Powerlink Queensland

Project Assessment Conclusions Report

7 February 2024

Maintaining power transfer capability and reliability of supply at Kemmis

Document purpose

For the benefit of those not familiar with the National Electricity Rules (the Rules) and the National Electricity Market, Powerlink offers the following clarifications on the purpose and intent of this document:

1. The Rules require Powerlink to carry out forward planning to identify future reliability of supply requirements[1] and consult with interested parties on the proposed solution as part of the Regulatory Investment Test for Transmission (RIT-T). This includes the replacement of network assets in addition to augmentations of the transmission network and providing for power system security services such as system strength and inertia. More information on the RIT-T process, and how it is applied to ensure that safe, reliable and cost effective solutions are implemented to deliver better outcomes to customers, is available on Powerlink's website.
2. Powerlink must 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 consumers. This assessment compares the net present value (NPV) of all credible options to identify the option that provides the greatest economic benefits to the market.
3. The document contains the results of this evaluation, and a final recommended solution to address the condition-based risks arising from the transformer at Kemmis Substation.

[1] Such requirements include, but are not limited to:

- addressing any emerging reliability of supply issues or relevant *ISP actionable projects* identified in the Australian Energy Market Operator's (AEMO) latest Integrated System Plan and
- providing the services required to meet the system strength and inertia requirements and/or declared shortfalls identified in AEMO's latest System Security Reports for which Powerlink has responsibility as the relevant Transmission Network Service Provider and System Strength and Inertia Service Provider in Queensland.

Contents

Executive Summary

Kemmis substation, located approximately 32km north west of Nebo, was established in 2002 to support the load growth arising from the expansion of mining in the northern Bowen Basin and to provide a bulk-supply injection point to the Ergon distribution network (part of the Energy Queensland group).

Power transformer 1 (Transformer 1) was first assembled and energised at an alternate site in 1984 and was subsequently relocated to Kemmis substation in 2003 as part of the substation's original development. Having been in-service for almost forty years, a recent condition assessment found that Transformer 1 is displaying a number of condition-based issues, indicating it is nearing the end of its technical life and, with an increasing risk of failure. The failure of a transformer can result in an extensive replacement timeframe increasing the risk of loss of supply to the local area, and in extreme cases, could present a risk to the safety of personnel.

Planning studies have confirmed there is a long-term requirement to continue to supply the existing electricity services provided by Kemmis Substation. Powerlink must therefore take action to avoid the increasing likelihood of unserved energy arising from failure of the ageing transformer at Kemmis, and ensure customers are provided with a reliable and safe supply of electricity.

As the identified need of the proposed investment is to meet reliability and service standards specified within Powerlink's Transmission Authority and guidelines and standards published by the Australian Energy Market Operator (AEMO), and to ensure Powerlink's ongoing compliance with Schedule 5.1 of the National Electricity Rules (Rules), it is classified as a 'reliability corrective action'[2].

This Project Assessment Conclusions Report (PACR) represents the final step in the Regulatory Investment Test for Transmission (RIT-T) process prescribed under the Rules undertaken by Powerlink to address the condition risk of the transformer at Kemmis Substation. It contains the results of the planning investigation and the cost-benefit analysis of the credible option compared to a non-credible Base Case where the emerging risks are left to increase over time. In accordance with the Rules, the credible option that maximises the net present value (NPV) of net economic benefits is recommended as the preferred option.

Credible options considered

Powerlink has developed one credible network option to maintain the existing electricity services, ensuring a reliable, safe and cost effective supply to customers in the area.

By addressing the condition risks, the credible option allows Powerlink to meet the identified need and continue to meet the reliability and service standards specified within Powerlink's Transmission Authority, Schedule 5.1 of the Rules, AEMO guidelines and standards and applicable regulatory instruments.

Powerlink published a Project Specification Consultation Report (PSCR) in September 2023 to address the condition risks of the transformer at Kemmis Substation. No submissions were received in response to the PSCR that closed on 22 December 2023. As a result, no additional credible options have been identified as a part of this RIT-T consultation.

The credible network option, along with its NPV relative to the Base Case is summarised in Table 1.

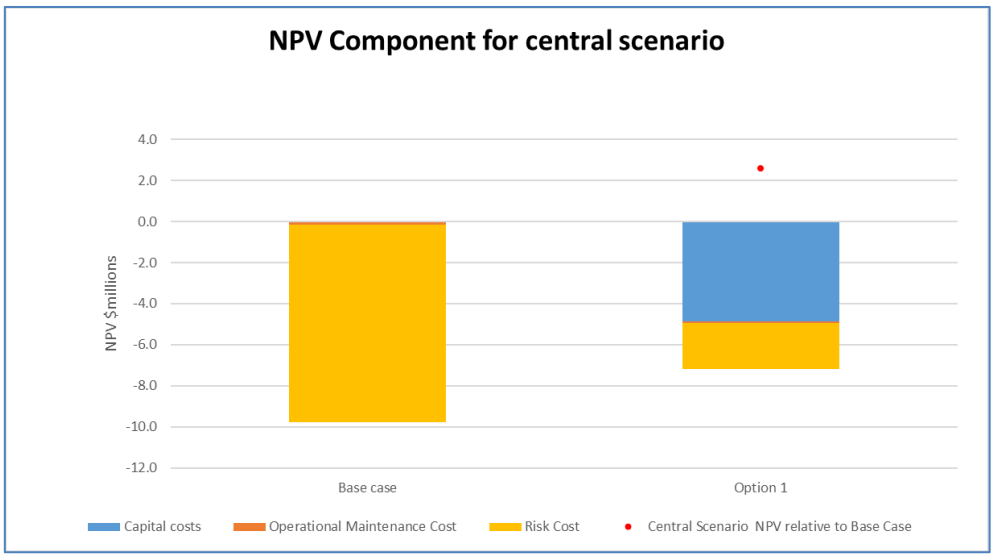
Table 1: Summary of credible network options ($m, real 2023)

Option	Description	Total Cost ($m)	NPV relative to Base Case ($m)
1	Replace 1 transformer by 2026	6.78	2.57

[2] The Rules clause 5.10.2, Definitions, reliability corrective action.

