Powerlink Queensland

# Project Specification Consultation Report

5 May 2020

# Addressing the secondary systems condition risks at Cairns

## Document purpose

For the benefit of those not familiar with the National Electricity Rules (the Rules) and the National Electricity Market (NEM), 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 and consult with interested parties on the proposed solution as part of the Regulatory Investment Test for Transmission (RIT-T). This includes replacement of network assets in addition to augmentations of the transmission network. 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 customers.
3. 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 addressed in the assessment. In particular, it encourages submissions from potential proponents of feasible non-network options to address the identified need.

## Contents

# Executive Summary

## Ageing and obsolete secondary systems at Cairns Substation require Powerlink to take action

Cairns Substation was established in the mid-1950s, as the principal connection point for all 132kV circuits in the Cairns area. In 2002, Woree Substation was established, which allowed the Cairns Substation to be rebuilt with a reduced configuration. It now acts as the major injection node for the southern section of the Cairns 22kV network, which is supplied via Ergon Energy (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 Cairns Substation.

The secondary systems at Cairns Substation broadly perform the functions of transmission element protection, data collection, remote (and local) control and monitoring.

Installed almost 20 years ago, most secondary systems at the Cairns Substation are reaching the end of their technical service lives, and are no longer supported by the manufacturer, with limited spares available. Increasing failure rates, along with the increased time to rectify faults due to the obsolescence of the equipment, significantly affects the availability and reliability of these systems and their ability to continue to meet the requirements of the National Electricity Rules (the Rules).

In addition to the site-specific impacts of obsolescence at Cairns substation, it is also important to note the compounding impact of equipment obsolescence occurring across the fleet of secondary systems assets installed in the Powerlink network. Running multiple secondary systems to failure across the network increases the likelihood of concurrent systemic faults with significant implications for network reliability and safety.

## Powerlink is required to apply the RIT-T to this investment

As the identified need for 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 Rules, it is classified as a 'reliability corrective action'[1].

The most expensive credible network option identified in this PSCR meets the capital expenditure cost threshold of $6 million, initiating public consultation under the Rules. Powerlink has adopted the expedited process for this RIT-T[2], as the preferred option is below $43 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 catered for in the risk cost modelling and consequentially represented in the economic analysis of the options.

## A non-credible Base Case has been developed against which to compare credible options

Consistent with the Australian Energy Regulator's (AER's) RIT-T Application Guidelines[3], the assessment undertaken in this PSCR compares and ranks the net present value (NPV) of credible network options designed to address the emerging risks, relative to a Base Case.

The Base Case is modelled as a non-credible option where the existing condition issues associated with an asset are managed via operational maintenance only, resulting in an increase in risk levels due to deterioration of asset condition and rectification of failures taking longer 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.

[1] The Rules clause 5.10.2, Definitions, reliability corrective action.
[2] In accordance with clause 5.16.4(z1) of the Rules
[3] AER, Application guidelines, Regulatory Investment Test for Transmission, December 2018

## Two credible network options have been developed to address the identified need

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

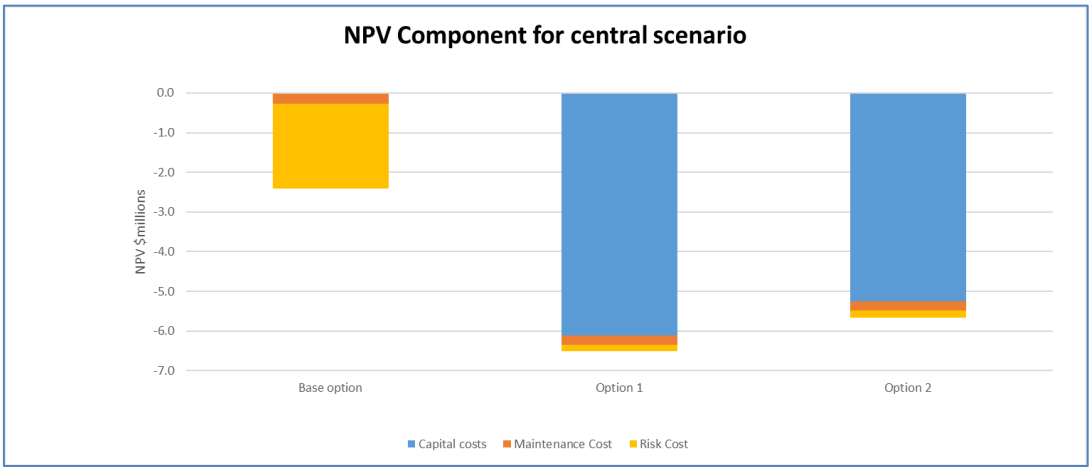
Table 1 details the two credible network options and shows that both options have a negative net present value (NPV) relative to the non-credible Base Case, as allowed for under the Rules for 'reliability corrective actions'. Of the two credible network options, Option 2 has the lowest net economic cost.

