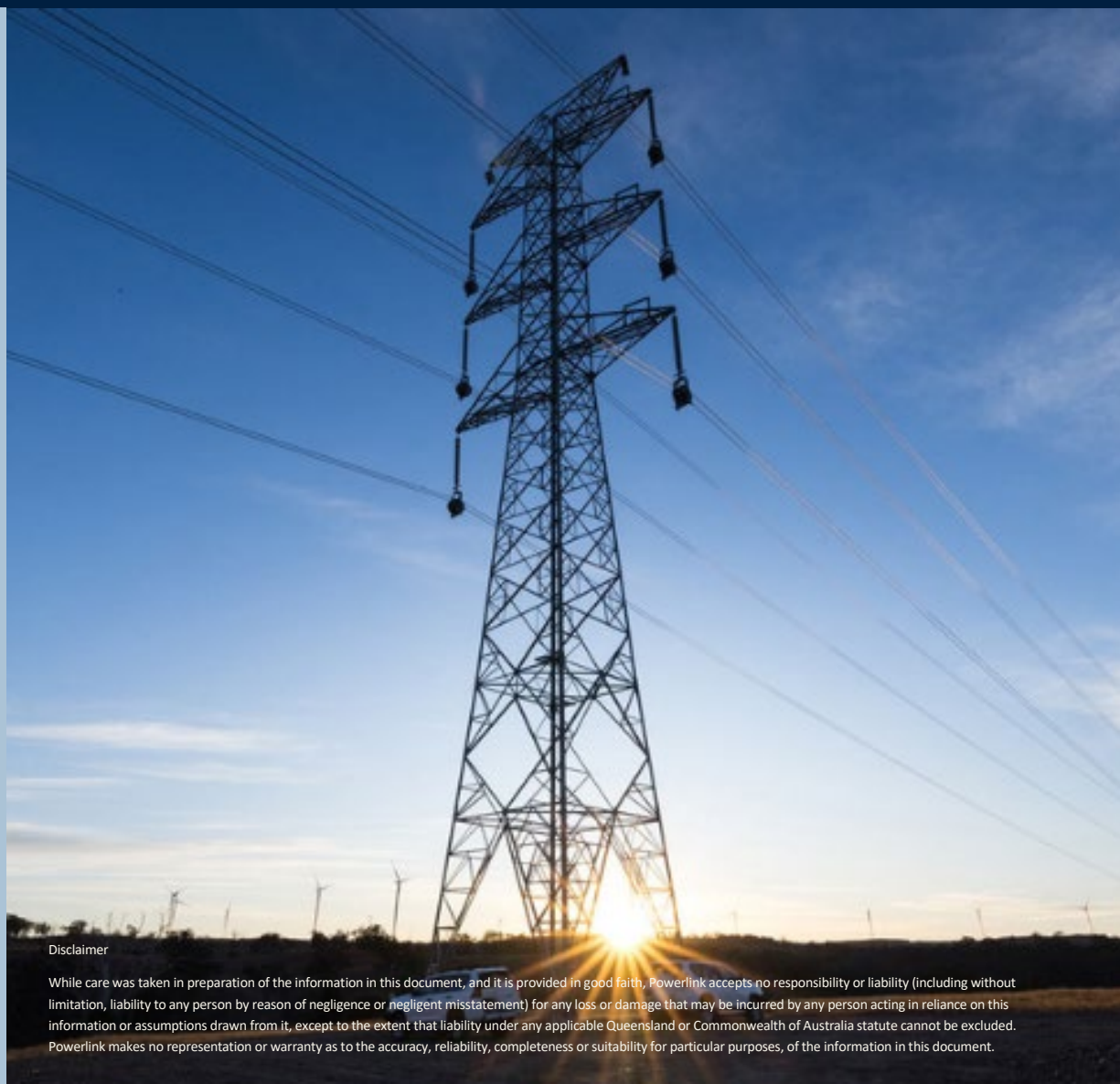
1 APRIL 2025

Maintaining reliability of supply to Mansfield

Project Assessment Conclusions Report



Preface

Powerlink Queensland is a Transmission Network Service Provider (TNSP) that owns, develops, operates and maintains Queensland's high-voltage electricity transmission network. The network transfers bulk power from Queensland generators to electricity distributors Energex and Ergon Energy (part of the Energy Queensland Group), and to a range of large industrial customers.

This Project Assessment Conclusions Report has been prepared in accordance with version 224 of the National Electricity Rules (NER), and the Regulatory Investment Test for Transmission (RIT-T) Instrument (November 2024) and RIT-T Application Guidelines (November 2024). The RIT-T Instrument and Application Guidelines are made and administered by the Australian Energy Regulator.

The NER requires Powerlink to carry out forward planning to identify future reliability of supply requirements, which may include replacement of network assets or augmentations of the transmission network. Powerlink must then identify, evaluate and compare network and non-network options (including, but not limited to, generation and demand side management) to identify the preferred option which can address future network requirements at the lowest net cost to electricity customers.

Powerlink also has obligations under the NER to address power system security requirements identified by the Australian Energy Market Operator in its annual System Security Reports.

The main purpose of this document is to provide details of the identified need, credible options, categories of market benefits likely to impact the ranking of credible options, and recommend the preferred option for implementation.

More information on the RIT-T process and how Powerlink applies it to ensure that safe, reliable and cost-effective solutions are implemented to deliver better outcomes to customers is available on Powerlink's website.

A copy of this report will be made available to any person within three business days of a request being made. Requests should be directed to the Manager Network and Alternate Assessments, by phone ((07) 3860 2111) or email (networkassessments@powerlink.com.au).

Powerlink acknowledges the Traditional Owners and their custodianship of the lands and waters of Queensland and in particular, the lands on which we operate. We pay our respect to their Ancestors, Elders and knowledge holders and recognise their deep history and ongoing connection to Country.

Contents

Executive Summary

The deteriorating condition of the underground cables and associated transformers between Belmont Substation and its Mansfield site requires Powerlink to take action.

Powerlink owns and maintains a site at Mansfield adjacent to Belmont Substation, located in South East Queensland, approximately eleven kilometres south east of the Brisbane CBD. The site has been identified for ongoing use by Powerlink, and there is a long-term requirement to continue the existing electricity services currently provided to the site by Belmont Substation.

Two 11kV underground cables, two auxiliary transformers, and two station service transformers connect Belmont Substation to the Mansfield site. The two 11kV cables are original cables from 1971 that have been repaired after previously suffering significant damage, and have reached the end of their economic life. Both auxiliary transformers are over forty years old, and are not compatible with modern cable termination technology. The two station services transformers are also at the end of their technical life.

The condition of the underground cables and associated transformers present a range of safety, reliability of supply and compliance risks, requiring Powerlink to take action.

Powerlink is required to apply the Regulatory Investment Test for Transmission

The estimated capital cost of the most expensive credible option to maintain reliability of supply to the Mansfield site meets the minimum threshold (currently $8 million) to apply the Regulatory Investment Test for Transmission (RIT-T).

