September 2024

Maintaining reliability of supply to Mansfield

Project Specification Consultation 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 Specification Consultation Report has been prepared in accordance with version 214 of the National Electricity Rules (NER), and the Australian Energy Regulator's Regulatory Investment Test for Transmission (RIT-T) Instrument (August 2020) and RIT-T Application Guidelines (October 2023).

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, technical characteristics of non-network options, and categories of market benefits likely to impact selection of the preferred option. In particular, it encourages submissions from potential proponents of feasible non-network options to address the identified need.

This document also provides customers, stakeholders and communities with information on the potential investment/s (network and non-network) that are required in the near-term to meet an identified need and offers the opportunity to provide input into the future development of the transmission network in Queensland.

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.

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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 $7 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 will adopt the expedited process for non-ISP projects for this RIT-T, as the estimated capital cost of the preferred option is below $46 million, and is unlikely to result in any material market benefits other than those arising from a reduction in involuntary load shedding. The reduction in involuntary load shedding under the credible network options is included in the risk cost modelling and represented in the economic analysis of the options.

Powerlink has developed a non-credible base case against which to compare credible options

Powerlink has modelled a non-credible option where the asset condition issues are managed via operational maintenance or operational measures only. This results in an increase in overall risk levels as the condition of the asset deteriorates over time and an increase in failure rectification timeframes due to obsolescence issues. These increasing risk levels are assigned a monetary value and added to the ongoing maintenance costs to form the base case.

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

The table below details the credible network option and 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	Total Capital Costs ($m)	Central scenario NPV relative to Base Case ($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

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

Non-network options are not expected to address the identified need for this RIT-T

Powerlink does not consider non-network options are able to meet the identified need to maintain reliability of supply to Mansfield. The two 11kV underground cables provide direct communication links between Belmont Substation and Powerlink's Mansfield site which a non-network solution would be unable to meet.

Lodging a submission with Powerlink

Powerlink is seeking written submissions on this Project Specification Consultation Report (PSCR), on or before **20 December 2024**, particularly on the credible option presented in this PSCR.

Please address submissions to:

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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 ISO55000 Asset Management Standards.[1] 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.[2]

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 $7 million.[3] The identified need referred to in this RIT-T – to address the reliability of supply to its Mansfield site – is not included in 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.[4] This Project Specification Consultation Report (PSCR) is the first step in the RIT-T process.[5] More information on the RIT-T process is provided in Appendix 1.

[1] Refer to AS *ISO55000:2014 Asset Management – Overview, principles and terminology*.
[2] National Electricity Rules, clause 5.15A.1(c) and chapter 10, glossary ('net economic benefit').
[3] 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 $7 million for three years from 1 January 2022.
[4] National Electricity Rules, rule 5.16.
[5] This RIT-T consultation process has been prepared in accordance with clauses 5.16.4(b) to (g) of the National Electricity Rules and AER, *Regulatory Investment Test for Transmission Application Guidelines*, October 2023.

2. Consumer and Non-network Engagement

More than five million Queenslanders and 253,000 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 2022/23 shows Powerlink's achievements against the principles of the Energy Charter.

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.

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.[6] Cost increases are affecting infrastructure project costs in many areas including labour, fuel, logistics, steel, cement, copper, aluminium, and other key commodities.[7] 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.

Powerlink does not consider non-network options can meet the identified need to ensure ongoing compliance with Schedule 5.1 as required under the NER. This is because of the specific technical requirements needed to address the identified need which perform a function embedded within the existing transmission network that a non-network solution would not be able to provide. 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 are included in this PSCR.

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

Powerlink undertakes 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.

