low risk costs scenario	High risk costs scenario
Scenario weighting	1/3	1/3	1/3
Discount rate	7.0%	7.0%	7.0%
VCR (\$2024/25 m)	31,536/MWh	31,536/MWh	31,536/MWh
Network capital costs	Base estimate	Base estimate	Base estimate
Avoided unserved energy	Central demand forecast (POE50)	Low demand forecast (POE90)	High demand forecast (POE10)
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

6.5. Sensitivity analysis

In addition to the scenario analysis, we have also considered the robustness of the outcome of the cost benefit analysis through undertaking a range of sensitivity testing, focused on the central scenario.

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

- lower and higher capital costs of the credible options;
- 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 7.4.

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

²⁷ As per: AER, *Regulatory investment test for transmission: Application guidelines*, November 2024.

7. Assessment of credible options

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

All costs and benefits presented in this PSCR are in 2024/25 dollars.

7.1. Estimated gross benefits

Table 7-1 below summarises the present value of the gross benefits of Option 1 under the three scenarios. These include both the avoided risk cost estimates for Option 1 relative to the base case.

Table 7-1 Estimated gross benefits from Option 1 relative to the base case (\$m, PV)

Option/scenario	Central	Low risk cost scenario	High risk cost scenario	Weighted
<i>Scenario weighting</i>	33%	33%	33%	
Option 1	169.53	127.15	211.91	169.53

7.2. Estimated costs

Table 7-2 below summarises the costs of Option 1, relative to the base case, in present value terms. The cost includes the direct capital and routine operating costs of the option, relative to the base case.

Table 7-2 Costs of Option 1 relative to the base case (\$m, PV)

Option/Scenario	Cost
Option 1	16.71

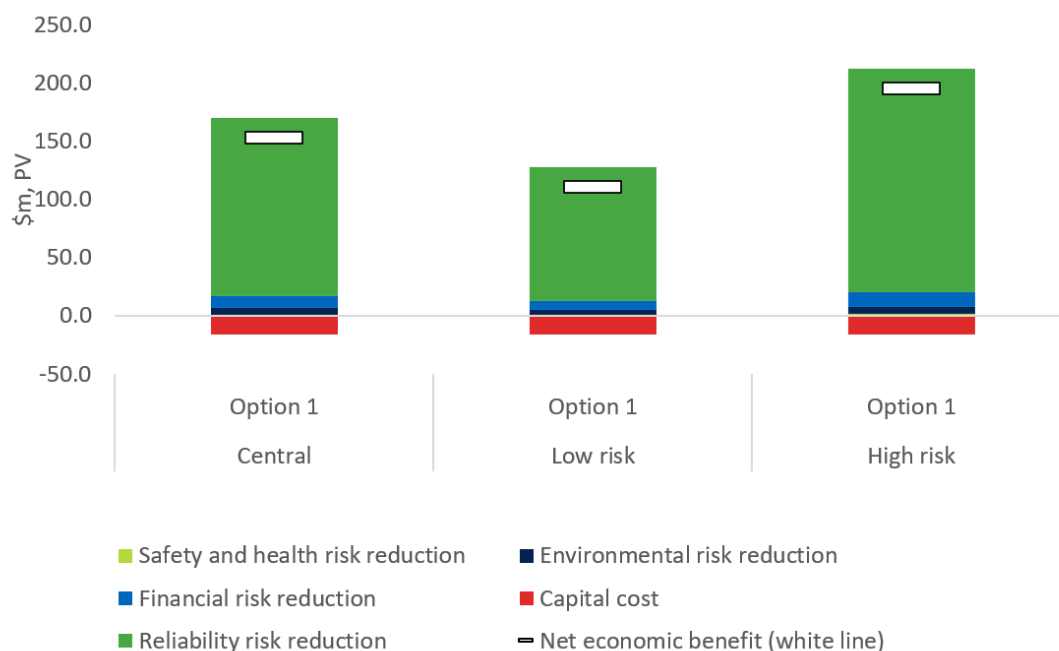
7.3. Estimated net economic benefits

The net economic benefits are the differences between the estimated gross benefits and the estimated costs. Table 7-3 below summarises the present value of the net economic benefits for Option 1 is found to have positive net benefits for all scenarios investigated. On a weighted basis, Option 1 is found to deliver approximately \$255.95 million.