As the identified need for the proposed investment is to meet reliability and service standards specified within Powerlink's Transmission Authority, guidelines and standards published by the Australian Energy Market Operator (AEMO), and Powerlink's ongoing compliance with Schedule 5.1 of the National Electricity Rules (NER), it is classified as a reliability corrective action under the NER. The identified need is not discussed in AEMO's most recent Integrated System Plan (ISP) and is therefore subject to the application and consultation process for RIT-T projects that are not actionable ISP projects.

Powerlink commenced this RIT-T with the publication of a Project Specification Consultation Report (PSCR) in September 2024 to outline the risks and obsolescence issues arising from the condition of the underground cables and associated transformers at Belmont Substation. No submissions were received in response to the PSCR by the due date of 20 December 2024. As a result, no additional credible options have been identified as a part of this RIT-T consultation.

This Project Assessment Conclusions Report (PACR) is the final step in the RIT-T process to address safety, reliability of supply and compliance risks at the Mansfield site. The PACR contains the results of the planning investigation and the cost-benefit analysis of credible options compared to a non-credible base case where the asset condition issues are managed via operational maintenance or operational measures only. The base case is used as a reference point to compare and rank the credible options against each other, and reflects a 'state of the world' which would result in an increase in overall risk levels due to continuing deterioration of asset condition and increasing failure rectification timeframes due to obsolescence issues.[1]

[1] See AER, *Regulatory Investment Test for Transmission*, November 2024, paragraph 24 and AER, *Application Guidelines, Regulatory Investment Test for Transmission*, November 2024, pages 32-35 for a definition and discussion of states of the world in a RIT-T.

Powerlink has developed one credible network option to address the identified need

Option 1 involves the replacement of the two 11kV underground cables and associated transformers. The table below shows that Option 1 have a negative Net Present Value (NPV) relative to the base case, as allowed for a reliability corrective action RIT-T.

Summary of Credible Option

Option	Description	Indicative Capital Cost ($m)	Central scenario NPV relative to Base Case ($m)	Ranking
Base Case	No capital expenditure. Operation Maintenance Cost excluding irreparable damages. Risk Cost include risks resulting from irreparable damages.			
1	Two 11kV underground cables and associated transformers replacement by December 2026	14.8	-11.9	1

Evaluation and conclusion

The RIT-T requires that the preferred option maximise the present value of economic benefits, taking into account changes to Australia's greenhouse gas emissions where relevant. If the identified need is for a reliability corrective action, the preferred option may have a net economic cost.

Option 1 is the only credible network option which addresses the major risks resulting from the deteriorating condition of the 11kV cables and associated transformers and is therefore the preferred option.

The indicative capital cost of Option 1 is $14.8 million in 2023/24 prices.

As the outcomes of the cost-benefit analysis contained in this PACR remain unchanged from those published in the PSCR, the draft recommendation has been adopted as the final recommendation and will now be implemented. Commissioning of the new underground cables and associated transformers will be completed by December 2026.

Dispute Resolution

In accordance with clause 5.16B(a) of the NER, energy industry participants, the Australian Energy Market Commission, electricity consumers (including their representatives) may, by notice to the Australian Energy Regulator (AER), dispute conclusions made by Powerlink in this PACR in relation to:

- the application of the RIT-T;
- the basis on which Powerlink has classified the preferred option as a reliability corrective action; or
- Powerlink's assessment of whether the preferred option will have a material inter-network impact.

Notice of a dispute must be given to the AER within 30 days of the publication date of this report. Any parties raising a dispute are also required to simultaneously provide a copy of the dispute notice to Powerlink.

1. Introduction

1.1. Powerlink asset management and obligations

Powerlink is committed to sustainable asset management practices. To ensure a consistent approach that delivers cost-effective and efficient services, Powerlink's Asset Management System is adapted from the Institute of Asset Management and aligns with ISO 55000 Asset Management Standards.[2] Powerlink's approach to asset management delivers value to customers and stakeholders by optimising whole of life cycle costs, benefits and risks, while ensuring compliance with relevant legislation, regulations and standards. This is underpinned by Powerlink's corporate risk management framework and international risk assessment guidelines and methodologies.

Planning studies have identified the Mansfield site for ongoing use by Powerlink, and there is a long-term requirement to continue the existing electricity services currently provided to the site by Belmont Substation.

The condition of the 11kV underground cables, associated auxiliary transformers, and station service transformers present a range of safety, reliability of supply and compliance risks.

The proposed credible network option addresses the increasing likelihood of faults arising from the condition of the 11kV cables and associated transformers. When developing the credible option, Powerlink has focused on implementing a cost-effective solution that ensures a reliable and safe supply.

1.2. Overview of the Regulatory Investment Test for Transmission

The purpose of a Regulatory Investment Test for Transmission (RIT-T) is to identify the preferred investment option that meets the identified network need. The preferred option maximises the present value of economic benefits, taking into account changes to Australia's greenhouse gas emissions where relevant. If the identified need is for a reliability corrective action, the preferred option may have a net economic cost.[3]

Powerlink applies the RIT-T to potential prescribed (regulated) investments in the transmission network where the estimated capital cost of the most expensive option exceeds $8 million.[4] The identified need referred to in this RIT-T – to maintain reliability of supply to Mansfield – is not included in the Australian Energy Market Operator's (AEMO's) most recent Integrated System Plan (ISP), published in June 2024. As such, this RIT-T is subject to the application and consultation process for RIT-T projects that are not actionable ISP projects.[5]

Powerlink commenced this RIT-T with publication of a Project Specification Consultation Report (PSCR) on 30 September 2024. The PSCR identified Option 1, involving the replacement of two 11kV underground cables and associated transformers, as the preferred option to address the risks at Mansfield. The PSCR stated that the indicative capital cost of Option 1 was $14.8 million in 2023/24 prices.

The PSCR indicated that Powerlink would adopt the expedited process for this RIT-T, as allowed under the National Electricity Rules (NER) for RIT-T projects without material market benefits and where other conditions

[2] Refer to AS *ISO55000:2014 Asset Management – Overview, principles and terminology*.
[3] National Electricity Rules, clause 5.15A.1(c) and chapter 10, glossary ('net economic benefit').
[4] National Electricity Rules, clauses 5.15.3(a) and (b)(2) set the threshold at $5 million. The Australian Energy Regulator's (AER) latest cost threshold review increased the value to $8 million for three years from 1 January 2025. At the time Powerlink issued the PSCR for this RIT-T, the threshold was $7 million.
[5] National Electricity Rules, rule 5.16.

are met.[6] Submissions on the PSCR were due to Powerlink by 20 December 2024; as no submissions were received, no additional credible options that could deliver a material market benefit have been identified via the RIT-T consultation process. Powerlink has satisfied the conditions to expedite this RIT-T process, and not issued a Project Assessment Draft Report (PADR). This Project Assessment Conclusions Report (PACR) is the final step in the RIT-T process to address risks at Mansfield.

More information on the RIT-T process is provided in Appendix 1.

2. Consumer and Non-network Engagement

More than five million Queenslanders and 241,000 Queensland businesses depend on Powerlink's performance. Powerlink recognises the importance of engaging with a diverse range of customers and stakeholders who have the potential to affect, or be affected by, Powerlink activities and/or investments.