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

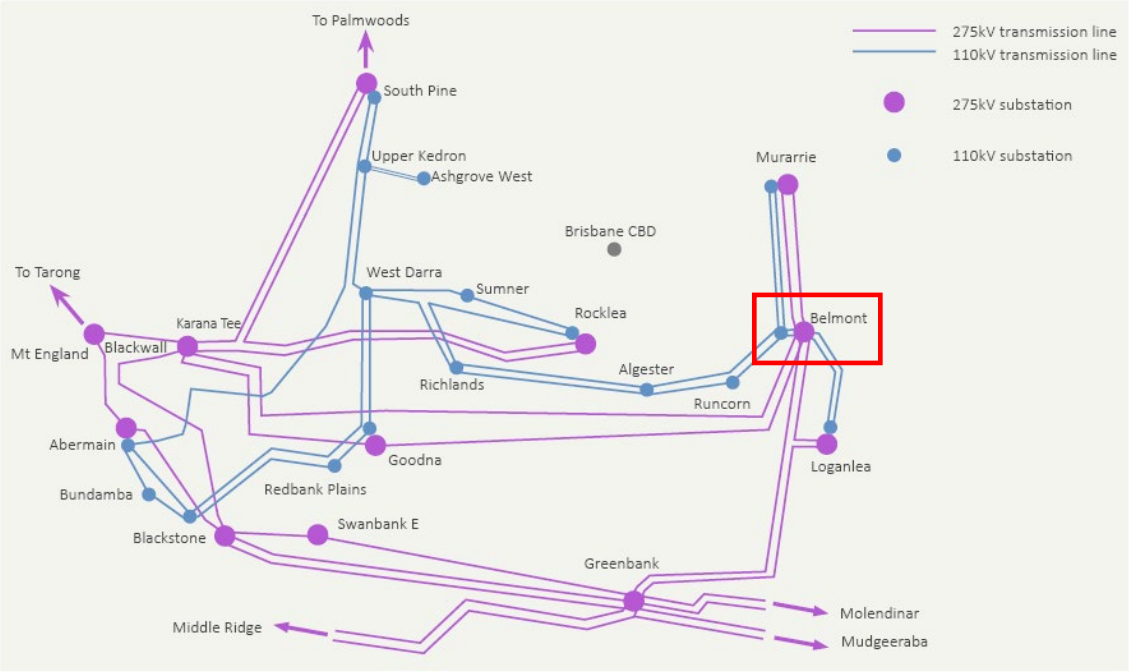
3. Identified Need

In a RIT-T, the identified need is the objective Powerlink seeks to achieve by investing in the network. [8] 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 the identified need.[9]

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.[10] The Transmission Authority is also subject to a broader obligation under the *Electricity Act 1994* (Qld) (the Electricity Act) that Powerlink operate, maintain (including

[8] National Electricity Rules, chapter 10 (definition of 'identified need').
[9] AER, *Application Guidelines, Regulatory Investment Test for Transmission*, October 2023, page 15.
[10] Transmission Authority No. T01/98, section 6.2(c).

repair and replace if necessary) and protect its transmission grid to ensure the adequate, economic, reliable and safe transmission of electricity.[11]

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.

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. Required Technical Characteristics for Non-network Options

As identified in Section 2.4, Powerlink does not consider non-network options can meet the identified need to ensure ongoing compliance with Schedule 5.1 as required under the NER. Notwithstanding this, the information provided in this section is intended to enable interested parties to formulate and propose genuine and practicable non-network solutions such as, but not limited to, local generation and demand side management initiatives.

4.1. Criteria for proposed network support services

A non-network option that assists in minimising the overall investment could provide either a full solution that replicates the functionality of the 11kV cables and associated transformers, or a partial solution to replace one of the 11kV supplies at risk. A non-network solution would need to replicate the full functionality of a 33/11kV 1.5MVA auxiliary transformer and a 1MVA supply to the Mansfield site on a cost-effective basis.

Powerlink has identified the following common criteria that must be satisfied if proposed network support services are to meet supply requirements.[12]

[11] *Electricity Act 1994* (Qld), section 34(1)(a).

[12] Powerlink's Network Support Contracting Framework provides a general guide to assist potential non-network solution providers. This framework outlines the key contracting principles that are likely to appear in any network support agreement.

Size and location

- Proposed solutions must be large enough, individually or collectively, to provide the size of injection or demand response set out above. However, the level of support is dependent on the location, type of network support and load forecasts.
- Due to the bulk nature of the transmission network, aggregation of sub 10MW non-network solutions will be the sole responsibility of the non-network provider.
- Notwithstanding the location of any solution, each proposal would require assessment in relation to technical constraints pertinent to the network connection, such as impacts on intra-regional transfer limits, fault level, system strength, maintaining network operability and quality of supply.

Operation

- A non-network option would need to be capable of operating continuously 24 hours per day over a period of years.
- If a generation service is proposed (either standalone or in conjunction with other services), such operation will be required regardless of the market price.
- Proponents of generation services are advised that network support payments are intended for output that can be demonstrated to be additional to the plant's normal operation in the NEM.
- Where there are network costs associated with a proposed non-network option, including asset decommissioning, these costs form part of the scope of a non-network option and will be included in the overall cost of a non-network option as part of the RIT-T cost-benefit analysis.

Reliability

- Proposed services must be capable of reliably meeting electricity demand under a range of conditions and, if a generator, must meet all relevant NER requirements related to grid connection.
- Powerlink has obligations under the NER, its Transmission Authority and connection agreements to ensure supply reliability is maintained to its customers. Failure to meet these obligations may give rise to liability. Proponents of non-network options must also be willing to accept any liability that may arise from its contribution to a reliability of supply failure.

Timeframe and certainty

- Proposed services must be able to be implemented in sufficient time to meet the identified need, using proven technology and, where not already in operation, provision of information in relation to development status such as financial funding and development timeline to support delivery within the required timeframe must be provided.