Table 7-3 Net economic benefits for Option 1 relative to the base case (\$m, PV)

Option	Central	Low risk cost scenario	High risk cost scenario	Weighted
<i>Scenario weighting</i>	33%	33%	33%	
Option 1	152.82	110.44	195.20	152.82

Figure 7-1 Net economic benefits (\$m, PV)



7.4. Sensitivity testing

We have undertaken sensitivity testing 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 network capital costs of the credible options
- Alternate commercial discount rate assumptions.

The sensitivity testing was undertaken as 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.

7.4.1. Optimal timing of the project

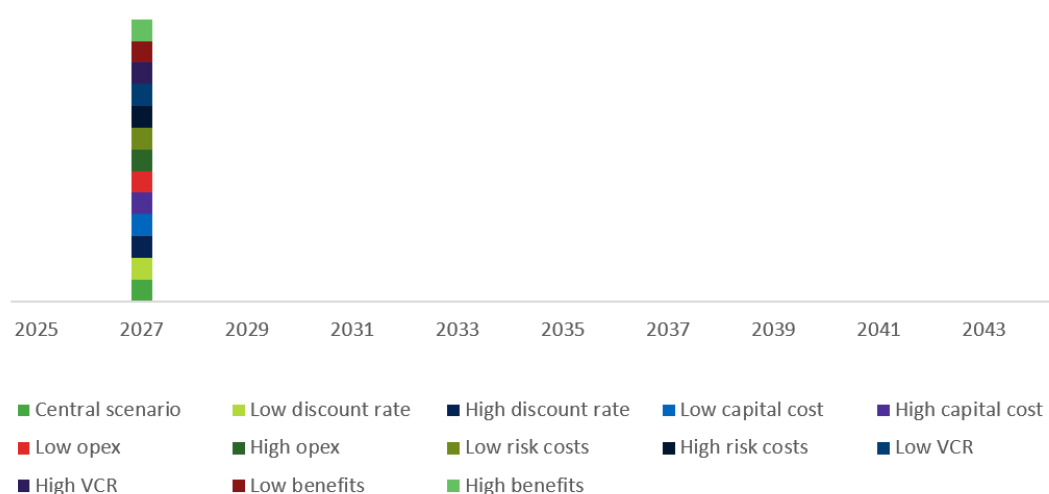
We have estimated the optimal timing for the preferred option. The optimal timing of an investment is the year when the annual benefits (avoided risk costs) from implementing the option become greater than the annualised investment costs. The analysis was undertaken under the central set of assumptions 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 reliability, safety, environmental and financial risk costs

The results of this analysis are presented in the figure below. In all cases, the optimal timing for the preferred option is 2026/27.

Figure 7-2 Optimal timing of Option 1.



7.4.2. 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).