Together with our industry counterparts from across the electricity and gas supply chain, Powerlink has committed to the Energy Charter. The charter is a national CEO-led collaboration that supports the energy sector towards a customer-centric future. Powerlink joins other signatories in committing to progress the culture and solutions needed to deliver more affordable, reliable and sustainable energy systems. Powerlink's Energy Charter Disclosure Statement for 2023/24 assesses Powerlink's progress against the principles of the Energy Charter and identifies opportunities for improvement.

2.1. Powerlink takes a proactive approach to engagement

Powerlink regularly hosts a range of activities to provide timely and transparent information to customers and stakeholders within the broader community.

Powerlink's annual Transmission Network Forum (TNF) is a primary vehicle used to engage with the community, understand broader customer and industry views and obtain feedback on key topics. It also provides Powerlink with an opportunity to further inform its business network and non-network planning objectives. TNF participants include customers, landholders, environmental groups, Traditional Owners, government agencies, and industry bodies.

Engagement activities such as the TNF help inform the future development of the transmission network and assist Powerlink in providing services that align with the long-term interests of customers. Powerlink also incorporates feedback from these activities into a number of publicly available reports.

2.2. Working collaboratively with Powerlink's Customer Panel

Powerlink's Customer Panel provides a face-to-face opportunity for customers and consumer representatives to give their input and feedback about Powerlink's decision-making, processes and methodologies. The panel also provides Powerlink with a valuable avenue to keep customers and stakeholders better informed, and to receive feedback about topics of relevance, including RIT-Ts.

The Customer Panel is regularly advised on the publication of Powerlink's RIT-T documents, and is briefed quarterly on the status of current RIT-T consultations as well as upcoming RIT-Ts. This provides an ongoing opportunity for the Customer Panel to ask questions and provide feedback to further inform RIT-Ts, and for Powerlink to better understand the views of customers when undertaking the RIT-T consultation process.

[6] National Electricity Rules, clause 5.16.4(z1).

Powerlink will continue to provide updates to and request input from the Customer Panel throughout the RIT-T consultation process.

2.3. Transparency on future network requirements

Powerlink's annual planning review findings are published in the Transmission Annual Planning Report (TAPR) and TAPR templates (available via the TAPR portal). It provides early information and technical data to customers and stakeholders on potential transmission network needs over a 10-year outlook period. The TAPR plays an important part in planning Queensland's transmission network and helping to ensure it continues to meet the needs of Queensland electricity consumers and participants in the National Electricity Market (NEM).

2.4. Maintaining reliability of supply to Mansfield

Based on the information available when the project scope was developed, the cost estimate for the proposed network option to address reliability of supply to Powerlink's Mansfield site was not expected to reach the RIT-T cost threshold.

Since this time, the external environment in which Powerlink operates has become more complex. Ongoing geopolitical uncertainties continue to contribute to a high level of uncertainty in the overseas outlook and elevated supply constraints which, coupled with an ongoing increase in domestic factors, have contributed to an upward pressure on prices.[7] Cost increases are affecting infrastructure project costs in many areas including labour, fuel, logistics, steel, cement, copper, aluminium, and other key commodities.[8] In addition to an increase in prices received through procurement investigations, the scope of works in relation to the proposed network option to address the identified need has been extended as more detailed design information has become available. These factors have resulted in the cost of the credible network option to meet the identified need exceeding the RIT-T cost threshold.

While Powerlink is not aware of any non-network options able to address the identified need, for completeness the technical characteristics and criteria for non-network options were included in the PSCR.

2.5. Powerlink applies a considered approach to RIT-T engagement

Powerlink applies a considered and consistent approach to ensure an appropriate level of stakeholder engagement is undertaken for each individual RIT-T consultation. The scope of engagement activities is dependent upon various considerations, such as the characteristics and complexity of the identified need and potential credible options.

For all RIT-Ts, members of Powerlink's Non-network Engagement Stakeholder Register receive email notifications of publication of RIT-T reports. For projects where Powerlink identifies material or significant market benefits, additional activities such as webinars or dedicated engagement forums may be appropriate. For more information, see Powerlink's RIT-T stakeholder engagement matrix.

[7] Reserve Bank of Australia, Statement of Monetary Policy, 18 June 2024.
[8] KPMG, *Market Sounding Report on Transmission*, report for Energy Networks Australia and the Clean Energy Council, August 2022, page 17.

2.6. Community engagement

Powerlink recognises the importance of engaging with stakeholders who may reasonably be expected to be affected by the works required to meet the identified need described in this PACR.

The engagement frameworks and strategies that underpin Powerlink's engagement approach include:

- The International Association for Public Participation (IAP2) spectrum[9], noting each stakeholder group has unique needs and requires an individual assessment on the spectrum;
- Powerlink's Stakeholder Engagement Framework, Community Engagement Strategy and Reflect Reconciliation Action Plan; and
- the Energy Charter Landholder and Community Better Practice Engagement Guide; and Better Practice Social Licence Guideline.

2.6.1. Powerlink assesses the requirement for community engagement based on the identified need

Powerlink undertakes an assessment of the potential for social and environmental impacts of anticipated replacement or augmentation projects well in advance of the identified need timing. Understanding if and when community engagement may be required, as well as the appropriate engagement approach, is an integral component of the early planning analysis needed to inform option identification, consideration of statutory processes (e.g. Ministerial Infrastructure Designation if required) and subsequent project development strategy and engagement plans.

Powerlink's engagement approach is tailored to maximise the accessibility of the proposed project's information to the stakeholder groups and/or communities affected by the project once the need to undertake community engagement is identified. Key stakeholders may include, but are not limited to, directly impacted and adjacent landholders, Traditional Land Owner groups, local residents, businesses and other organisations such as schools, community organisations and environmental groups as well as local government authorities and elected representatives within local and state governments.

2.6.2 Assessment and basis of assessment on the need for community engagement

Powerlink has assessed that minimal community engagement is required given the scope of works under consideration for the proposed network option to meet the identified need. This is due to the replacement of equipment within the existing Powerlink sites. Powerlink will provide notifications to nearby residents to ensure all affected parties are appropriately informed of project activities.

3. Identified Need

In a RIT-T, the identified need is the objective the RIT-T proponent seeks to achieve by investing in the network.[10] The identified need should be framed in terms of why an investment is required, rather than as a description of a particular solution to a network need. The AER's RIT-T Application Guidelines note that network and non-network options can address an identified need.[11]