Duration

- The agreement duration for any proposed service will provide sufficient flexibility to ensure that Powerlink is pursuing the most economic long run investment to address the condition risks arising from the ageing cables and associated transformers between Belmont Substation and Mansfield office.

Powerlink welcomes submissions from potential proponents who consider that they could offer a credible non-network option that is both economically and technically feasible.

5. Potential Credible Network Options to Address the Identified Need

5.1. 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 5.1: Summary of credible option

Option	Description	Total costs ($m, 2024)	Indicative annual O&M costs ($m, 2024)
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.

5.2. 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.[13]

6. 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.[14]

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

Powerlink considers that changes in involuntary load shedding (expected unserved energy) between options, set out in this PSCR, may impact the ranking of the credible options under consideration and that this class of market

[13] 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.

[14] National Electricity Rules, clauses 5.15A.2(b)(4), (5) and (6). See also AER, *Regulatory Investment Test for Transmission*, August 2020, paragraphs 10 to 13.

benefit could be material. Powerlink has quantified and included these benefits in the cost-benefit and risk cost analysis as network risk.

6.2. 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 cables and associated transformers 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 cable 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 cables 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.
- **Differences in the timing of expenditure:** credible options for cable 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 cables 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.
- **Competition benefits:** Powerlink does not consider that the credible option 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 option 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.
- **Changes in greenhouse gas emissions:** Powerlink does not consider that the credible option will materially affect 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.

6.3. Consideration of market benefits for non-network options

Powerlink notes that non-network options may impact the wholesale electricity market (for example by displacing generation output). Accordingly, it is possible that several of the above classes of market benefits will be material where there are credible non-network options, depending on the specific form of the option.

Where credible non-network options are identified as part of the consultation process on this PSCR, Powerlink will assess the materiality of market benefits associated with these options. Where the market benefits are considered material, these will be quantified as part of the RIT-T assessment of these options.

7. Base Case

7.1. 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.[15]

The assessment undertaken in this PSCR 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.[16]

To develop the base case, the existing condition issues are managed by undertaking operational maintenance or operational measures only. This results in an increase in overall risk levels as the condition 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.

7.2. 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.

7.3. Base case assumptions

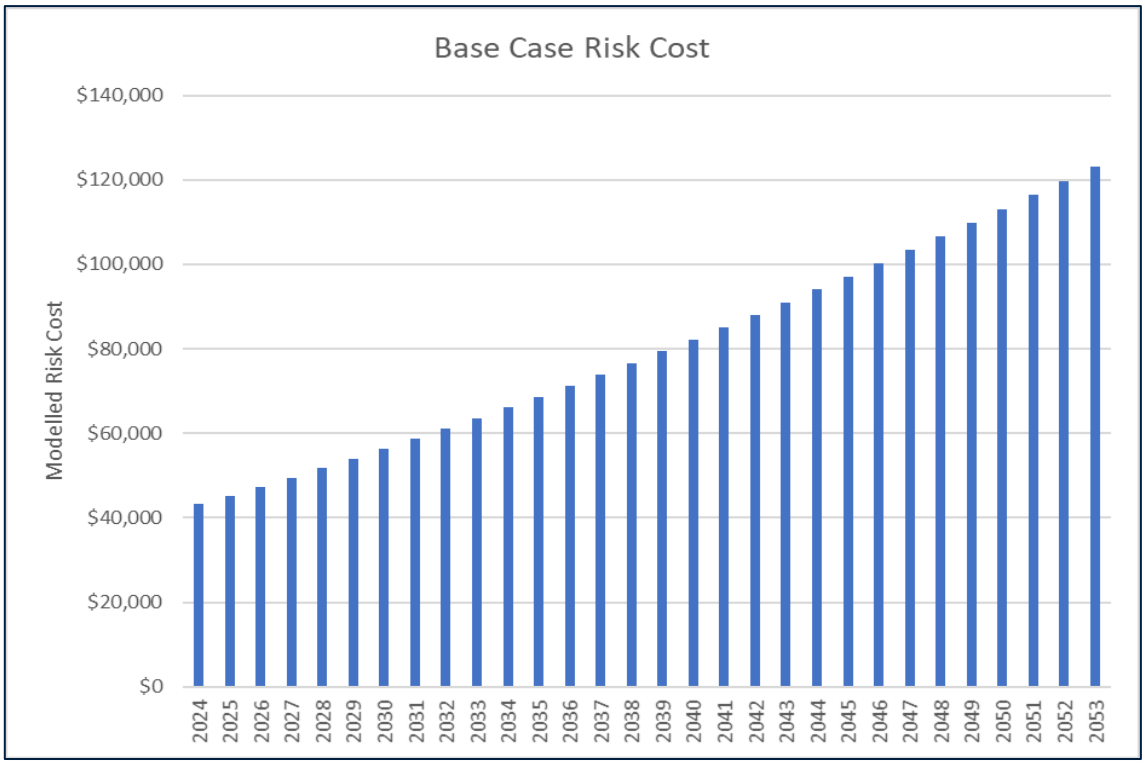
In calculating the potential expected unserved energy arising from a failure of the ageing 11kV underground cables at Belmont Substation, the following modelling assumptions have been made:

- 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 $52.20/kWh has been used when evaluating network risk costs, based on the business customer (commercial) VCR value published within the AER's Value of Customer Reliability Review Final Report and Appendices, updated in December 2023;
- 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.