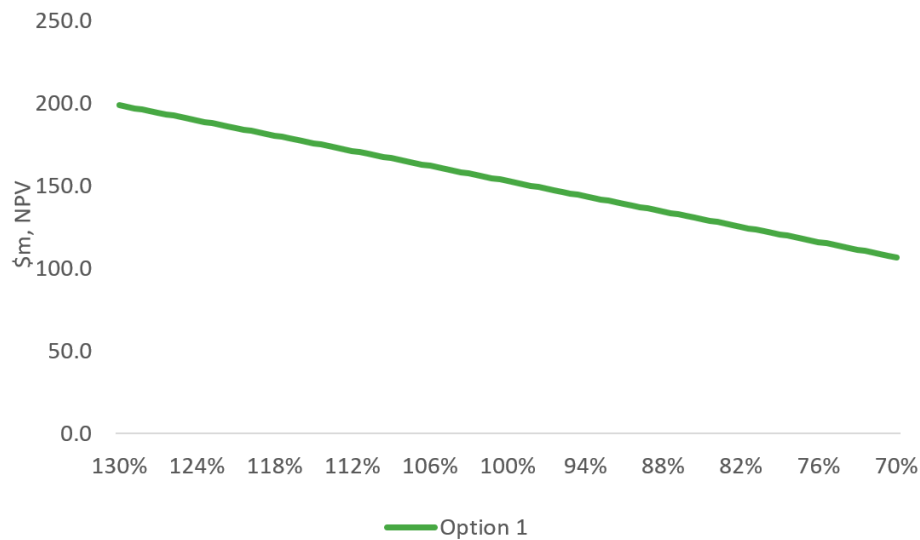
7.4.3. Value of customer reliability

We estimated the net economic benefit of each 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 7-4: Sensitivity of net economic benefits under a lower and higher VCR (\$2024/25 m)

Option/scenario	Low VCR	High VCR	Ranking
Sensitivity	Central estimate - 30%	Central estimate + 30%	
Option 1	106.84	198.80	1

Figure 7-3 Sensitivity of net economic benefits under a lower and higher VCR (\$2024/25 m)



We have also undertaken a threshold analysis to identify the change in VCR that would need to occur for the one credible option to have a zero net benefit. The estimated VCR would need to decrease to \$92/MWh to result in no expected net market benefits (i.e. an NPV of zero) under the central scenario, holding all else constant. Such a change in VCR is outside the expected range and, as such, this result of Option 1 being expected to provide positive net benefits is robust to reasonable VCR sensitivities.

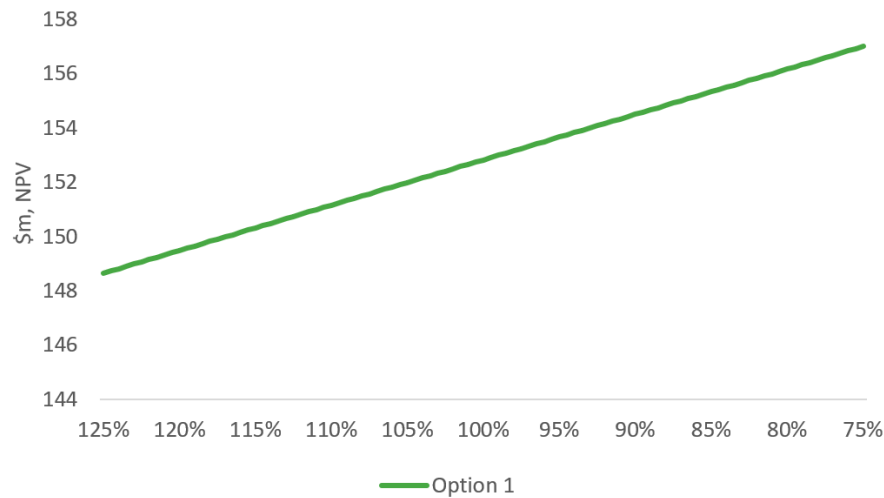
7.4.4. Network capital costs

We estimated the net economic benefit of each option by adopting capital costs for each option that are 25% higher (the 'High capital expenditure' scenario) and 25% lower (the 'Low capital expenditure' scenario) than the capital cost estimates in our central scenario. The results of this analysis are presented in the table and figure below.

Table 7-5: Sensitivity of net economic benefits under lower and higher capital costs (\$2024/25 m)

Option/scenario	Low capital expenditure	High capital expenditure	Ranking
Sensitivity	Central estimate - 25%	Central estimate + 25%	
Option 1	157.00	148.65	1

Figure 7-3 Sensitivity of net economic benefits 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 915% 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.