Figure 1 shows the breakdown of the NPV of the Base Case and option 1 for the central scenario. Option 1 reduces the total risk costs arising from the ageing transformer at Kemmis remaining in service and being managed via operational maintenance only (as in the Base Case), and hence reflects a net economic benefit when compared to the Base Case.

Figure 1: Central scenario NPV components of Base Case and credible network options ($m, real 2023)



Evaluation and Conclusion

The RIT-T requires that the preferred option maximises the NPV of net economic benefit, or minimises the net cost, to all those who produce, consume and transport electricity. The cost-benefit analysis demonstrates that Option 1 provides the greatest net economic benefit in NPV terms and is therefore the preferred option.

In accordance with the expedited process for the RIT-T, the PSCR made a draft recommendation to implement Option 1, which involves the replacement of Transformer 1 by 2026. The indicative capital cost of the RIT-T project for the preferred option is $6.78 million in 2022/23 prices.

Under Option 1, procurement of new equipment would commence in 2024, with replacement of the existing Transformer 1 completed by 2026. Powerlink is the proponent of this network project.

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.

Dispute Resolution

In accordance with clause 5.16B(a) of the Rules, Registered Participants, the Australian Energy Market Commission, Connection Applicants, Intending Participants, AEMO and interested parties may, by notice to the Australian Energy Regulator (AER), dispute conclusions in this report in relation to:

- the application of the RIT-T,
- the basis upon which the preferred option was classified as a reliability corrective action, or
- the assessment of whether the preferred option has a *material inter-regional impact* or not.

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, as the RIT-T proponent.

1 Introduction

This Project Assessment Conclusions Report (PACR) represents the final step of the Regulatory Investment Test for Transmission (RIT-T) process[3] prescribed under the National Electricity Rules (the Rules) undertaken by Powerlink to address the condition risks arising from the ageing transformer at Kemmis Substation. It follows the publication of the Project Specification Consultation Report (PSCR) in September 2023.

The PSCR:

- described the identified need that Powerlink is seeking to address, together with the assumptions used in identifying this need
- set out the technical characteristics that a non-network option would be required to deliver in order to address the identified need
- described the credible options that Powerlink considered may address the identified need
- discussed specific categories of market benefit that in the case of this RIT-T assessment are unlikely to be material
- presented the Net Present Value (NPV) economic assessment of each of the credible options (as well as the methodologies and assumptions underlying these results) and identified the preferred option
- noted that Powerlink was claiming an exemption from producing a Project Assessment Draft Report (PADR)
- invited submissions and comments, in response to the PSCR and the credible options presented, from Registered Participants, the Australian Energy Market Operator (AEMO), potential non-network providers and any other interested parties.

Powerlink identified Option 1, involving the replacement of Transformer 1 by 2026. The indicative capital cost of the RIT-T project for the preferred option is $6.78 million in 2022/23 prices.

The Rules clause 5.16.4(z1) provides for a RIT-T proponent to claim exemption from producing a PADR for a particular RIT-T application if all of the following conditions are met:

- the estimated capital cost of the preferred option is less than $46 million[4]
- the preferred option is identified in the PSCR noting exemption from publishing a PADR
- the preferred option, or other credible options, do not have a material market benefit, other than benefits associated with changes in involuntary load shedding
- submissions to the PSCR did not identify additional credible options that could deliver a material market benefit.

There were no submissions received in response to the PSCR that closed for consultation on 22 December 2023. As a result, no additional credible options that could deliver a material market benefit have been identified as part of this RIT-T consultation. As the conditions for exemption are now satisfied, Powerlink has not issued a PADR for this RIT-T.

Subsequent to the publication of the PSCR, the risk cost analysis has been updated to reflect the Australian Energy Regulator's (AER) most recent Value of Customer Reliability (VCR) annual adjustment. Consequently, the cost-benefit analysis has been updated to reflect these more recent parameters, which has not resulted in a change to the outcome of the cost-benefit analysis, ranking of options or identification of the preferred option under this RIT-T.

Powerlink is now publishing this PACR, which:

- describes the identified need and the credible option that Powerlink considers addresses the identified need

[3] This RIT-T consultation has been prepared based on the following documents: National Electricity Rules, Version 204, 5 December 2023, AER, *Regulatory Investment Test for Transmission*, August 2020 and AER, *Application Guidelines, Regulatory Investment Test for Transmission*, October 2023.
[4] Rules, clause 5.16.4(z1)(1) sets the threshold at $35 million. The AER, Costs threshold review for the regulatory investment tests, November 2021 increased the threshold to $46 million for three years from 1 January 2022.