[15] AER, *Regulatory Investment Test for Transmission*, August 2020, glossary ('base case').
[16] AER, *Application Guidelines, Regulatory Investment Test for Transmission*, October 2023, page 22.

The 30-year forecast of risk costs for the base case is shown in Figure 7.1.

Figure 7.1: 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 $43,187 in 2024 to $123,151 in 2053.

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.

7.4. 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.

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.[17]

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.[18]

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).[19]

8.3. Description of reasonable scenarios

The RIT-T analysis is required to incorporate a number of different reasonable scenarios, which are used to estimate market benefits and rank options.[20] The number and choice of reasonable scenarios must be appropriate to the credible options under consideration and reflect any variables or parameters that are likely to affect the ranking of the credible options, where the identified need is reliability corrective action.[21]

Powerlink has chosen to present a 'central scenario' illustrated in Table 8.1.

[17] AER, *Regulatory Investment Test for Transmission*, August 2020, paragraphs 18 and 19.
[18] This indicative commercial discount rate of 7.0% is based on AEMO, *2023 Inputs, Assumptions and Scenarios Report*, July 2023, page 123.
[19] A discount rate of 3.63% real pre-tax Weighted Average Cost of Capital is based on *TasNetworks 2024-29 Final Determination*, April 2024.
[20] AER, *Regulatory Investment Test for Transmission*, August 2020, paragraph 22.
[21] AER, *Regulatory Investment Test for Transmission*, August 2020, paragraph 23.

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

8.4. 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 RIT-T Application 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.

The Application Guidelines require that, for each credible option, the RIT-T proponent 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;
- 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.[22]

At the Project Assessment Draft Report (PADR) and Project Assessment Conclusions Report (PACR) stages of a RIT-T, RIT-T proponents must include a quantification of costs, including a breakdown of operating and capital expenditure for each credible option.[23] At the PSCR stage, information for each credible option is only required on total indicative capital and operating and maintenance costs, to the extent practicable.[24]

Basis of Estimation

The basis for the estimation for the credible option presented in this PSCR, addressing the methodologies and processes, is aligned with Powerlink's Cost Estimation Methodology[25] which provides context to the classes of estimate discussed in this section.

Key inputs and assumptions

Option 1: 11kV Cable and associated transformers replacement by December 2026

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:

[22] AER, *Application Guidelines, Regulatory Investment Test for Transmission*, October 2023, page 30.
[23] National Electricity Rules, clauses 5.16.4(k)(3) and (v)(1).
[24] National Electricity Rules, clause 5.16.4(b)(6)(v).
[25] The methodology is available on the RIT-T Consultations page of Powerlink's website.

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

9. Cost-benefit Analysis and Identification of Preferred Option

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)