7.4.5. Discount rate

We estimated the net economic benefit of each 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),²⁸ 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).²⁹ The results of this analysis are presented in the table and figure below.

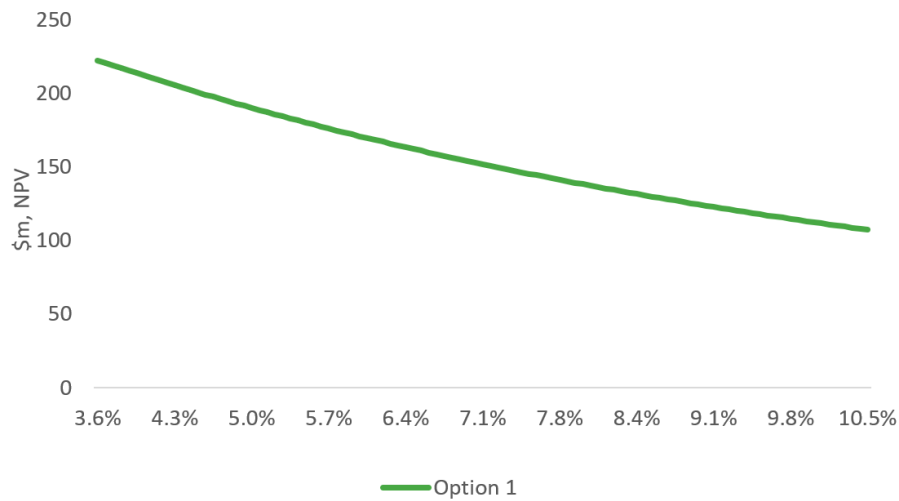
Table 7-6: Sensitivity of net economic benefits under a lower and higher discount rates (\$2024/25 m)

Option/scenario	Low discount rate	High discount rate	Ranking
Sensitivity	3.63%	10.5%	
Option 1	222.42	107.25	1

²⁸ 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.

²⁹ AEMO '2023 Inputs, Assumptions and Scenarios Report', July 2023, p 123.

Figure 7-3 Sensitivity of net economic benefits under a lower and higher discount rate (\$2024/25 m)



We have also undertaken a threshold analysis to identify whether a change in the discount rate would change the RIT-T outcome. 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.

8. Draft conclusion and exemption from preparing a PADR

This PSCR has found that Option 1 is the preferred option at this draft stage of the RIT-T. Option 1 involves replacing the gantries and remediating holding down bolts which have reached end of life.

The estimated capital expenditure associated with this option is \$27.93 million. Routine operating and maintenance costs relating to planned checks by our field crew are \$91,298 per year.

Stage 1 planning, design, development and procurement (including completion of the RIT-T) will occur between 2023/24 and 2025/26, while project delivery and construction will occur in 2025/26 and 2026/27. All works are expected to be completed by 2026/27.

Stage 2 planning, design, development and procurement will occur between 2028/29 and 2030/31, while project delivery and construction will occur in 2030/31 and 2031/32. All works are expected to be completed by 2031/32.

Subject to the identification of additional credible options during the consultation period, publication of a Project Assessment Draft Report (PADR) is not required for this RIT-T as we consider that the conditions in clause 5.16.4(z1) of the NER exempting RIT-T proponents from providing a PADR have been met.

Specifically, production of a PADR is not required because:

- the estimated capital cost of the proposed preferred option being less than \$54 million³⁴;
- the PSCR states:
 - > the proposed preferred option, together with the reasons for the proposed preferred option;
 - > the RIT-T is exempt from producing a PADR; and
 - > the proposed preferred option and any other credible option will not have a material market benefit for the classes of market benefit specified in clause 5.16.4(z1), with the exception of market benefits arising from changes in voluntary and involuntary load shedding;
- the RIT-T proponent considers that there were no PSCR submissions identifying additional credible options that could deliver a material market benefit; and
- the PACR must address any issues raised in relation to the proposed preferred option during the PSCR consultation.