- discusses the consultation process followed for this RIT-T together with the reasons why Powerlink is exempt from producing a PADR
- provides a quantification of costs and reasons why specific classes of market benefit are not material for the purpose of this RIT-T assessment
- provides the results of the cost-benefit analysis for the credible option assessed, together with accompanying explanatory statements
- identifies the preferred option for investment by Powerlink and details the technical characteristics and proposed commissioning date of the preferred option.

2 Customer and non-network engagement

With more than five million Queenslanders and 253,000 Queensland businesses depending 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.

2.1 Powerlink takes a proactive approach to engagement

Powerlink regularly hosts a range of engagement forums and webinars, sharing information with customers and stakeholders within the broader community. These engagement activities help inform the future development of the transmission network and assist Powerlink in providing services that align with the long-term interests of customers. Feedback from these activities is also incorporated 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 representative bodies to give their input and feedback about Powerlink's decision-making, processes and methodologies. It 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 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.

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, providing 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.

In addition, beyond the defined TAPR process, Powerlink's associated engagement activities provide an opportunity for non-network alternatives to be raised, further discussed or formally submitted for consideration as options to meet transmission network needs, well in advance of the proposed investment timings and commencement of regulatory consultations (where applicable).

2.3.1 Maintaining power transfer and reliability of supply at Kemmis

Powerlink identified in its 2020-2023 TAPRs that action would be required to address the emerging power transfer and reliability of supply issues in the North transmission zone[5].

[5] This relates to the standard geographic definitions (zones) identified within the TAPR.

Powerlink advised members of its Non-network Engagement Stakeholder Register (NNESR) of the publication of these TAPRs and the PSCR for this RIT-T.

No submissions proposing credible and genuine non-network options have been received from prospective non-network solution providers in the normal course of business, in response to the publication of the TAPR or as a result of stakeholder engagement activities.

2.4 Powerlink applies a consistent approach to the RIT-T stakeholder engagement process

Powerlink undertakes a considered and consistent approach to ensure an appropriate level of stakeholder engagement is undertaken for each individual RIT-T. Powerlink's website has detailed information on the types of engagement activities that may be undertaken during the consultation process. These activities focus on enhancing the value and outcomes of the RIT-T process for customers, stakeholders and non-network providers. Powerlink welcomes feedback from all stakeholders to further improve the RIT-T stakeholder engagement process.

2.5 The transmission component of electricity bills

Powerlink's contribution to electricity bills comprises approximately 9% of the total cost of the residential electricity bill (refer to Figure 2.1).

Figure 2.1: Components of end user bills

Detailed information on transmission pricing, including discussion on how Powerlink is actively engaging with customers and stakeholders on transmission pricing concerns, is available on Powerlink's website.

3 Identified need

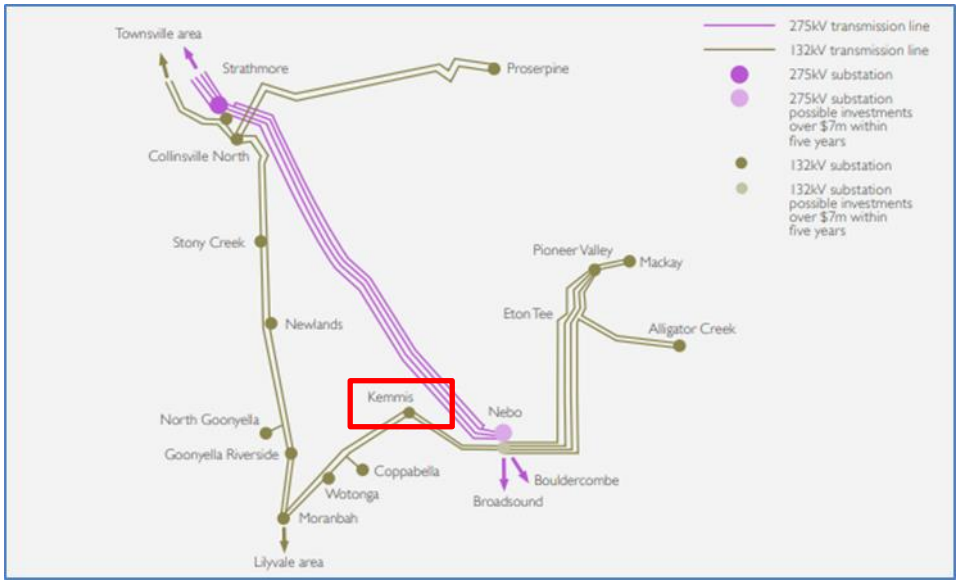
This section provides an overview of the existing arrangements at Kemmis Substation and describes the increasing risk to Powerlink of being unable to maintain compliance with relevant standards, applicable regulatory instruments and the Rules, which are designed to ensure Powerlink's customers continue to receive safe, reliable and cost effective electricity services.

3.1 Geographical and network need

Kemmis Substation was established in 2002 to support the load growth arising from the mining expansion in the Northern Bowen Basin and to provide a bulk supply injection point to the Ergon distribution network (part of the Energy Queensland group).

Planning studies have confirmed there is a long-term requirement to continue to supply the existing electricity services provided by Kemmis Substation. The North Zone transmission network is shown in Figure 3.1.

Figure 3.1: North Zone transmission network



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 50MW at any one time; or
- will not be more than 600MWh in aggregate[6].