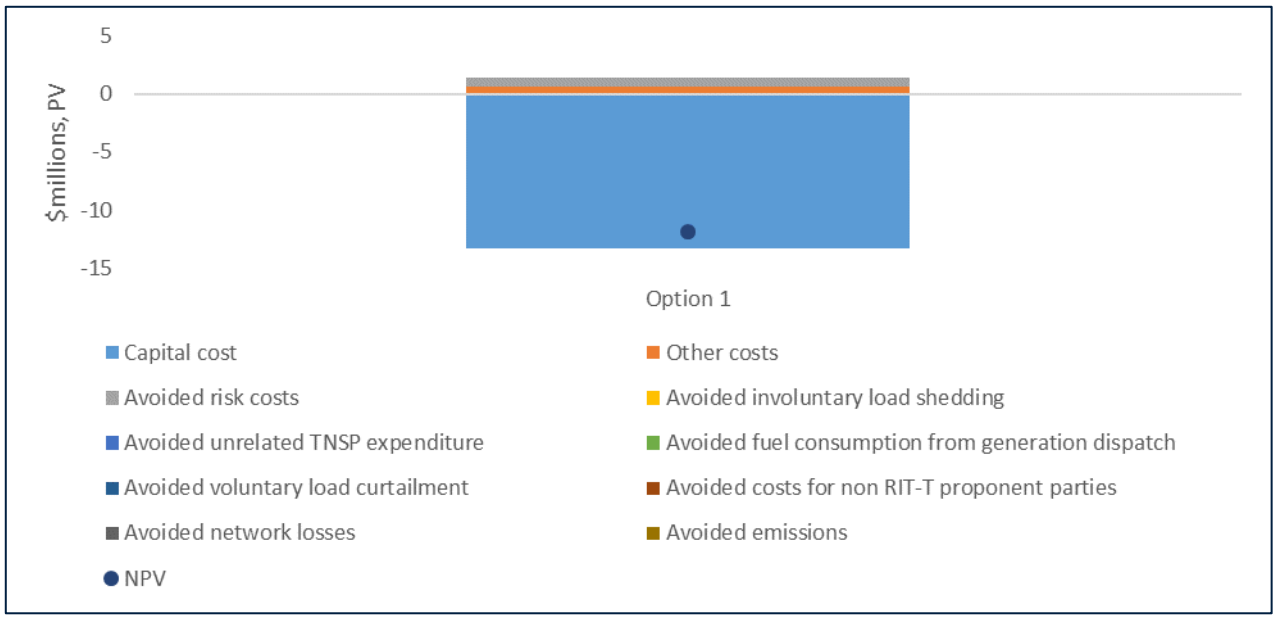


Figure 9.1 illustrates that the only credible option, Option 1, will significantly reduce the risk cost compared to the Base Case.

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. Draft 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 deteriorated 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.

11. Submission Requirements and Next Steps

Powerlink invites submissions and comments in response to this PSCR from Registered Participants, AEMO, potential non-network providers and any other interested parties.

This is not a tender process – submissions are requested so that Powerlink can fulfil its regulatory obligations to analyse non-network options. In the event that a non-network option appears to be a genuine and practicable alternative that could satisfy the RIT-T, Powerlink will engage with that proponent or proponents to confirm cost inputs and commercial terms.

11.1. Submissions from non-network providers

Submissions should be presented in a written form and should clearly identify the author of the submission, including contact details for subsequent follow-up if required. If parties prefer, they may request to meet with Powerlink ahead of providing a written response.

Submissions from potential non-network providers should contain the following information:

- details of the party making the submission (or proposing the service);
- technical details of the project (capacity, proposed connection point if relevant, etc.) to allow an assessment of the likely impacts on future supply capability;
- sufficient information to allow the costs and benefits of the proposed service to be incorporated in a comparison in accordance with AER's RIT-T Application Guidelines;
- an assessment of the ability of the proposed service to meet the technical requirements of the NER;
- timing of the availability of the proposed service; and

- other material that would be relevant in the assessment of the proposed service.

Powerlink will publish a PADR if submissions to this PSCR identify other credible options not yet considered, and which could provide a more cost efficient outcome for customers. The PADR will also summarise and provide comment on any submissions received in response to the PSCR.[26]

Powerlink will publish submissions on the PSCR, subject to any claim of confidentiality by the person making the submission. Where confidentiality over part or all of a submission is made, this should be clearly identified. Powerlink may also explore whether a redacted or non-confidential version of the submission can be made available.[27]

Powerlink is required to use all reasonable endeavours not to disclose any confidential information it receives. The obligation is subject to a number of exceptions, including that disclosure may be made:

- with the consent of the person providing the information; or
- to the AER, Australian Energy Market Commission or any other regulator having jurisdiction over Powerlink under the NER or otherwise.[28]

It should be noted that Powerlink is required to publish the outcomes of the RIT-T analysis. If parties making submissions elect not to provide specific project cost data for commercial-in-confidence reasons, Powerlink may rely on cost estimates from independent specialist sources.

11.2. Next steps

Powerlink intends to carry out the following process to assess what action, if any, should be taken to address future supply requirements.