Table 1: Summary of credible network options

| Option | Description | Total costs ($m) 2019/20 | NPV relative to Base Case ($m) | Ranking |
|---|---|---|---|---|
| Option 1 Replacement in existing building | Replacement of secondary systems into new panels in the existing building by December 2024 | 9.14 | -4.11 | **2** |
| Option 2 Replacement in new building | Replacement of secondary systems in a new demountable building by December 2024 | 7.84 | -3.25 | **1** |

Figure 1 illustrates that the Base Case and both credible options have negative NPVs, with Option 2 having a lower economic cost compared to Option 2. Both credible options reduce the risk cost compared to the Base Case arising from the condition of the ageing and obsolete secondary systems at Cairns under the Base Case.

Figure 1: NPV of Base Case and Credible Network Options




## Option 2 has been identified as the preferred option.

The Base Case is not a credible option, in that it does not allow Powerlink to continue to maintain compliance with relevant standards, applicable regulatory instruments and the Rules. As the investment is classified as a 'reliability corrective action' under the Rules, the purpose of the RIT-T is to identify the credible option that minimises the total cost to customers.

The economic analysis demonstrates that Option 2 provides the lowest net economic cost of the two credible options and is therefore the preferred option.

Option 2 involves the replacement of the secondary systems at Cairns in a new demountable building by December 2024. The indicative capital cost of this option is $7.84 million in 2019/20 prices.

Under Option 2, initial design work will commence in mid-2021, followed by fabrication of the new building and panels in mid-2023, with all work completed by December 2024.

### Powerlink welcomes the potential for non-network options to form part or all of the solution

Due to the nature of secondary systems, Powerlink is of the view that it is unlikely for there to be an economically and technically feasible non-network option to meet the identified need. However, Powerlink welcomes submissions from proponents who consider they could offer a potential non-network solution by December 2024.

A non-network option that avoids the proposed replacement of the ageing and obsolete secondary systems would need to replicate, in part or full, the support that Cairns Substation delivers to customers in the area on a cost effective basis.

### Lodging a submission with Powerlink

Powerlink is seeking written submissions on this Project Specification Consultation Report, on or before Friday, 31 July 2020, particularly on the credible options presented[4].

Please address submissions to:

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Tel: (07) 3860 2111

Email submissions to: networkassessments@powerlink.com.au

[4] Powerlink's website has detailed information on the types of engagement activities, which may be undertaken during the consultation process. These activities focus on enhancing the value and outcomes of the RIT-T engagement process for customers and non-network providers.

# 1 Introduction

## 1.1 Powerlink Asset Management and Obligations

Powerlink Queensland is a Transmission Network Service Provider (TNSP) in the National Electricity Market (NEM) that owns, develops, operates and maintains Queensland's high-voltage electricity transmission network. This 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.

Powerlink's asset management approach includes a commitment to sustainable asset management practices that ensure the provision of valued transmission services to our customers by managing risk[5], optimising performance and efficiently managing assets through the whole of asset life cycle[6].

Planning studies have confirmed there is a long-term requirement to continue to supply the existing electricity services currently provided by Cairns Substation to customers in Cairns area.

Substation secondary systems broadly perform the functions of transmission element protection, data collection, remote (and local) control and monitoring. At Cairns, the ageing and obsolete secondary systems, are nearing the end of their technical service life and are increasingly at risk of failure, with many items of equipment no longer supported by the manufacturers with limited spares available.

If action is not taken to reduce the risks associated with the supportability of the Cairns secondary systems, Powerlink will be at risk of breaching the Rules requirements for protection availability, and the requirements set down for secondary systems as defined in the AEMO Power System Security Guidelines[7] and the Power System Data Communication Standard[8].