If an additional credible option that could deliver a material market benefit is identified during the consultation period, then we will produce a PADR that includes an NPV assessment of the net economic benefit of each additional credible option.

If no additional credible options with material market benefits are identified during the consultation period, then the next step in this RIT-T will be the publication of a PACR that addresses all submissions received, including any issues in relation to the proposed preferred option raised during the consultation period.³⁵

Appendix A Compliance checklist

This appendix sets out a checklist which demonstrates the compliance of this PSCR with the requirements of the National Electricity Rules version 227.

Rules clause	Summary of requirements	Relevant section
	A RIT-T proponent must prepare a report (the project specification consultation report), which must include:	–
	(1) a description of the identified need;	2
	(2) the assumptions used in identifying the identified need (including, in the case of proposed reliability corrective action, why the RIT-T proponent considers reliability corrective action is necessary);	2
	(3) the technical characteristics of the identified need that a non-network option would be required to deliver, such as: (i) the size of load reduction of additional supply; (ii) location; and (iii) operating profile;	NA (Refer to Section 4)
	(4) if applicable, reference to any discussion on the description of the identified need or the credible options in respect of that identified need in the most recent National Transmission Network Development Plan;	NA
	(5) a description of all credible options of which the RIT-T proponent is aware that address the identified need, which may include, without limitation, alternative transmission options, interconnectors, generation, demand side management, market network services or other network options;	3
	(6) for each credible option identified in accordance with subparagraph (5), information about: (i) the technical characteristics of the credible option; (ii) whether the credible option is reasonably likely to have a material inter-network impact; (iii) the classes of market benefits that the RIT-T proponent considers are likely not to be material in accordance with clause 5.15A.2(c)(6), together with reasons of why the RIT-T proponent considers that these classes of market benefit are not likely to be material; (iv) the estimated construction timetable and commissioning date; and (v) to the extent practicable, the total indicative capital and operating and maintenance costs.	3 & 5

5.16.4(z1)	<p>A RIT-T proponent is exempt from [preparing a PADR] (paragraphs (j) to (s)) if:</p> <ol style="list-style-type: none"> 1. the estimated capital cost of the proposed preferred option is less than \$35 million³⁰ (as varied in accordance with a cost threshold determination); 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)(4), 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(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. 	8
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In addition, the table below outlines a separate compliance checklist demonstrating compliance with the binding guidance in the latest AER RIT-T guidelines.

Guidelines section	Summary of the requirements	Relevant Section(s)
3.1	In all cases, it is essential that RIT-T proponents express the identified need as the achievement of an objective or end, and not simply the means to achieve the objective or end. This objective should be expressed as a proposal to electricity consumers and be clearly stated and defined in RIT-T reports, as opposed to being implicit.	2.2
3.2.5	A RIT-T proponent must consider social licence issues in the identification of credible options. There are many potential sources of information when considering how this should be done, which include community sentiment data, prior experience, best practices, relevant guidelines, and early engagement with consumers, stakeholders and communities.	3.5 & 5.3
3.4	Except for specific circumstances, RIT-T proponents must adopt the inputs, assumptions and scenarios from the most recent inputs, assumptions and scenarios report (IASR).	6.1
3.4.1	<p>The RIT-T specifies that:</p> <ol style="list-style-type: none"> (i) The RIT-T proponent must adopt the discount rate from the most recent inputs, assumptions and scenarios report unless it provides demonstrable reasons why a variation is necessary. If the RIT-T proponent decides to vary this parameter, this variation must be consistent with paragraph 19. (ii) The present value calculations must use a commercial discount rate appropriate for the analysis of a private enterprise investment in the electricity sector. The discount rate used must be consistent with the cash flows being discounted. 	6.1

³⁰ Varied to \$54m based on the [AER Final Determination: Cost threshold review](#) November 2024.