Planning studies have confirmed that in order to continue to meet the reliability standard within Powerlink's Transmission Authority, the services currently provided by Kemmis Substation are required into the foreseeable future to meet ongoing customer requirements.[7]

The ageing transformer at Kemmis substation is nearing the end of its technical service life and is increasingly at risk of failure. Consequently, there is a need for Powerlink to address this emerging risk to ensure ongoing compliance with Schedule 5.1 of the Rules, relevant standards and applicable regulatory instruments, which are designed to ensure Powerlink's customers continue to receive safe, reliable and cost effective electricity services.

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 Rules, it is a 'reliability corrective action' under the Rules.[8]

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. The identified need is described in greater detail in in the PSCR published in September 2023.

4 Submissions received

There were no submissions received in response to the PSCR that was open for consultation until 22 December 2023. As a result, no additional credible options that could deliver a material market benefit have been identified as part of this RIT-T consultation.

[6] Transmission Authority No. T01/98, section 6.2(c).
[7] Powerlink, *Transmission Annual Planning Report 2023*
[8] The Rules clause 5.10.2, Definitions, reliability corrective action.

5 Credible options assessed in this RIT-T

Powerlink has assessed one credible network option to maintain the existing electricity services, ensuring a reliable, safe and cost effective supply to customers in the area. The option that has been considered but not progressed for technical reasons is discussed in Appendix 1, Table A1 in the PSCR.

The credible network option to address the identified need for maintaining power transfer capabilities and reliability of supply at Kemmis Substation proposes a like for like replacement of Transformer 1 by 2026. A summary of the credible option is given in Table 5.1.

Table 5.1: Summary of credible option

Option	Description	Indicative project costs ($m)	Indicative annual average O&M costs ($m)
1	Replace 1 transformer by 2026	6.78*	0.007

The credible option addresses the major risks resulting from the deteriorated condition of the ageing transformer at Kemmis Substation, allowing Powerlink to meet its reliability of supply and safety obligations under its Transmission Authority, the *Electricity Act 1994* (Qld) and Schedule 5.1 of the Rules.

The credible option has not been discussed by AEMO in its most recent Integrated System Plan (ISP)[9].

5.1 Material inter-network impact

Powerlink does not consider that the credible option being considered will have a material inter-network impact, based on AEMO's screening criteria[10].

6 Materiality of market benefits

The Rules require that all categories of market benefits identified in relation to a RIT-T be quantified, unless the proponent can demonstrate that a specific category(ies) is/are unlikely to be material.[11]

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

Powerlink considers that changes in involuntary load shedding (i.e. the reduction in expected unserved energy (USE)) under the credible network option presented could have a material market benefit. Consequently, these benefits have been quantified and included within the cost-benefit and risk cost analysis as network risk.

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

Other than market benefits associated with involuntary load shedding, Powerlink does not consider any other category of market benefits to be material, and had not estimated them as part of this RIT-T.

More information on consideration of individual classes of market benefits can be found in the PSCR.

[9] Clause 5.16.4(b)(4) of the Rules requires Powerlink to advise whether the identified need and or solutions are included in the most recent ISP. The most recent ISP was published in June 2022.
[10] In accordance with 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.
[11] Rules, clauses 5.15A.2(b)(4)–(6). See also AER, *Regulatory Investment Test for Transmission*, August 2020, paragraphs 10–13.

7 Base Case

7.1 Modelling a Base Case under the RIT-T

In a RIT-T that is not for an actionable ISP project, the Base Case is a 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[12].

The assessment undertaken in this RIT-T compares the costs and benefits of the credible option 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 of the ageing asset is only addressed through standard operational activities, with escalating safety, financial, environmental and network risks[13].

To develop the Base Case, the existing condition issues associated with an asset are managed by undertaking operational maintenance only, which results in an increase in 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 for the Kemmis transformer 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 the plant 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.

7.2 Kemmis Base Case risk costs

Powerlink has developed a risk modelling framework consistent with the RIT-T Application Guidelines and the AER Industry Practice Application Note[14]. An overview of the framework is available on Powerlink's website[15] and the principles of the framework have been used to calculate the risk costs of the Kemmis Base Case. The framework includes the modelling methodology and general assumptions underpinning the analysis.

7.3 Base Case assumptions

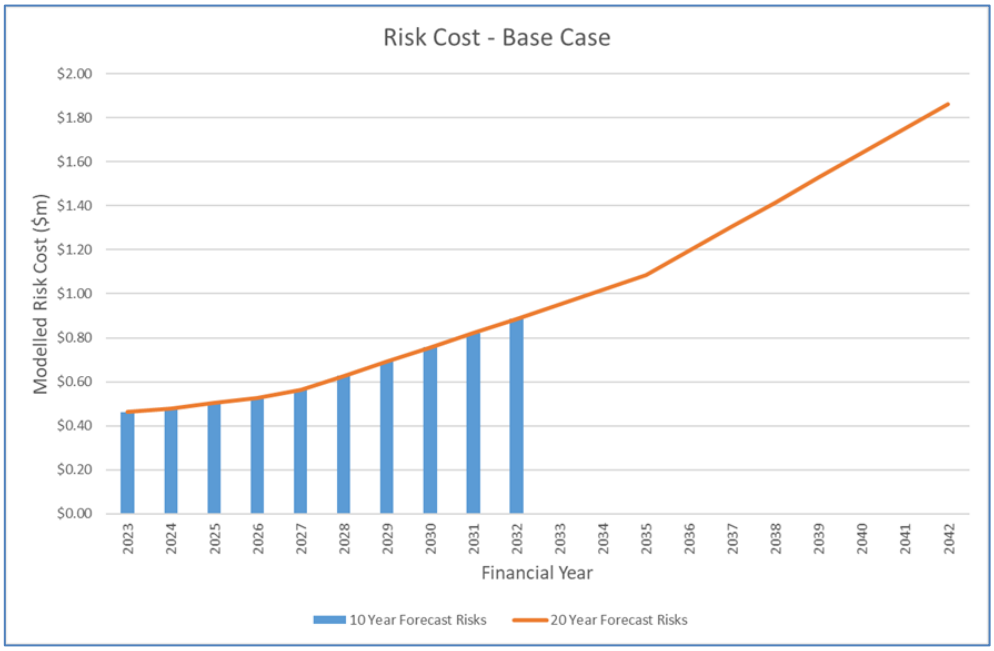
In calculating the potential USE arising from a failure of the ageing transformer at Kemmis, the following modelling assumptions specific to the Kemmis network configuration have been made.