As the potential investment is in excess of $6 million, Powerlink must assess the credible options under the RIT-T. The proposed credible network options in this RIT-T maintain current electricity services to customers in the area by addressing the reduction in availability below mandated standards, arising from faults occurring on Cairn's Substation's ageing and obsolete secondary systems.

When developing the credible options, Powerlink has focussed on implementing cost effective solutions that ensure a reliable supply, delivering better outcomes for customers.

## 1.2 RIT-T Overview

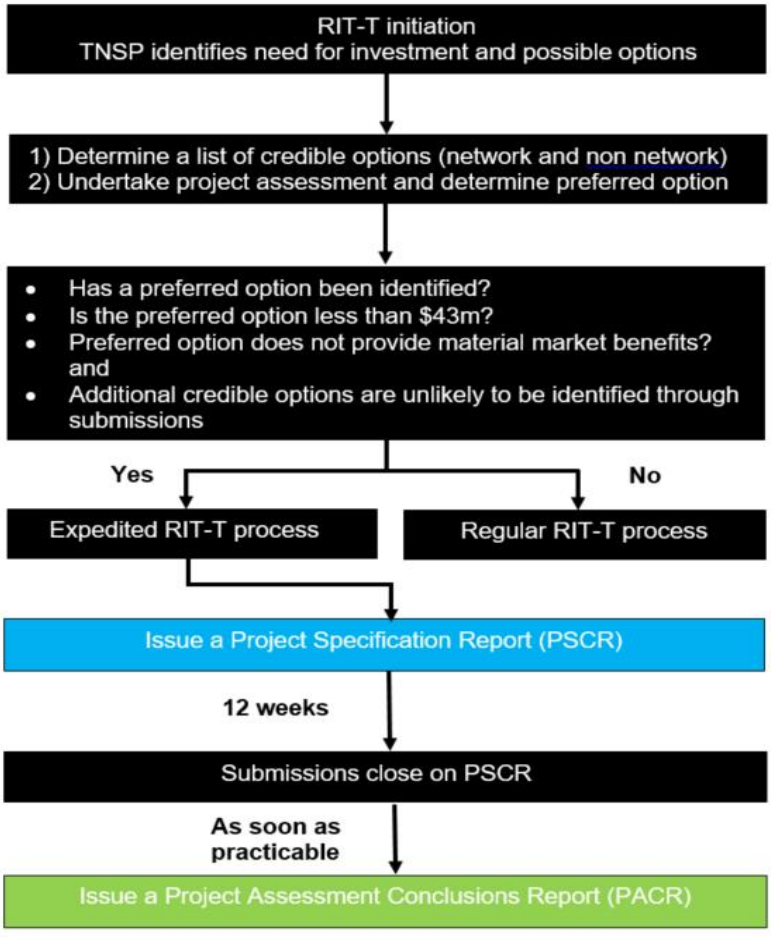
This Project Specification Consultation Report (PSCR) is the first step in the RIT-T process[9]. It:

- describes the reasons why Powerlink has determined that investment is necessary (the 'identified need'), together with the assumptions used in identifying this need
- 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 in considering whether they could offer an alternative solution

[5] Risk assessments are underpinned by Powerlink's corporate risk management framework and the application of a range of risk assessment methodologies set out in AS/NZS ISO31000:2018 Risk Management Guidelines.
[6] Powerlink aligns asset management processes and practices with AS ISO55000:2014 Asset Management – Overview, principles and terminology to ensure a consistent approach is applied throughout the life cycle of assets
[7] AEMO, Power System Operating Procedure SO_OP_3715, Power System Security Guidelines, V95, 23 September 2019 (the Rules require AEMO to develop and publish Power System Operating Procedures pursuant to clause 4.10.1(b) of the Rules, which Powerlink must comply with per clause 4.10.2(b))
[8] AEMO, Power System Data Communication Standard, Section 3 Reliability and Section 6 Maintenance, V2, 1 December 2017 (This standard has been made by AEMO under clause 4.11.2(c) of the Rules and incorporates the standards and protocols referred to in clause 4.11.1)
[9] This RIT-T consultation has been prepared based on the following documents: National Electricity Rules, Version 135, 19 Match 2020 and AER, Application guidelines, Regulatory Investment Test for Transmission, December 2018.