[9] Refer to IAP2's website

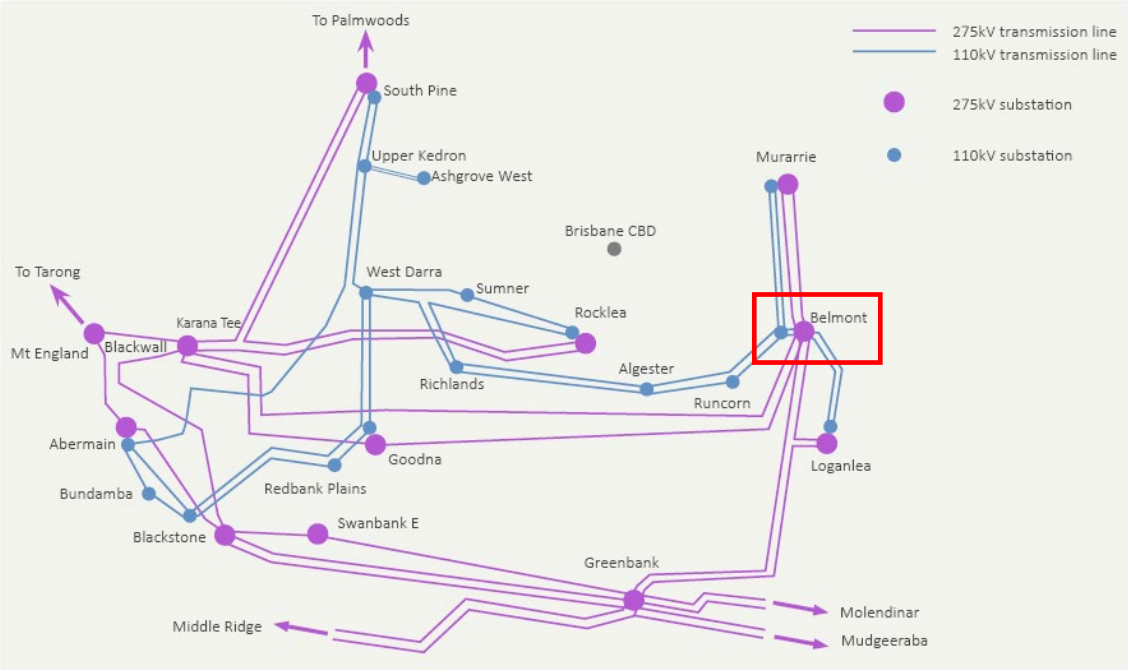
[10] National Electricity Rules, chapter 10 (definition of 'identified need').

[11] AER, *Application Guidelines, Regulatory Investment Test for Transmission*, November 2024, page 13.

3.1. Geographical and network need

Powerlink owns and maintains a site at Mansfield adjacent to Belmont Substation, located in South East Queensland, approximately eleven kilometres south east of the Brisbane CBD.

Figure 3.1: Belmont Substation and Mansfield site locality



3.2. Description of identified need

Powerlink's Transmission Authority requires it to plan and develop the transmission network in accordance with good electricity industry practice, having regard to the value that end users of electricity place on the quality and reliability of electricity services. It allows load to be interrupted during a critical single network contingency, provided the maximum load and energy will not exceed 50 megawatts (MW) at any one time, or will not be more than 600 megawatt hours (MWh) in aggregate.[12] The Transmission Authority is also subject to a broader obligation under the *Electricity Act 1994* (Qld) (the Electricity Act) that Powerlink operate, maintain (including repair and replace if necessary) and protect its transmission grid to ensure the adequate, economic, reliable and safe transmission of electricity.[13]

The Manfield site provides services to support the reliable operation of the transmission network as detailed in clauses 5.2.3 and schedule 5.1 of the NER for the monitoring, operation and control of the high voltage and telecommunications networks. Planning studies have identified the Mansfield site for ongoing use by Powerlink, and that in order to continue to its obligations under the Transmission Authority and the NER, the supplies currently provided by Belmont Substation to the site are required into the foreseeable future to meet ongoing requirements.

[12] Transmission Authority No. T01/98, section 6.2(c).
[13] *Electricity Act 1994* (Qld), section 34(1)(a).

3.3. Assumptions and requirements underpinning the identified need

Two 11kV underground cables, two station service transformers, and two auxiliary transformers connect Belmont Substation to the Mansfield site.

The 11kV cables are original cables from 1971 that have been repaired after previously suffering significant damage, and have reached the end of their economic life. The two associated auxiliary transformers are over forty years old, and not compatible with modern cable termination technology. The associated station services transformers are also at the end of its technical life.

The condition of the underground cables and associated transformers present a range of safety, reliability of supply and compliance risks.

With an increasing likelihood of faults and longer rectification periods arising from the ageing cables and associated transformers remaining in service at Belmont Substation, Powerlink must undertake reliability corrective action if it is to continue to meet its jurisdictional obligations and the standards for reliability of supply set out by AEMO and in the NER.

4. Credible Options to Address the Identified Need

4.1. Credible options

Powerlink has developed one credible network option to address the risks arising from the deteriorated condition of the underground 11kV cables and associated transformers at Belmont Substation:

- Option 1 – 11kV cables and associated transformers replacement by December 2026

Table 4.1: Summary of credible option

Option	Description	Indicative Capital Cost ($m)	Indicative annual O&M costs ($m)
Base Case	No capital expenditure. Operation Maintenance Cost excluding irreparable damages. Risk Cost include risks resulting from irreparable damages.		
1	Two 11kV underground cables and associated transformers replacement by December 2026	14.8	0.006

Note: O&M denotes operations and maintenance.

Option 1 addresses the major risks to allow Powerlink to meet its reliability of supply and safety obligations under its Transmission Authority, the Electricity Act and Schedule 5.1 of the NER, by the replacement of the deteriorated 11kV underground cables and associated transformers.

4.2. Material inter-network impact

Powerlink does not consider that any of the credible options being considered will have a material inter-network impact, based on AEMO's screening criteria.[14]

5. Materiality of Market Benefits

The NER requires RIT-T proponents to quantify a number of classes of market benefits for each credible option, unless the proponent can demonstrate that a specific category(ies) is/are unlikely to materially affect the outcome of the assessment of credible options.[15]

5.1. Market benefits that are material for this RIT-T assessment

Powerlink considers that changes in involuntary load shedding – that is, the reduction in expected unserved energy (USE) – between options may impact the ranking of the credible options under consideration in this RIT-T and that this class of market benefit could be material. Powerlink has quantified and included these benefits in the cost-benefit and risk cost analysis as network risk.

5.2. Market benefits that are not material for this RIT-T assessment

A discussion of each market benefit under the RIT-T that Powerlink considers not to be material is presented below.

- **Changes in patterns of generation dispatch**: replacement of secondary systems by itself does not affect transmission network constraints or affect transmission flows that would change patterns of generation dispatch. It follows that changes through different patterns of generation dispatch are not material to the outcome of the RIT-T assessment.
- **Changes in voluntary load curtailment**: a secondary systems fault by itself does not affect prices in the wholesale electricity market. It follows that changes in voluntary load curtailment will not be material for the purposes of this RIT-T.
- **Changes in costs for other parties**: the effect of replacing secondary systems under the credible options considered are localised to the substation they are located at and do not affect the capacity of transmission network assets and therefore are unlikely to change generation investment patterns (which are captured under the RIT-T category of 'costs for other parties').
- **Differences in the timing of expenditure**: credible options for secondary systems replacement do not affect the capacity of transmission network assets, the way they operate, or transmission flows. Accordingly, differences in the timing of expenditure of unrelated transmission investments are unlikely to be affected.
- **Changes in network losses**: credible options are not expected to provide any changes in network losses as replacing secondary systems does not affect the characteristics of primary transmission assets.
- **Changes in ancillary services cost**: there is no expected change to the costs of Frequency Control Ancillary Services (FCAS), Network Control Ancillary Services (NCAS), or System Restart Ancillary Services (SRAS) due to credible options under consideration. These costs are therefore not material to the outcome of the RIT-T assessment.