- Historical load profiles and embedded generation patterns have been used when assessing the likelihood of USE under concurrent failure events.
- USE generally accrues under concurrent failure events, and consideration has been given to potential feeder trip events within the wider Kemmis area.
- Kemmis Substation supplies primarily to mines, resulting in a VCR of $41,220/MWh. The most relevant mines VCR values are published within the AER's Value of Customer Reliability Annual Adjustment (updated in 2023) and have been used to determine this VCR.
- Powerlink's business response to mitigating USE under prolonged supply outage events has been incorporated within the risk cost modelling.

The 20-year forecast of risk costs for the Base Case is shown in Figure 7.1.

[12] AER, *Regulatory Investment Test for Transmission*, August 2020, Glossary ('base case').
[13] AER, *Application guidelines, Regulatory investment test for transmission,* October 2023, page 22.
[14] AER *Industry Practice Application Note, Asset Replacement Planning*, January 2019.
[15] The risk costs are calculated using the principles set out in the Powerlink document, *Overview of Asset Risk Cost Methodology*, May 2019.

Figure 7.1: Modelled Base Case risk costs ($m, real 2023)



The main areas of risk cost are safety risk arising from the failure of equipment, financial risk related to the replacement of damaged or failed equipment, as well as network risk, involving reliability of supply through the failure of the deteriorated transformer, modelled as probability weighted USE[16]. These risks increase over time as the condition of plant further deteriorates and the likelihood of failure rises.

7.4 Modelling of risk in options

Each option is scoped to mitigate the major risks arising in the Base Case and to maintain compliance with all statutory requirements, the Rules 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 NPV inputs.

8 General modelling approach adopted for net benefit analysis

8.1 Analysis period

The RIT-T analysis has been undertaken over a 20-year period, from 2023 to 2042. A 20-year period sufficiently takes into account the size and complexity of the transformer replacement investment.

As there will be remaining asset life in 2042, a terminal value[17] is calculated to account for any future benefits that would accrue over the balance of the asset's life.

8.2 Discount rate

Under the RIT-T, a commercial discount rate is applied to calculate the NPV of costs and benefits of credible options. Powerlink has adopted a real, pre-tax commercial discount rate of 7%[18] as the central assumption for the cost-benefit analysis presented in this report.

[16] Unserved Energy is modelled using a VCR consistent with that published by AER in their *Value of Customer Reliability Annual Adjustment (updated in 2023)*.
[17] Terminal value was calculated based on remaining asset value using straight-line depreciation over the capital asset life.
[18] This indicative commercial discount rate of 7% is based on AEMO, *2023 Inputs, Assumptions and Scenarios Report*, 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%[19] and an upper bound discount rate of 11% (i.e. a symmetrical upwards adjustment).

8.3 Description of reasonable scenario

The RIT-T analysis is required to incorporate a number of different reasonable scenarios, which are used to estimate market benefits. 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[20].

The detailed modelling of scenarios based upon AEMO's 2023 Inputs, Assumptions and Scenarios Report would represent a disproportionate cost in relation to the scale of the proposed network investment.

As discount rate, capital expenditure, operational maintenance expenditure and risk cost sensitivity does not impact on the sign of the option NPV, Powerlink has elected to present the NPV for the central scenario, in accordance with the provisions of the RIT-T Application Guidelines.

Table 8.1: Reasonable scenario assumed

Key parameter	Central scenario
Capital cost	100% of base capital cost estimate
Maintenance cost	100% of base maintenance cost estimate
Discount rate	7%
Risk cost	100% of base risk cost forecast

9 Cost-benefit analysis and identification of the preferred option

9.1 NPV Analysis

Table 9.1 outlines the NPV for the credible option and the corresponding ranking of the credible option, relative to the Base Case.

Table 9.1: NPV of credible options relative to the Base Case ($m, 2023)

Option	Description	Central Scenario NPV relative to Base Case ($m)	Ranking
1	Replace 1 transformer by 2026	2.57	1

Option 1 will address the identified need on an enduring basis, and has a positive NPV relative to the Base Case.

Figure 9.1 sets out the central scenario NPV components of capital cost, maintenance cost and risk cost for the Base Case and the credible option. Note that the non-credible Base Case consists of operational maintenance and total risk costs and does not include any capital expenditure.

[19] A discount rate of 3.04% pre-tax real Weighted Average Cost of Capital is based on the most recent AER determination, Final decision: Transgrid transmission determination 1 July 2023 to 30 June 2028.
[20] AER, *Regulatory Investment Test for Transmission*, August 2020, paragraph 23.