- 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[10]
- 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
- describes how customers and stakeholders have been engaged with regarding the identified need
- provides stakeholders with the opportunity to comment on this assessment so that Powerlink can refine the analysis (if required) as part of the Project Assessment Conclusions Report (PACR).

Figure 1.1: RIT-T Process Overview




Powerlink has adopted the expedited process for this RIT-T, as allowed for under the Rules for investments of this nature[11]. Specifically, Powerlink will publish a PACR following public consultation on this PSCR and apply the exemption from publishing a Project Assessment Draft Report (PADR) as:

[10] As required by clause 5.16.1(c)(iv) of the Rules.
[11] In accordance with clause 5.16.4(z1) of the Rules

- the preferred option has an estimated capital cost of less than $43 million
- none of the credible options have material market benefits, other than benefits associated with changes in involuntary load shedding[12]
- 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 secondary systems replacement project.

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.

# 2 Consumer and non-network engagement

Delivering electricity to almost four million Queenslanders, 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, providing an ongoing opportunity for:

- the Customer Panel to ask questions and provide feedback to further inform RIT-Ts
- Powerlink to better understand the views of customers when undertaking the RIT-T consultation process.

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

[12] Section 4.3 Project Assessment Draft Report, Exemption from preparing a draft report, AER, Application guidelines, Regulatory investment test for transmission, December 2018

### 2.2.1 Transmission Annual Planning Report (TAPR) – the initial stage of formal public consultation

Powerlink utilises the TAPR as a primary vehicle to engage and understand broader consumer, customer and industry views on key topics as part of the annual Transmission Network Forum (TNF) and to inform its business network and non-network planning objectives. TNF participants encompass a diverse range of stakeholders including customers, landholders, environmental groups, Traditional Owners, government agencies, and industry bodies.

## 2.3 Addressing the secondary systems condition risks at Cairns Substation

Powerlink identified in its 2018 to 2019 TAPRs, an expectation that action would be required at Cairns Substation to maintain reliability of supply in the Far North zone[13].

Members of Powerlink's Non-network Engagement Stakeholder Register (NNESR) were directly advised of the publication of the TAPR and the accompanying compendium of potential non-network solution opportunities (Appendix F), which set out the indicative non-network requirements to meet the identified need at Cairns Substation.

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 TAPRs or as a result of stakeholder engagement activities.

### 2.3.1 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. Please visit Powerlink's website for 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.

# 3 Identified need

This section provides an overview of the existing arrangements at Cairns 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

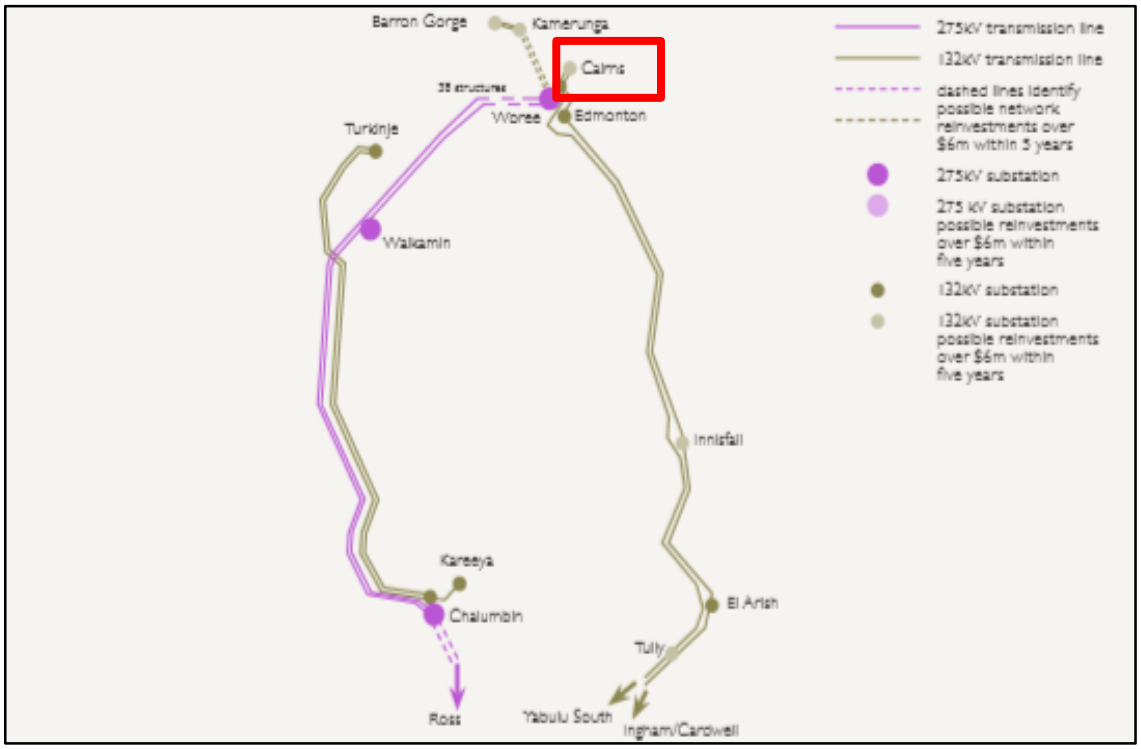
Cairns Substation, located approximately 4 kilometres south west of the Cairns Esplanade, was originally established in the mid-1950s. It was rebuilt in early 2002 and now serves as the major injection point for the southern section of the Cairns Energy Queensland (EQ) 22kV distribution network.