	Consistent with the RIT-T requirement, present value calculations in the ISP must use a commercial discount rate appropriate for the analysis of a private enterprise investment in the electricity sector. Given this consistency, it should be suitable for RIT-T proponents to apply the discount rate that AEMO has applied in the most recent ISP.	
3.5	<p>In the RIT-T, costs are the present value of a credible option's direct costs. These must include the following classes of costs:</p> <ul style="list-style-type: none"> • Costs incurred in constructing or providing the credible option. • Operating and maintenance costs over the credible option's operating life. For clarity, a consequence of this is that, if the modelling period is shorter than the life of the credible option, the RIT-T proponent would incorporate the operating and maintenance costs (if any) for the remaining years of the credible option into the terminal value. • Costs of complying with relevant laws, regulations and administrative requirements. <p>A RIT-T proponent must exclude from its analysis, the costs (or negative benefits) of a credible option's harm to the environment or to any party that is not prohibited under the relevant laws, regulations or legal instruments, with the exception of changes in Australia's greenhouse gas emissions.</p>	6.2
3.5A.1	<p>Where the estimated capital costs of the preferred option exceeds \$100 million³¹ (as varied in accordance with a cost threshold determination), a RIT-T proponent must, in a RIT-T application:</p> <ol style="list-style-type: none"> 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 for all credible options (including the preferred option), either <ul style="list-style-type: none"> • 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. 	NA
3.5A.2	<p>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:</p> <ol style="list-style-type: none"> all key inputs and assumptions adopted in deriving the cost estimate a breakdown of the main components of the cost estimate the methodologies and processes applied in deriving the cost estimate (e.g. market testing, unit costs from recent projects, and engineering-based cost estimates) the reasons in support of the key inputs and assumptions adopted and methodologies and processes applied the level of any contingency allowance that have been included in the cost estimate, and the reasons for that level of contingency allowance 	3 & 6
3.5.3	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.	3.5 & 6.2

³¹ Varied to \$103m based on the [AER Final Determination: Cost threshold review](#) November 2024.

3.6.1	<p>Under the RIT-T instrument, a RIT-T proponent must include all classes of market benefits unless:</p> <ul style="list-style-type: none"> it can provide reasons for why a particular class of market benefit is unlikely to materially affect the outcome of the credible options assessment, or it expects the cost of undertaking the analysis to quantify the market benefits will be disproportionate to the scale, size and potential benefits of the credible options. 	5
3.6.2	<p>Under the RIT-T instrument, a RIT-T proponent must also consider classes of market benefits that:</p> <ul style="list-style-type: none"> the RIT-T proponent determines relevant, and we have agreed to in writing before the RIT-T proponent publishes its consultation report. 	5
3.7.1	<p>For each credible option, a RIT-T proponent must develop two states of the world (one with the credible option in place and the other being the base case with no option in place) for each reasonable scenario. This allows the RIT-T proponent to later derive the market benefits of an option by comparing these states of the world, and then probability weighting those benefits across a range of reasonable scenarios.</p>	6.4
	<p>All assets and facilities that exist during a RIT-T application must, at least initially, form part of all relevant states of the world (both with and without the credible option in place and in all reasonable scenarios). Beyond taking account of existing assets and facilities, a state of the world must capture the future evolution of and investment in generation, network and load. To capture this, the RIT-T instrument requires the RIT-T proponent to include appropriate:</p> <ul style="list-style-type: none"> Committed projects: these must form part of all states of the world, consistent with the treatment of existing assets and facilities. Actionable ISP projects: these must form part of all states of the world, consistent with the treatment of committed projects unless the level of analysis required to include the actionable ISP project is disproportionate to the scale and likely impact of the credible options under consideration. Anticipated projects: the RIT-T proponent must use the ISP, and where absent from the ISP, its reasonable judgement to include these in all relevant states of the world. Modelled projects: appropriate market development modelling will determine which modelled project to include in a given state of the world. For completeness, where a RIT-T proponent adopts the market modelling from the most recent ISP, ISP projects that are not actionable ISP projects (that is, future ISP projects and ISP development opportunities) will usually be modelled projects. 	NA
3.8.1	<p>Where no scenarios from the ISP are relevant to the RIT-T application, the RIT-T proponent must form reasonable scenarios consistently with the requirements for reasonable scenarios in the RIT-T instrument.</p>	7
	<p>Under the RIT-T instrument, the number and choice of reasonable scenarios must be appropriate to the credible options under consideration. Specifically, the choice of reasonable scenarios must reflect any variables or parameters that are likely to affect:</p> <ul style="list-style-type: none"> the ranking of the credible options, where the identified need is for reliability corrective action, inertia network services or system strength services. In these cases, only the ranking (as opposed to the sign) of credible options' net economic benefits is important; and the ranking or sign of the net economic benefit of any credible option where the identified need is not for reliability corrective action, inertia network services or system strength services. In these cases, the preferred option must have a positive net economic benefit. 	