[14] National Electricity Rules, clause 5.16.4(b)(6)(ii). AEMO has published guidelines for assessing whether a credible option is expected to have a material inter-network impact.
[15] National Electricity Rules, clauses 5.15A.2(b)(4), (5) and (6). See also AER, *Regulatory Investment Test for Transmission*, November 2024, paragraphs 10 to 13.

- **Changes in Australia's greenhouse gas emissions**: Powerlink does not consider that any of the credible options will materially affect Australia's greenhouse gas emissions, and the cost of quantifying any greenhouse gas emission benefits would involve a disproportionate level of effort compared to the additional insight it would provide.
- **Competition benefits:** Powerlink does not consider that any of the credible options will materially affect competition between generators, and generators' bidding behaviour and, consequently, considers that the techniques required to capture any changes in such behaviour would involve a disproportionate level of effort compared to the additional insight it would provide.
- **Option value**: Powerlink does not consider that the identified need for the options considered in this RIT-T is affected by uncertain factors about which there may be more clarity in future. As a consequence, option value is not a relevant consideration for this RIT-T.
- **Costs associated with social licence activities:** Powerlink does not consider that the cost of social licence activities is a relevant consideration for this RIT-T given only one credible option has been identified.

6. Base Case

6.1. Modelling a base case under the RIT-T

In a RIT-T that is not an actionable ISP project, the base case is the situation in which the RIT-T proponent does not implement a credible option to meet the identified need, and continues with business-as-usual activities.[16]

The assessment undertaken in this RIT-T compares the costs and benefits of credible options to address the risks arising from an identified need with a base case. As characterised in the RIT-T Application Guidelines, the base case reflects a state of the world in which the condition and obsolescence issues arising from the ageing assets are only addressed through standard operational activities, with escalating safety, financial, environmental and network risks.[17]

To develop the base case, the existing condition and obsolescence issues are managed by undertaking operational maintenance or operational measures only. This results in an increase in overall risk levels as the condition and availability of the asset deteriorates over time. These increasing risk levels are assigned a monetary value that is used to evaluate the credible options designed to offset or mitigate these risk costs.

The base case therefore includes the costs of work associated with operational maintenance and the risk costs associated with the failure of the assets. The costs associated with equipment failures are modelled in the risk cost analysis and are not included in the operational maintenance costs.

The base case acts as a benchmark and provides a clear reference point in the cost-benefit analysis to compare and rank the credible options against each other over the same timeframe.

6.2. Base case risk costs

Powerlink has developed a risk modelling framework consistent with the RIT-T Application Guidelines. An overview of the framework is available on Powerlink's website and the principles of the framework have been used to calculate the risk costs of the base case and options. The framework includes the modelling methodology and general assumptions underpinning the analysis.

[16] AER, *Regulatory Investment Test for Transmission*, November 2024, glossary ('base case').
[17] AER, *Application Guidelines, Regulatory Investment Test for Transmission*, November 2024, page 21.

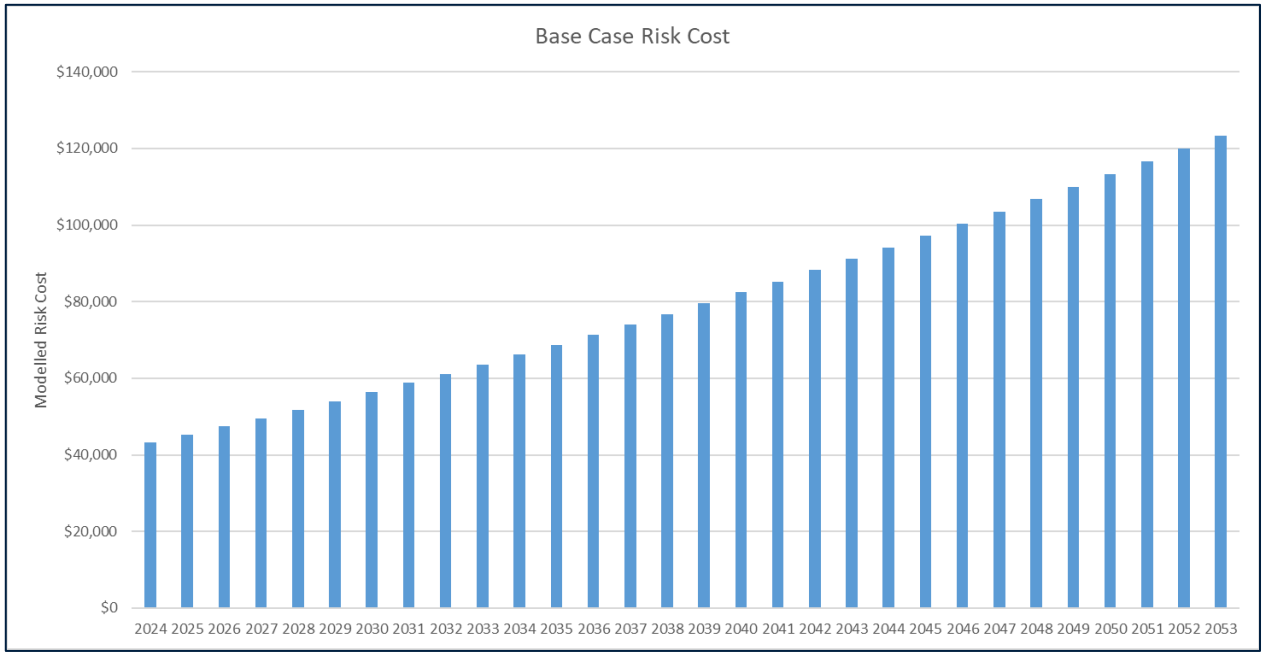
6.3. Base case assumptions

In calculating the potential expected unserved energy arising from a failure of the ageing 11kV underground cables at Belmont Substation, Powerlink has made the following modelling assumptions:

- Historical failure data of the 11kV cables, auxiliary, and station service transformers within the Powerlink network is limited and therefore a Weibull probability of failure curve based on the calendar age of the assets has been implemented.
- The Mansfield site is required to be operational at all times. Therefore, the load type is assumed to be commercial. A Value of Customer Reliability (VCR) value of $52.63/kWh[18] has been used when evaluating network risk costs, based on the business customer (commercial – small and medium) VCR value published within the AER's Values of Customer Reliability Final Report on VCR Values, updated in December 2024.
- There is limited historical data for auxiliary and station transformers. The historical data available indicates that these types of transformers fail in a peaceful manner. Based on this information and the location of the transformers is within Powerlink substations that are not accessible to the general public, it is assumed the safety risk posed by the failure of these transformers is negligible.

The 30-year forecast of risk costs for the base case is shown in Figure 6.1.

Figure 6.1: Modelled base case risk costs



Based on the assessed condition of the ageing cables and associated transformers between Belmont and Mansfield site, the total risk costs are projected to increase from approximately $43,000 in 2024 to over $123,000 in 2053.

[18] AER, *Values of Customer Reliability Final Report on VCR Values*, December 2024, page 55.

The main areas of risk costs for the underground cables are:

- safety risks due to failed insulation within habitable and vehicular areas;
- network risks that involve reliability of supply through the failure of deteriorated underground cables, modelled as probability weighted expected unserved energy; and
- financial risk costs associated with the replacement of failed cables in an emergency.