Figure 9.1: Central scenario NPV components of the Base Case and credible options ($m, real 22/23)

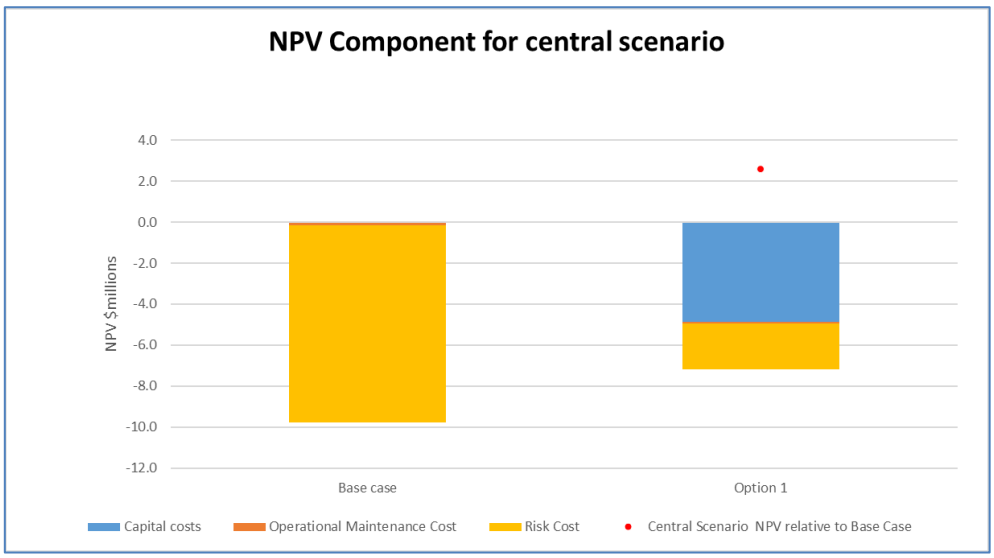


Figure 9.1 illustrates that the capital investment for the credible option that addresses risks associated with Transformer 1 at Kemmis Substation will result in benefits from a reduction in risk costs, as well as a reduction in operational maintenance costs when compared to the Base Case.

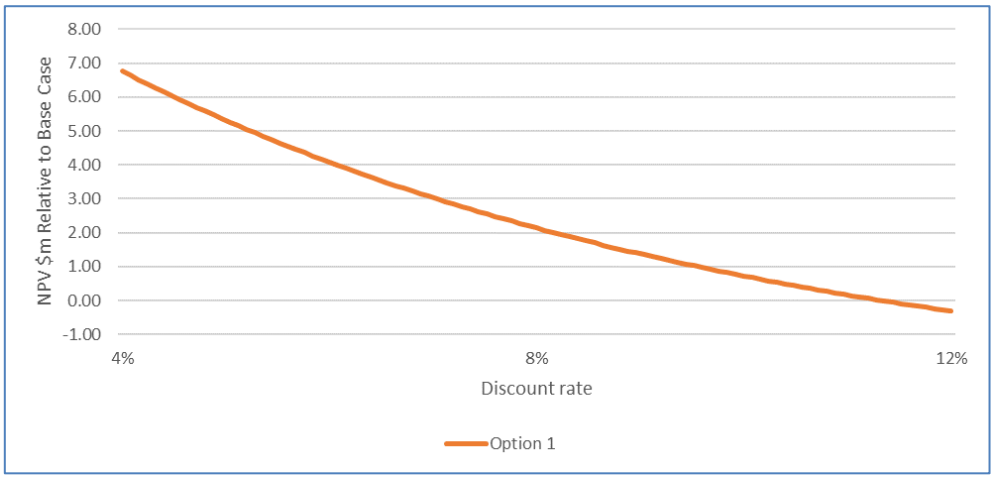
9.2 Sensitivity analysis

Powerlink has investigated the following sensitivities on key assumptions:

- a range from 3% to 11% for discount rate[21]
- a range from 75% to 125% for capital expenditure estimates
- a range from 75% to 125% for operational maintenance expenditure estimates
- a range from 75% to 125% for total risk cost estimates.

As illustrated in Figures 9.2.1 – 9.2.4, sensitivity analysis for the NPV relative to the Base Case shows that varying the discount rate, capital expenditure, operational maintenance expenditure and total risk cost does not impact on the sign of the NPV for Option 1. Therefore, Powerlink has elected to present the NPV for the central scenario.

Figure 9.2.1 Discount rate sensitivity



[21] A discount rate of 3.04% pre-tax real Weighted Average Cost of Capital is based on the most recent AER determination, Final decision: Transgrid transmission determination 1 July 2023 to 30 June 2028.