3.8.2	Where the estimated capital cost of the preferred option exceeds \$100 million ³² (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.	NA
3.9.1	<p>The methodology for assigning probabilities to each reasonable scenario must be consistent with the methodology for choosing the reasonable scenarios themselves. Where a RIT-T proponent has no evidence or rationale for assigning a higher probability for one reasonable scenario over another, it may weight all reasonable scenarios equally.</p> <p>Moreover, where the RIT-T proponent uses the most recent ISP scenarios as its reasonable scenarios, it must adopt the probability weightings that AEMO used in the most recent ISP.</p>	6.4
3.9.2	A RIT-T proponent must separately undertake a weighted averaging of the direct costs of a credible option as well as the market benefits of a credible option.	7
3.9.3	The RIT-T instrument requires RIT-T proponents to consider option value as a class of potential market benefit.	5.2
3.9.4	<p>If a contingency allowance is included in a cost estimate for a credible option, the RIT-T proponent must explain:</p> <ul style="list-style-type: none"> 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. 	NA
3.11.2	<p>While there are no specific requirements for the level of information required of concessional finance agreements at the RIT-T stage of a project, enough information must be provided to justify an agreement's inclusion.</p> <p>If a proponent seeks to include an unexecuted concessional finance agreement in the RIT-T, they must undertake sensitivity testing for the scenario the agreement doesn't eventuate</p>	NA
4.1	<p>RIT-T proponents are required to describe in each RIT-T report</p> <ul style="list-style-type: none"> 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 	3.5

³² Varied to \$103m based on the [AER Final Determination: Cost threshold review](#) November 2024.