The main areas of risk costs for the associated transformers are:

- network risks that involve reliability of supply through the failure of deteriorated underground cables, modelled as probability weighted expected unserved energy; and
- financial risk costs associated with the replacement of failed transformers in an emergency.

These risks increase over time as the condition of equipment further deteriorates, the likelihood of failure rises.

6.4. Modelling of risk in options

Each option is scoped to manage the major risks arising in the base case and to maintain compliance with all statutory requirements, the NER and AEMO standards. The residual risk is calculated for each option based upon the individual implementation strategy of the option. This is included with the capital and operational maintenance cost of each option to develop the Net Present Value (NPV) inputs.

7. Cost Estimation

In October 2023, additional information requirements were added to the RIT-T Application Guidelines in cases where the estimated capital cost of the preferred option exceeds $100 million. The guidelines also encourage RIT-T proponents, where the estimated capital cost of the preferred option is less than $100 million, to outline the process undertaken to ensure cost estimates are as accurate as possible. Further, the guidelines require that, for each credible option, RIT-T must specify to the extent practicable and in a manner that is fit-for-purpose for the stage of the RIT-T:

- key inputs and assumptions adopted in deriving the cost estimate;
- main components of the cost estimate;
- methodologies and processes applied to derive the cost estimate;
- reasons in support of key inputs and assumptions adopted and methodologies and processes applied; and
- the level of, and basis for, any contingency allowance that has been included in the cost estimate.[19]

At the PSCR stage of a RIT-T, information for each credible option is only required on total indicative capital and operating and maintenance costs, to the extent practicable.[20] At the PADR and PACR stages, RIT-T proponents must include a quantification of costs, including a breakdown of operating and capital expenditure for each credible option.[21]

[19] AER, *Application Guidelines, Regulatory Investment Test for Transmission*, November 2024, page 29. The AER's latest cost threshold review increased the value to $103 million for three years from 1 January 2025. At the time Powerlink issued the PSCR for this RIT-T, the threshold was $100 million.
[20] National Electricity Rules, clause 5.16.4(b)(6)(v).
[21] National Electricity Rules, clauses 5.16.4(k)(3) and (v)(1).

7.1. Basis of Estimation

The basis for the estimation for the preferred option presented in this PACR aligns with Powerlink's Cost Estimation Methodology[22] which provides context to the classes of estimate discussed in this section.

7.2. Key inputs and assumptions

A Class 3 estimate has been produced for Option 1 with an accuracy range of -20% to 30%. Powerlink has made the following scope assumptions in producing this estimate:

- Complete replacement of both 11kV underground cables;
- Complete replacement of both auxiliary transformers;
- Complete replacement of both station service transformers; and
- Other primary plant will not be impacted.

7.3. Contingency allowance

For proposed transmission investments subject to the RIT-T, known and unknown delivery risk costs are excluded from the cost of the option. This approach aligns with that of the RIT-T Instrument which requires that the cost of the options considered include only direct costs, apart from any other costs the AER has agreed to in writing.[23]

8. General Modelling Approach for Net Benefit Analysis

8.1. Analysis period

Powerlink has undertaken the RIT-T analysis over a 30-year period, from 2024 to 2053. A 30-year period takes into account the size and complexity of the cable and transformer replacement options. There will be remaining asset life by 2053, at which point a terminal value is calculated to account for capital costs under each credible option.

8.2. Discount rate

Under the RIT-T Instrument:

- RIT-T proponents must adopt the discount rate from AEMO's most recent Inputs, Assumptions and Scenarios Report unless the proponent can demonstrate why variation is necessary; and
- The present value calculations of the costs and benefits of credible options must use a commercial discount rate appropriate for the analysis of a private enterprise investment in the electricity sector.[24]

In this RIT-T Powerlink has adopted a real, pre-tax commercial discount rate of 7.0% as the central assumption for the NPV analysis.[25]

[22] The methodology is available on the RIT-T Consultations page of Powerlink's website.
[23] AER, *Regulatory Investment Test for Transmission*, November 2024, paragraph 5.
[24] AER, *Regulatory Investment Test for Transmission*, November 2024, paragraphs 18 and 19.
[25] This indicative commercial discount rate of 7.0% is based on AEMO, *2023 Inputs, Assumptions and Scenarios Report*, July 2023, page 123.

Powerlink has tested the sensitivity of the results to changes in this discount rate assumption, and specifically to the adoption of a lower bound discount rate of 3.63% and an upper bound discount rate of 10.37% (i.e. a symmetrical upwards adjustment).[26]

8.3. Description of reasonable scenarios

The RIT-T analysis is required to incorporate reasonable scenarios, which are used to estimate market benefits and rank options.[27] The number and choice of reasonable scenarios must be appropriate to the credible options under consideration and, where the identified need is reliability corrective action, reflect any variables or parameters that are likely to affect the ranking of the credible options.[28]

Based on the minor differences between the options in terms of operational outcomes, Powerlink has chosen to present a single reasonable scenario for comparison purposes. The detailed market modelling of future generation and consumption patterns required to assess alternative scenarios relating to connection of renewable generation represents a disproportionate cost in relation to the scale of the proposed network investment.

Notwithstanding this, Powerlink has considered capital cost, discount rate and risk cost sensitivities individually and in combination and found that none of the parameters has an impact on ranking of results. Hence, Powerlink has chosen to present a 'central scenario' illustrated in Table 8.1.

Table 8.1: Reasonable scenario parameters

Key parameter	Central Scenario
Capital cost	100% of base capital cost estimate
Maintenance cost	100% of base maintenance cost estimate
Discount rate	7.0%
Risk cost	100% of base risk cost forecast

9. Cost-benefit Analysis and Identification of Preferred Option

As the proposed investment is for meeting reliability and service standards arising from Powerlink's Transmission Authority and to ensure Powerlink's ongoing compliance with Schedule 5.1 of the NER, it is a reliability corrective action.[29] A reliability corrective action differs from that of an increase in producer and consumer surplus (market benefit) driven need in that the preferred option may have a negative net economic outcome because it is required to meet an externally imposed obligation on the network business.[30]

[26] A discount rate of 3.63% real pre-tax Weighted Average Cost of Capital is based on *TasNetworks 2024-29 Final Determination*, April 2024.
[27] AER, *Regulatory Investment Test for Transmission*, November 2024, paragraph 22.
[28] AER, *Regulatory Investment Test for Transmission*, November 2024, paragraph 23.
[29] National Electricity Rules, clause 5.10.2 (definition of 'reliability corrective action').
[30] National Electricity Rules, clause 5.15A.1(c).

9.1. NPV analysis

Table 9.1 outlines the NPV and the corresponding ranking of each credible option relative to the base case.

Table 9.1: NPV of credible option relative to the base case

Option	Description	Central scenario NPV relative to Base Case ($m)	Ranking
Base Case	No capital expenditure. Operation Maintenance Cost excluding irreparable damages. Risk Cost include risks resulting from irreparable damages.		
1	Two 11kV underground cables and associated transformers replacement by December 2026	-11.9	1

Figure 9.1 sets out the breakdown of capital cost, other operational maintenance cost and avoided risk cost for each option in NPV terms under the central scenario. Note that the non-credible base case consists of operational maintenance and total risk costs and does not include any capital expenditure.