Figure 9.2.2 Capital cost sensitivity

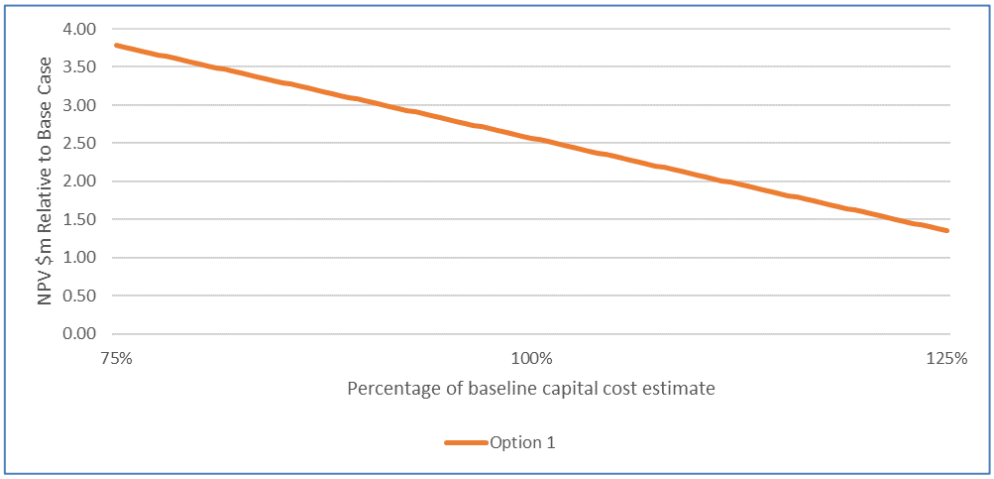


Figure 9.2.3 Maintenance cost sensitivity

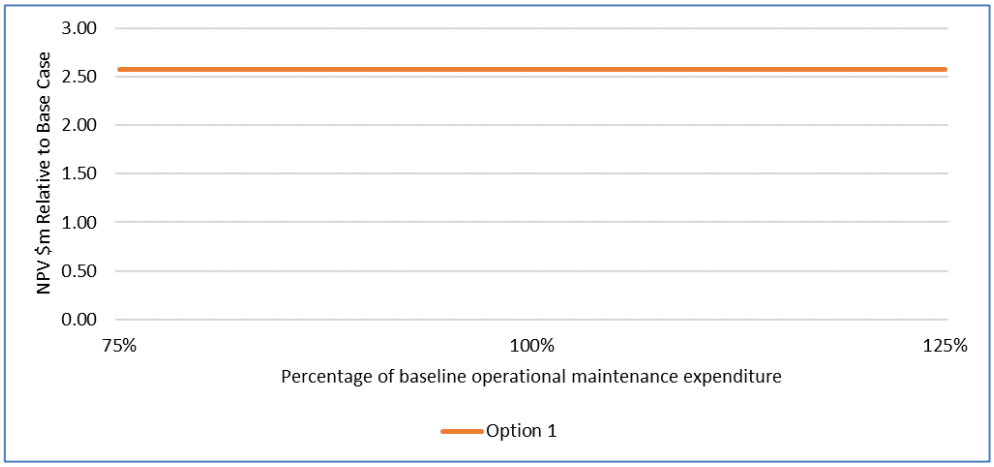
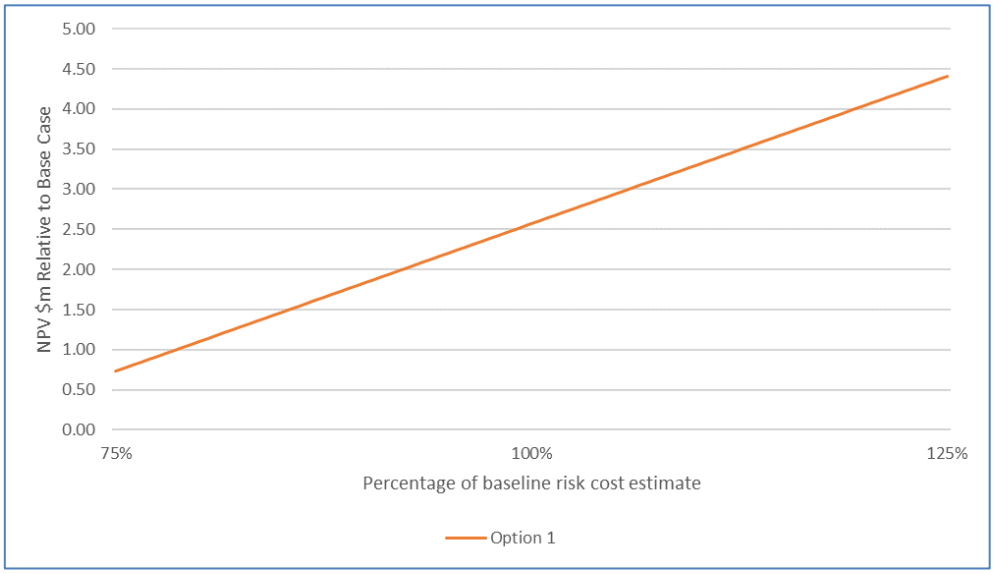


Figure 9.2.4 Risk cost sensitivity



9.3 Sensitivity to multiple key assumptions

Monte Carlo Simulation was performed with multiple input parameters (including capital cost, discount rate, maintenance cost, and total risk cost) generated for the calculation of NPV for the

credible option. This process is repeated over 5000 iterations, each time using a different set of random variables from the probability function.

The output is presented as a distribution of possible NPVs for the credible option, as illustrated in the boxplot presented in Figure 9.3.

It can be seen that the mean and median of Option 1 is positive relative to the base case. This confirms that the preferred option is robust over a range of input parameters in combination.