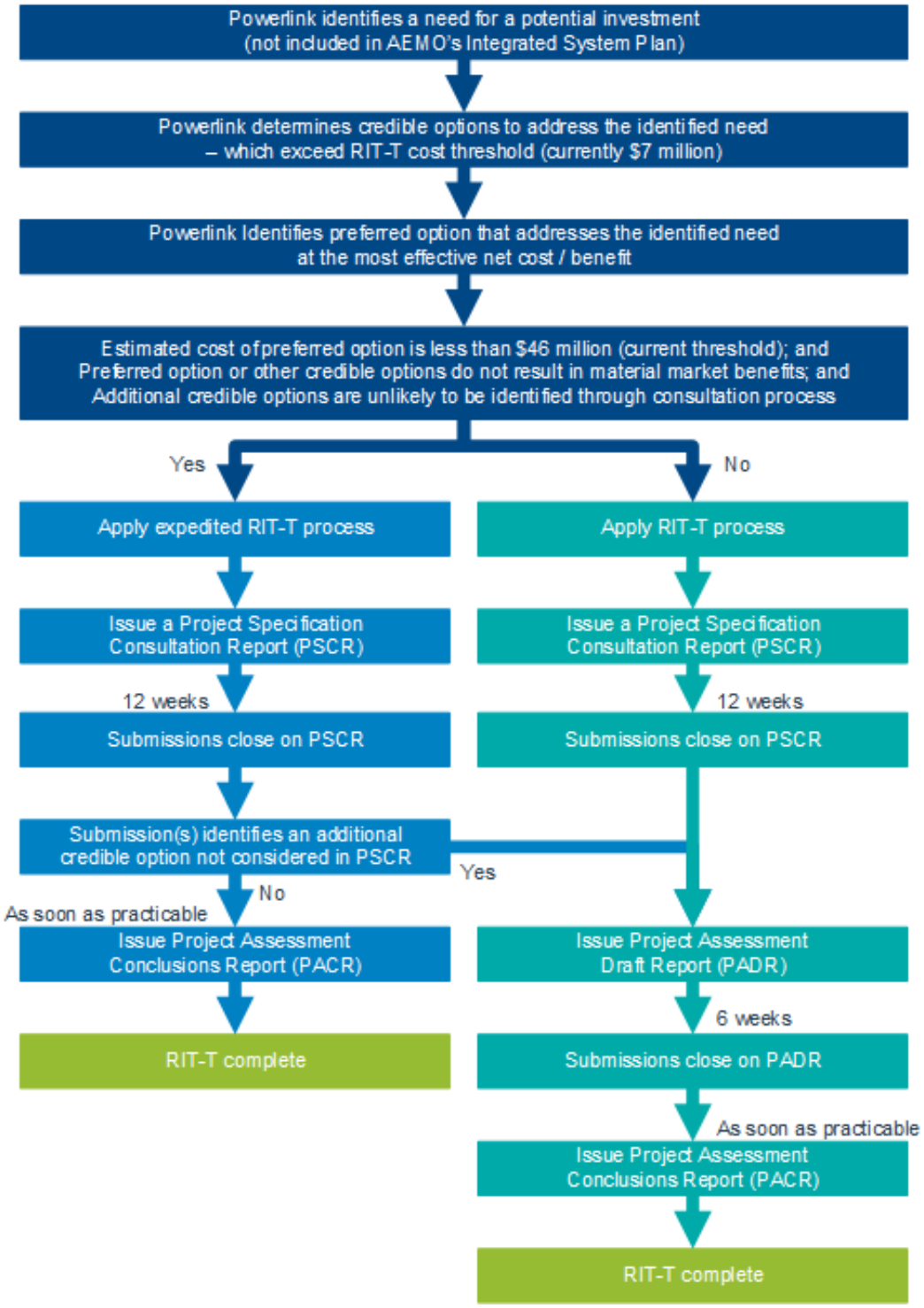
Part 1	PSCR Publication	September 2024
Part 2	Submissions due on PSCR Have your say on the credible option and propose non-network options	20 December 2024
Part 3	Publication of PACR Powerlink's response to any further submissions received and final recommendation on the preferred option for implementation	March 2025

Powerlink reserves the right to amend the timetable at any time. Amendments to the timetable will be made available on the Powerlink website (www.powerlink.com.au/rit-t-consultations).

[26] National Electricity Rules, clause 5.16.4(k)(2).
[27] AER, *Application Guidelines, Regulatory Investment Test for Transmission*, October 2023, page 69.
[28] National Electricity Rules, rule 8.6.

Appendix 1: RIT-T Process

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



As stated, this PSCR is 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.

Powerlink will adopt the expedited process for this RIT-T, as allowed for under the NER for investments of this nature.[29] Specifically, Powerlink will publish a PACR following public consultation on this PSCR and apply the exemption from publishing a PADR as:

- the preferred option has an estimated capital cost of less than $46 million;[30]
- none of the credible options have material market benefits, other than benefits associated with changes in involuntary load shedding, which have been catered for in the risk cost modelling and consequentially represented in the economic analysis of the options;
- Powerlink has identified its preferred option in this PSCR (together with the supporting quantitative cost-benefit analysis);
- 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 cable and transformer replacement project; and
- Powerlink is currently not aware of any non-network options that could be adopted. This PSCR provides a further opportunity for providers of feasible non-network options to submit details of their proposals for consideration.

As stated, Powerlink will however publish a PADR if submissions to this 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.

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

[30] National Electricity Rules, clause 5.16.4(z1)(1) sets the threshold at $35 million. The AER's latest cost threshold review increased the threshold to $46 million for three years from 1 January 2022.

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, 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.