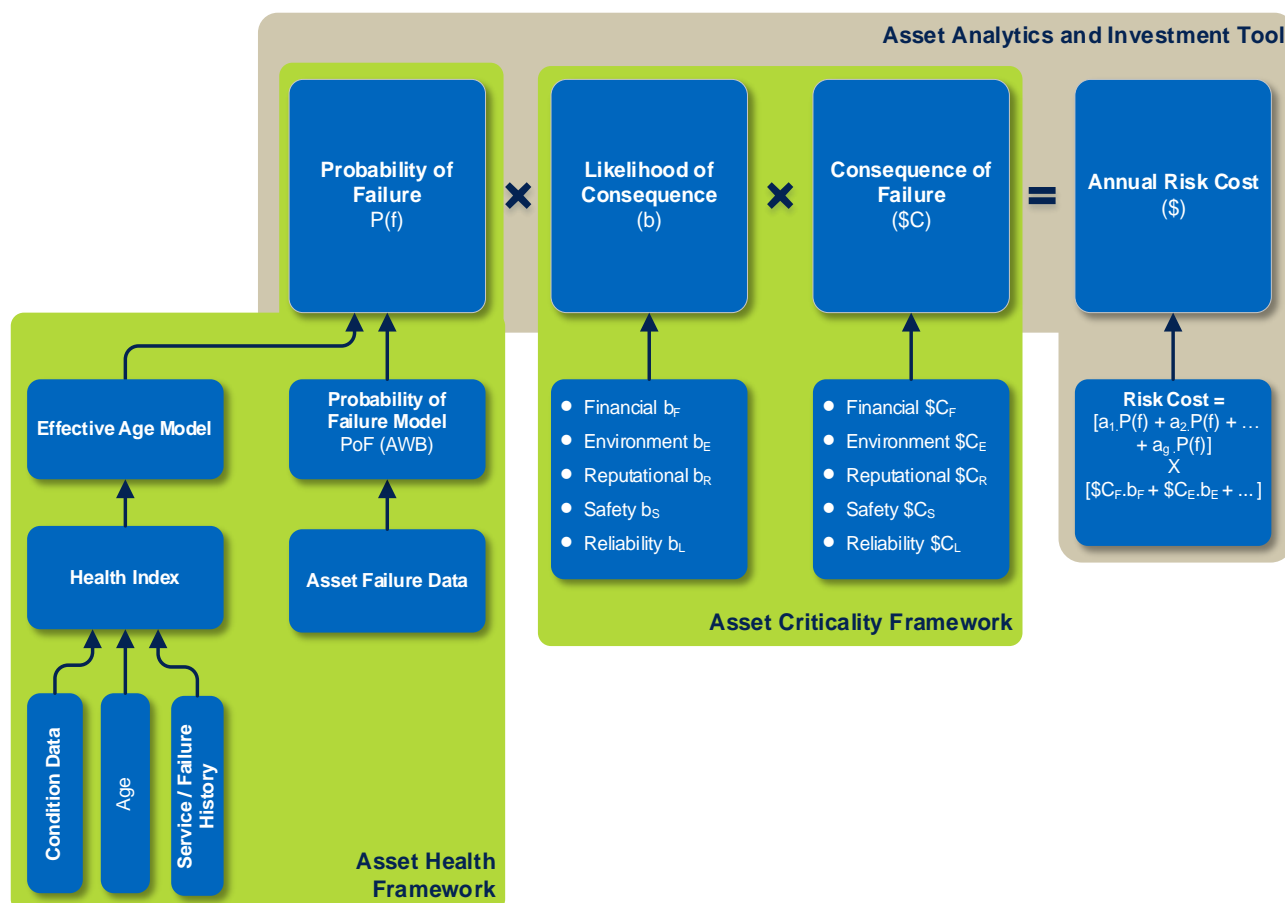
Appendix B Risk Assessment Methodology

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 guideline³³ 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 illustrates the base risk equation that we apply.

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:

³³ [Industry practice application note - Asset replacement planning, AER July 2024](#)

- Bushfire risk
- Safety risk
- Environmental risk
- Reliability risk, and
- Financial risk.

The risk categories relevant to this RIT-T are explained in Section 2.3.

Further details are available in our [Network Asset Risk Assessment Methodology](#).

Appendix C Asset Health and Probability of Failure

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. Substation gantries are unique assets in which the asset health and Probability of Failure (PoF) are calculated differently to other substation assets.

The approach in calculating the PoF of steelworks gantries differs slightly to the general approach for other substation assets. The PoF is calculated with the following:

- Condition data on beams, columns, footings, baseplates and holding down bolts is determined through steelwork inspections. Each component is assessed on visual corrosion, galvanic and rust thickness.
- Based on condition data, structural models were developed for each gantry including corrosion rates forecasted over the next 30 years to predict the rate of degradation and its effect on the structural capacity.
- Structural analysis was performed based on wind loading conditions to determine the annual probability of capacity exceedance and annual probability of failure.
- Short circuit forces under the ultimate design were used in the utilisation calculations but was not used as an input to the annual probability of failure.

The outputs of the PoF calculation are used to determine the asset risk. Further details of general asset health are detailed in our [Network Asset Health Methodology](#).