Figure 9.3: NPV sensitivity analysis of multiple key assumptions relative to the Base Case

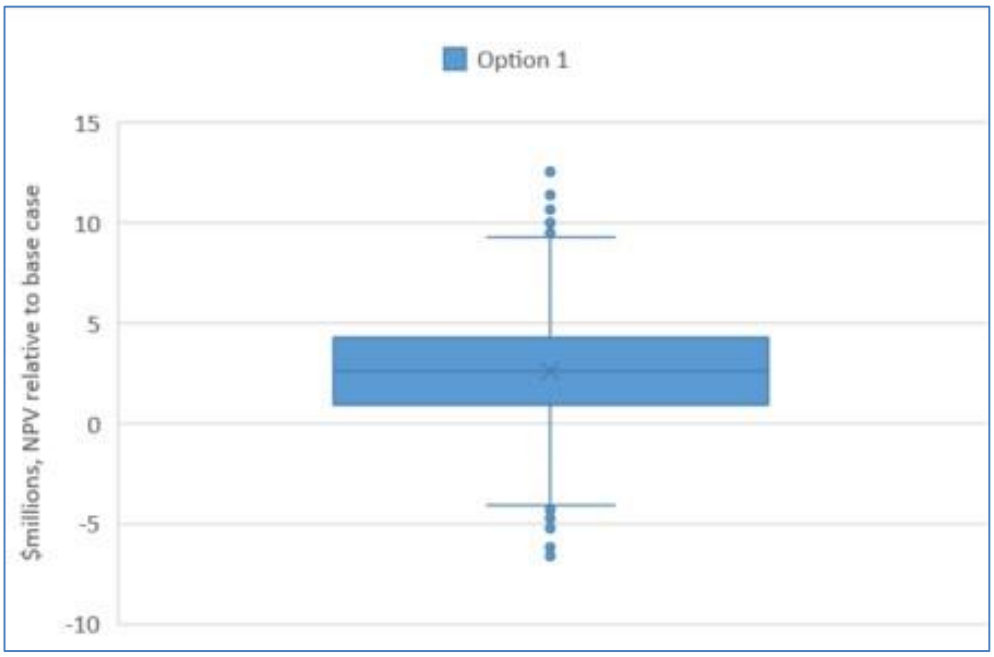


Figure Note: The box represents the interquartile interval, where 50% of the data is found. The horizontal line through the box is the median and the mean is represented by the cross (X). The two lines outside the box extend to 1.5 times the interquartile range. Data points that are outside of this interval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

10 Preferred Option

Based on the conclusions drawn from the cost-benefit analysis and the Rules 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 ageing transformer at Kemmis Substation. Implementing this option will also ensure ongoing compliance with relevant standards, applicable regulatory instruments and the Rules.

The result of the cost-benefit analysis indicates that Option 1 is the credible option with the highest net economic benefit, over the 20-year analysis period. Sensitivity testing shows the analysis is robust to variations in the capital cost, operational maintenance cost, risk cost and discount rate assumptions. Option 1 is therefore considered to satisfy the requirement of the RIT-T and is the preferred option.

11 Conclusions

The following conclusions have been drawn from the analysis presented in this report.

- Powerlink has identified condition risks arising from the ageing transformer at Kemmis substation as requiring action.
- The increasing likelihood of faults arising from ageing transformer compels Powerlink to undertake reliability corrective action at Kemmis Substation to continue to meet the reliability standards set out in its Transmission Authority. Such action will also ensure

Powerlink's ongoing obligations under the Electrical Safety Act and its service standards under the Electricity Act and Regulations and its Queensland Transmission Authority.

- Studies were undertaken to evaluate one credible option in accordance with the AER's RIT-T.
- Powerlink published a PSCR in September 2023 requesting submissions from Registered Participants, AEMO and interested parties on the credible option presented, including alternative credible non-network options, which could address the condition risks of the transformer at Kemmis Substation.
- The PSCR also identified the preferred option and that Powerlink was adopting the expedited process for this RIT-T, claiming exemption from producing a PADR as allowed for under the Rules Clause 5.16.4(z1) for investments of this nature.
- There were no submissions received in response to the PSCR, which was open for consultation until 22 December 2023. As a result, no additional credible options that could deliver material market benefits have been identified as part of this RIT-T consultation. The conditions specified under the Rules for exemption have now been fulfilled.
- The result of the cost-benefit analysis indicates that Option 1 has a positive net economic benefit relative to the base case over the 20-year analysis period. Sensitivity testing shows that the analysis is robust to variations in the capital cost, operational maintenance cost, discount rate and risk cost assumptions. As a result, Option 1 is considered to satisfy the RIT-T.
- Additionally, Option 1 is the only credible network option, which addresses the major risks resulting from the deteriorated condition of the ageing transformer at Kemmis Substation. Option 1 is therefore considered to satisfy the requirement of the RIT-T and is the proposed preferred option
- The outcomes of the cost-benefit analysis contained in this PACR remain unchanged from those published in the PSCR. Consequently, the draft recommendation has been adopted without change as the final recommendation and will now be implemented.

12 Final Recommendation

Based on the conclusions drawn from the cost-benefit analysis and the Rules 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 ageing transformer at Kemmis Substation.

Option 1 involves the replacement of Transformer 1 by 2026. The indicative capital cost of the RIT-T project for the preferred option is $6.78 million in 2022/23 prices.

Design and procurement activities will commence in 2024, with onsite work to be completed by 2026.

Powerlink will now proceed with the necessary processes to implement this recommendation.

Contact us

Registered office	33 Harold St Virginia Queensland 4014 Australia
Postal address	GPO Box 1193 Virginia Queensland 4014 Australia
Contact:	Roger Smith Manager Network and Alternate Solutions
Telephone	(+617) 3860 2111 (during business hours)
Email	networkassessments@powerlink.com.au
Website	www.powerlink.com.au
Social media	