Figure 9.1: NPV of credible option (NPV $m)

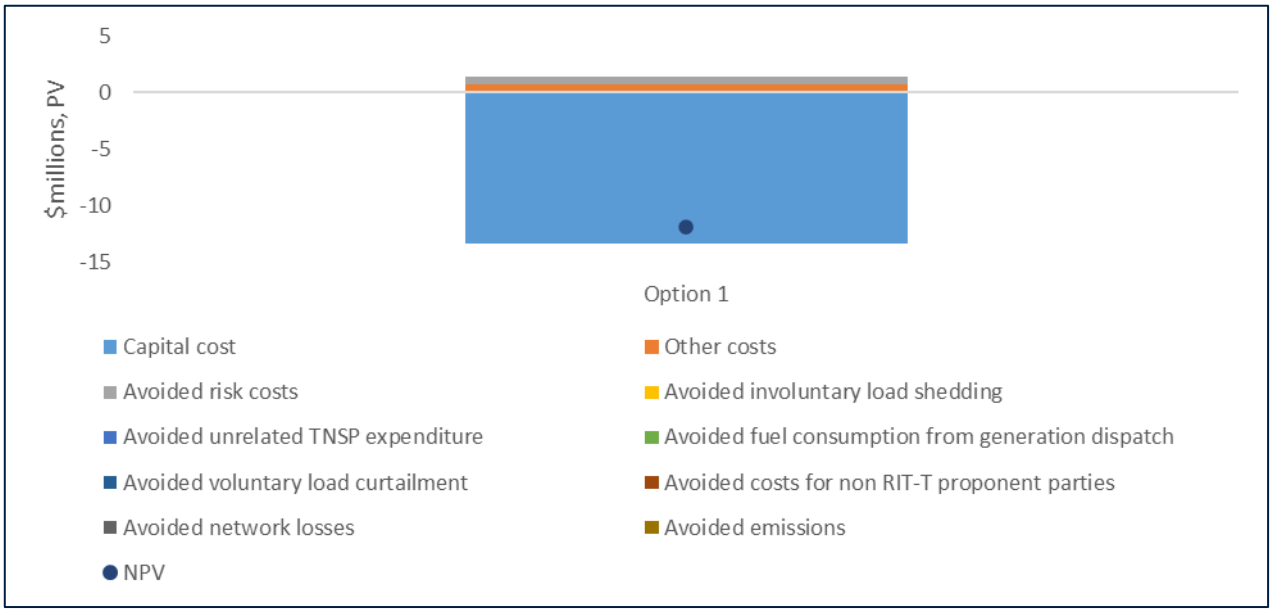


Figure 9.1 illustrates that the only credible option, Option 1, will significantly reduce the risk cost compared to the Base Case.

9.2. Conclusion

The result of the cost-benefit analysis indicates that Option 1 provides the highest net economic benefit (lowest cost in NPV terms) over the 30-year analysis period. Sensitivity testing shows the analysis is robust to variations in the capital cost, risk cost and discount rate assumptions.

Powerlink therefore considers Option 1 satisfies the requirements of the RIT-T and is the proposed preferred option.

10. Final Recommendation

Based on the conclusions drawn from the NPV analysis and regulatory requirements relating to the proposed replacement of transmission network assets, it is recommended that Option 1 be implemented to address the risks associated with the deteriorating condition of the underground cables and associated transformers between Belmont Substation and Mansfield office. Implementing this option will also ensure ongoing compliance with relevant standards, applicable regulatory instruments and the NER.

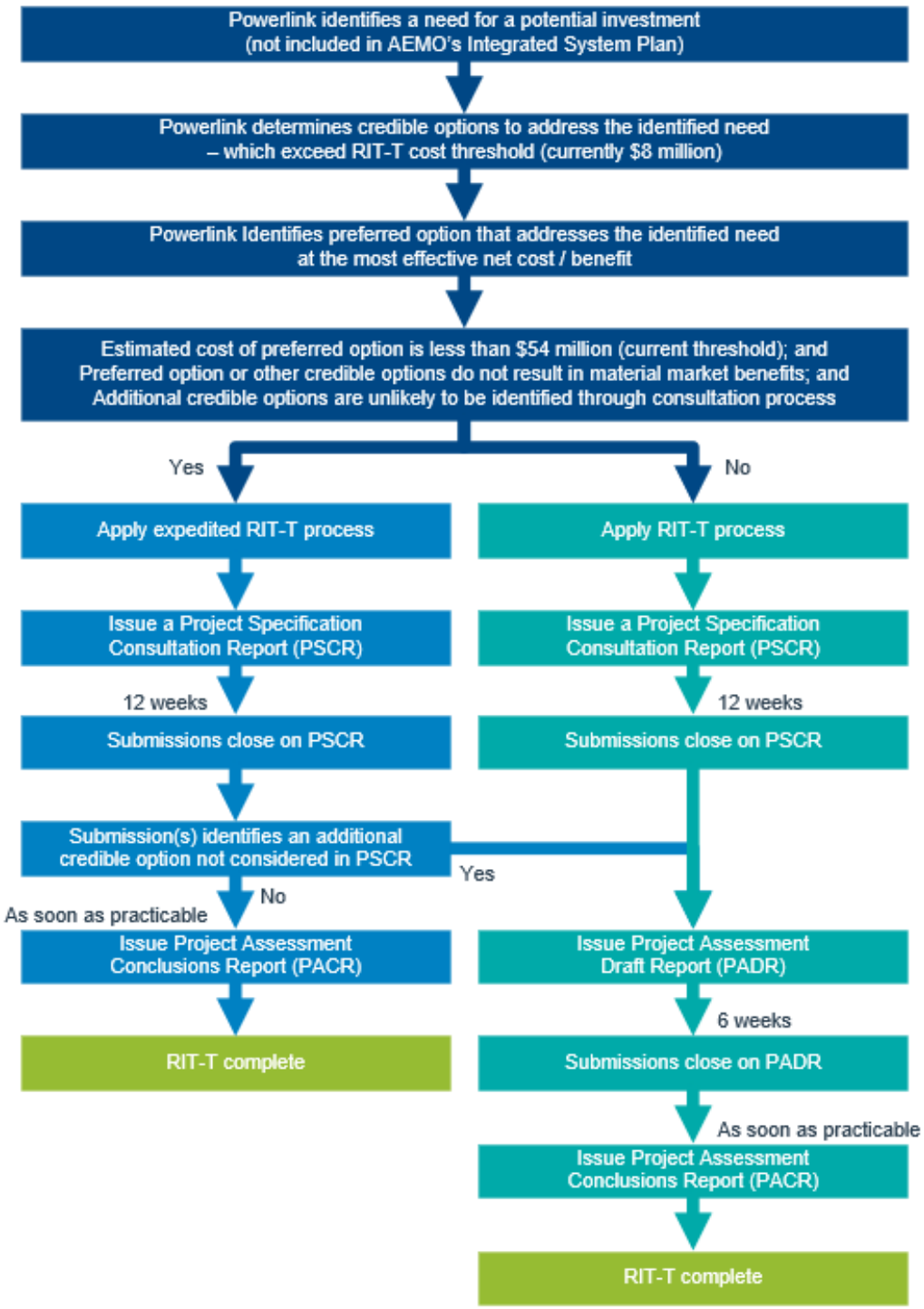
Option 1 involves the replacement of the two 11kV underground cables and associated transformers. The indicative capital cost of this option is $14.8 million in 2023/24 prices.