Figure A2.1: Discount rate sensitivity

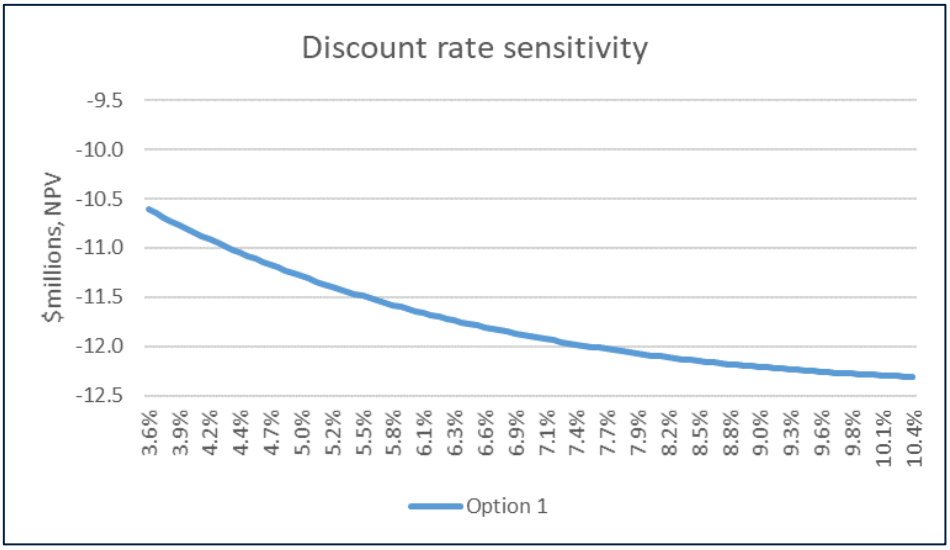


Figure A2.2: Capital cost sensitivity

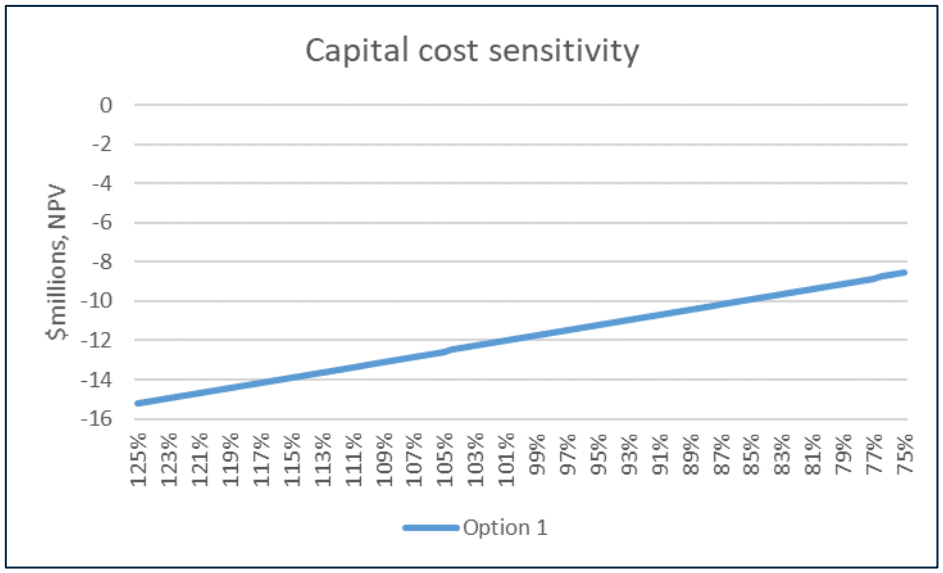
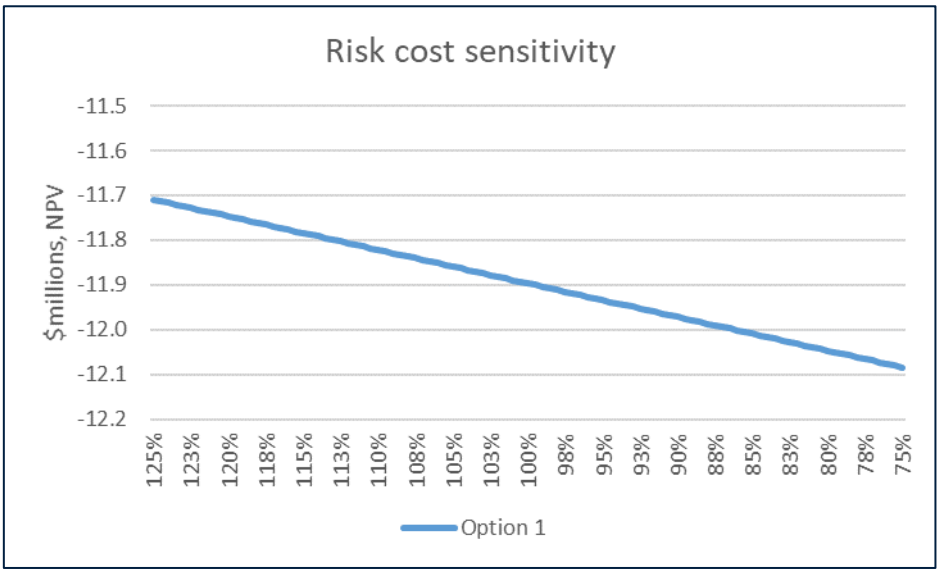
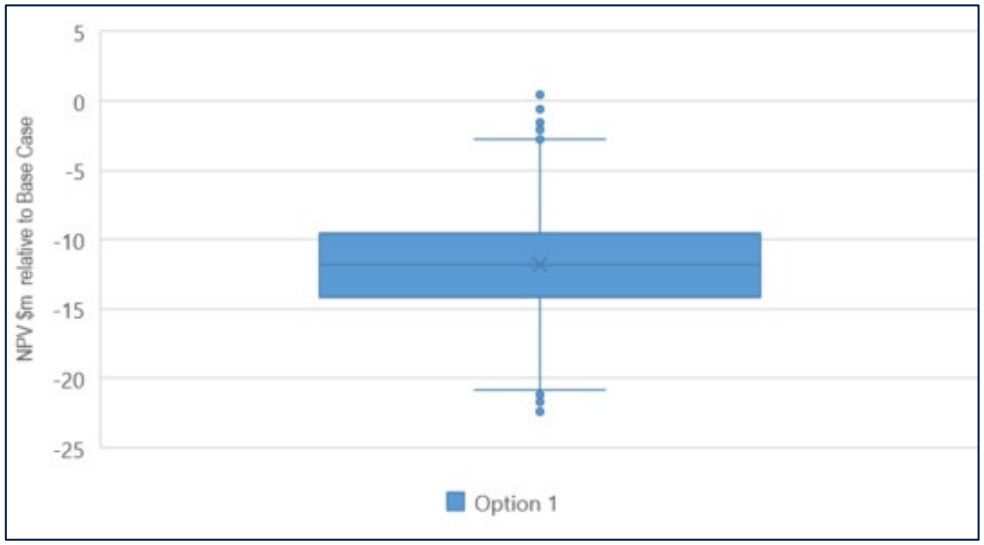