Planning studies have confirmed there is an enduring need for the supply of bulk electricity to the Cairns area.

The Far North zone transmission network is shown in Figure 3.1.

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

Figure 3.1: Far 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[14].

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

Schedule 5.1 of the Rules sets minimum standards for network service providers on the availability and operation of protection systems. Schedule 5.1.9 (c) specifically requires Powerlink provide sufficient primary and back-up protection systems (including breaker fail protection systems) to ensure that a fault is automatically disconnected[15]. The ageing and obsolete secondary systems at Cairns are nearing the end of their technical service lives and are increasingly at risk of failure, with many items of equipment no longer supported by the manufacturers and limited spares available. Increasing failure rates, along with the increased time to rectify the faults due to equipment obsolescence, significantly affects the availability and reliability of these systems.

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.

[14] Transmission Authority No. T01/98, section 6.2(c)
[15] The Rules Schedule 5.1.9(c)

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[16].

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.

## 3.3 Assumptions and requirements underpinning the identified need

The secondary systems at Cairns Substation broadly perform the functions of transmission element protection, data collection, remote (and local) control and monitoring. In performing these functions secondary systems:

- protect the public, the environment, the transmission network and substation primary plant from damage due to faults or mal operation
- allow remote and local automatic or manual control of primary plant
- enable the remote and local monitoring of primary and secondary plant and equipment.

Protection systems are critical to the safe and effective operation of the transmission network with the Electricity Act 1994 requiring Powerlink to:

> *"operate, maintain (including repair and replace if necessary) and protect its transmission grid to ensure the adequate, economic, reliable and safe transmission of electricity"*[17].

The Rules place specific requirements on Powerlink as a Transmission Network Service Provider (TNSP) to:

> *"Provide sufficient primary protection systems and back-up protection systems (including breaker fail protection systems) to ensure that a fault of any fault type anywhere on its transmission system or distribution system is automatically disconnected"*[18].

The importance of protection systems is further reinforced in the Rules, which require TNSPs to ensure:

> "*all protection systems for lines at a voltage above 66 kV, including associated intertripping, are well maintained so as to be available at all times other than for short periods (not greater than eight hours) while the maintenance of a protection system is being carried out"*[19].

As required by the Rules[20], AEMO has published the Power System Security Guidelines (PSS Guidelines) to clarify the Rules regarding unplanned outages of the protection systems. In the event of an unplanned outage of a secondary system, AEMO's PSS Guidelines require that the primary network assets be taken out of service if the fault cannot be rectified within 24 hours[21]. Both the Rules and the AEMO PSS Guidelines indicate that exceeding 24 hours to rectify a protection fault is not good practice, obligating Powerlink to take action to ensure the restoration period of unplanned outages of secondary systems does not reasonably exceed 24 hours.