Under Option 1, commissioning of the new underground cables and associated transformers will be completed by December 2026.

Powerlink will now proceed with the necessary processes to implement the preferred option.

Appendix 1: RIT-T Process

The flow chart below illustrates the RIT-T process[31] where the need is not identified as an actionable project in AEMO's ISP.



As the first step in the RIT-T process, the PSCR:

- describes the reasons why Powerlink has determined that investment is necessary (the identified need), together with the assumptions used in identifying this need, including whether the need is as an actionable project in AEMO's latest ISP;
- provides potential proponents of non-network options with information on the technical characteristics that a non-network solution would need to deliver, in order to assist proponents to consider whether they could offer an alternative solution;
- describes the credible options that Powerlink currently considers may address the identified need;
- discusses why Powerlink does not expect specific categories of market benefit to be material for this RIT-T;
- presents the NPV assessment of each of the credible options compared to a base case, as well as the methodologies and assumptions underlying these results;
- identifies and provides a detailed description of the credible option that satisfies the RIT-T, and is therefore the preferred option;
- provides information about Powerlink's estimation of costs for each credible option;
- describes how customers and stakeholders have been engaged with regarding the identified need; and
- provides stakeholders with the opportunity to comment on this assessment so that Powerlink can refine the analysis (if required) as part of the PACR.[32]

Powerlink may adopt the expedited process for a RIT-T for investments without material market benefits. Specifically, Powerlink may publish a PACR following public consultation on a PSCR and apply the exemption from publishing a PADR if:

- the preferred option has an estimated capital cost of less than $54 million;
- Powerlink has identified its preferred option in this PSCR (together with the supporting quantitative cost-benefit analysis) and indicated that the investment has the benefit of the expedited process;
- Powerlink does not envisage that additional credible options, which could deliver material market benefits, will be identified through the submission process given the nature of this secondary systems replacement project; and
- Powerlink is not aware of any non-network options that could be adopted. The PSCR provides a further opportunity for providers of feasible non-network options to submit details of their proposals for consideration.

Powerlink will however publish a PADR if submissions to a PSCR identify other credible options that have not yet been considered, and which could provide a material market benefit or a more cost-efficient outcome for customers.

A PADR and a PACR for a RIT-T must include:

- a description of each credible option assessed;
- a summary of and commentary on submissions received in response to the PSCR or PADR (as relevant);
- a quantification of the costs, including a breakdown of operating and capital expenditure, and classes of material market benefit for each credible option;

[31] National Electricity Rules, clause 5.15.3(a) requires the AER to undertake a regular review of RIT-T cost thresholds. Appendix 1 reflects The AER's latest cost threshold review which came into place for three years commencing 1 January 2025.
[32] National Electricity Rules, clause 5.16.4(b).

- reasons why Powerlink has determined that a class or classes of market benefit are not material;
- the results of NPV analysis for each credible option assessed, together with accompanying explanatory statements;
- the identification of the proposed preferred option, including details of the technical characteristics and the estimated construction timetable and commissioning date; and
- RIT-T reopening triggers if the estimated capital cost of the preferred option is greater than $100 million (as varied via AER cost threshold determinations).[33]

[33] National Electricity Rules, clauses 5.16.4(k) and (v).

Appendix 2: Sensitivity Analysis

Powerlink has investigated the following sensitivities on key assumptions:

- a range from 3.63% to 10.37% discount rate;
- a range from 75% to 125% of base capital expenditure estimates;
- a range from 75% to 125% of base risk cost estimates;

As illustrated in Figures A2.1 – A2.3 of the PSCR, sensitivity analysis for the NPV relative to the base case shows that varying the discount rate, capital expenditure and total risk costs has no impact on the identification of the preferred option. Option 1 is the preferred option under all scenarios tested.

Powerlink also performed a Monte Carlo simulation with multiple input parameters (including discount rate, capital cost and total risk cost) generated for the calculation of the NPV for each option. This process was repeated over 5,000 iterations, each time using a different set of random variables from the probability function. The sensitivity analysis output is presented as a distribution of possible NPVs for each option, as illustrated in Figure A2.5 of the PSCR. The Monte Carlo simulation also confirmed that Option 1 is robust over a range of input parameters in combination.

Appendix 3: NER Compliance Checklist

Clause 5.16.4(v) of the NER states that a PACR must include the matters detailed in the PADR, and summarise and comment on submissions received on the PADR. This appendix outlines Powerlink's compliance with PADR/PACR content requirements in each sub-paragraph of clause 5.16.4(k).

Table A3.1: Compliance Checklist

Sub-para	Requirement	Section of PACR
(1)	Description of each credible option	4.1
(2)	Summary of and commentary on submissions to the PSCR/PADR[34]	N/A
(3)	Quantification of costs, including breakdown of operating and capital expenditure	4.1 & 7.3
	Classes of material market benefit for each credible option	5.1
(4)	Description of methodologies used to quantify each class of material market benefit and cost	5.1
(5)	Reasons why a class/classes of market benefit are not material	5.2
(6)	Identification and quantification of any class of market benefit estimated to arise outside Queensland	N/A
(7)	Results of NPV analysis for each credible option, and explanation of results	9.1 – 9.2
(8)	Identification of preferred option	10
(9)	For the preferred option:	
	(i) details of the technical characteristics	4.1
	(ii) the estimated construction timetable and commissioning date	10
	(iii) an augmentation technical report from AEMO	N/A
	(iv) a statement that the preferred option satisfies the RIT-T	9.2
(10)	RIT reopening triggers	N/A

N/A denotes not applicable.

[34] Paragraph (v)(2) in clause 5.16.4 requires the PACR to include a response to submissions on the PADR.

Appendix 4: RIT-T Application Guidelines Compliance Checklist

This appendix outlines Powerlink's compliance with binding requirements included in the RIT-T Application Guidelines.

Table A4.1: RIT-T Application Guidelines Compliance Checklist

Section of Guidelines	Topic	Requirements	Section of PACR
3.5.3	Social licence costs	Provide the basis for any social licence costs, including any reference to best practice	5.2
3.5A.1	Cost estimation accuracy	Outline cost estimation process (as applicable to stage of the RIT-T)	7.1
3.5A.2	Cost estimation information	Details of inputs, assumptions and methodologies for each credible option (as applicable to the stage of the RIT-T)	7.2 & 7.3
3.7.3	Market benefits	Calculation of changes in Australia's greenhouse gases	N/A
3.8.2	Sensitivities	Sensitivity analysis on all credible options	Appendix 2
3.11.2	Concessional finance	Provide sufficient detail about a concessional finance agreement	N/A
4.1	Community engagement	Description of assessment of requirement for community engagement and, as applicable, how engagement has been undertaken and any relevant concerns sought to be addressed, and how the proponent plans to engage with stakeholder groups	2.6

N/A denotes not applicable.

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