Figure A2.3: Risk cost sensitivity



Powerlink also performed a Monte Carlo simulation with multiple input parameters (including capital cost, discount rate 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.

Figure A2.5: NPV sensitivity analysis of multiple key assumptions relative to the base case



Note: The box represents the interquartile interval, where 50% of the data is found. The horizontal line through the box is the median and the mean is represented by the cross (X). The two lines outside the box extend to 1.5 times the interquartile range. Data points that are outside of this interval are shown as dots on the graph.

Option 1 is robust over a range of input parameters in combination.

Appendix 3: Compliance Checklist

This appendix outlines Powerlink's compliance with PSCR content requirements set out in sub-paragraphs (1) to (6) of clause 5.16.4(b) of the NER.

Table A3.1: Compliance Checklist

Sub-para	Requirement	Section of PSCR
(1)	Description of identified need	3.2
(2)	Assumptions used to identify the identified need	3.3
(3)	Technical characteristics of the identified need that a non-network option would be required to deliver	4.1
(4)	Discussion of identified need or credible options to meet the identified need in most recent ISP	N/A
(5)	Description of credible options	5.1
(6)	For each credible option, information about:	
	(i) technical characteristics of the option;	5.1
	(ii) whether the option is reasonably likely to have a material inter-network impact;	5.2
	(iii) the classes of market benefit that are likely / not likely to be material	6.1 – 6.2
	(iv) estimated construction timetable and commissioning date	10
	(v) indicative capital and operating and maintenance costs	5.1

N/A denotes not applicable.

Appendix 4: Key Parameters and Inputs

This appendix summarises the key inputs and parameters included in the analysis for this PSCR.

Table A5.1: Key inputs and parameters

Parameter	Inputs / Values	Section of PSCR
Costs	$14.8 million, 2023/24	5.1
Value of Customer Reliability	Historical load data used to approximate ratio of load types AER VCR 2019, adjusted December 2023	7.3
Net Present Value	Analysis period: 30 years Lower bound discount rate: 3.63% Central discount rate: 7% Upper bound discount rate: 10.37%	8.1 – 8.2
Scenarios	Central only	8.3
Sensitivity analysis	Discount rate: 3.63% to 10.37% Base capital expenditure estimates: 75% to 125% Base risk cost estimates: 75% to 125% Monte Carlo simulation: 5,000 iterations	Appendix 2

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