Similar to protection requirements, AEMO's Power System Data Communication Standard specifies that the total period of critical outages over a 12 month period must not exceed

[16] The Rules clause 5.10.2 ,Definitions, reliability corrective action
[17] Electricity Act 1994 (Queensland), Chapter 2, Part 4, S34(1)(a)
[18] The Rules clause S5.1.9(c)
[19] The Rules clause S5.1.2.1 (d)
[20] The Rules clause 4.11.2 (c)
[21] AEMO, Power System Operating Procedure SO_OP_3715, Power System Security Guidelines, V95, September 2019 (the Rules require AEMO to develop and publish Power System Operating Procedures pursuant to clause 4.10.1(b) of the Rules, which Powerlink must comply with per clause 4.10.2(b)).

24 hours for remote control and monitoring functions[22]. This relates to both the reliability of the equipment (i.e. how often the device fails) and the repair time. It follows that the repair time for any single fault on this equipment must not exceed 24 hours if there are no other faults during the 12 month period.

Powerlink must therefore plan (have systems and processes in place) to safely resolve all protection, remote control and monitoring system problems and defects within 24 hours.

Analysis has shown that operating a secondary system beyond 20 years of effective age significantly impacts its ability to perform within acceptable limits[23]. Delaying replacement of secondary system assets beyond this optimal 20 year timeframe places the network at risk due to the limited supply of suitable spares, which prolongs the duration of any emergency corrective maintenance associated with replacing failed obsolete components beyond the 24 hour limit. In the case of protection systems, extended outages beyond 24 hours will result in the need to switch out network assets, placing the supply of electricity to customers at risk[24].

With an increasing likelihood of faults and longer rectification periods arising from the ageing and obsolete secondary systems remaining in service at Cairns 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 Rules.

## 3.4 Description of asset condition and risks

Powerlink has undertaken a comprehensive condition assessment of the secondary systems at Cairns Substation using an asset health index modelled from zero (0) to ten (10), where zero represents new assets and ten indicates that the asset requires urgent action to address the increasing risk of unavailability and unreliable operation. This has identified that a significant amount of secondary system equipment at Cairns is reaching the end of its technical service life.

The condition of the at-risk secondary systems at Cairns Substation is summarised in Table 3.1.

Table 3.1: Cairns at-risk secondary systems

| Bay | Construction year | Health index range (average) |
|---|---|---|
| 3x Feeder Bays Protection and Control | 2002 - 2004 | 7.3 – 8.3 (8.2) |
| 2x Transformer Bays* Protection and Control | 2001 - 2003 | 8.3 – 10.0 (8.8) |
| Metering Equipment 2x Transformers* | 1999 - 2014 | 4.5 – 9.8 (9.0) |
| Non-bay secondary systems (includes OpsWAN, SCADA, RTUs, AC boards) | 1992 - 2009 | 8.2 – 10. 0 (9.5) |

*Planning is currently underway to reconfigure the Cairns Substation by removing the site's ageing 50MVA transformer, leaving two 60MVA transformers in service.

[22] AEMO, Power System Data Communication Standard, Section 3 Reliability and Section 6 Maintenance (This standard has been made by AEMO under clause 4.11.2(c) of the Rules and incorporates the standards and protocols referred to in clause 4.11.1)
[23] Cigre, Study Committee B3, Paper B3_205_2018, "Modelling Substation Control and Protection Asset Condition for Optimal Reinvestment Decision Based on Risk, Cost and Performance" by T. Vu, M. Pelevin, D. Gibbs, J. Horan, C. Zhang (Powerlink Queensland)
[24] AEMO, Power System Operating Procedure SO_OP_3715, Power System Security Guidelines, V94, 23 April 2019

Most of the current secondary systems at Cairns were installed in 2002 to 2003 as part of the station rebuild, following the commissioning of the new Woree Substation. There have also been a number of selective secondary system component installations in later years due to capital works at remote substation ends, or the replacement of failed components.

The impact of equipment obsolescence is an important consideration when determining if remedial action is required. Over 90% of the current secondary systems equipment is expected to reach an unsupportable level by December 2024[25].

Transformer protection and control systems are also mounted in a series of stand-alone panels that no longer meet clearance specifications, while the feeder protection and control systems use swing-out frames with known isolation issues and terminals that work loose over time because of the way in which the frames are mounted.

Notwithstanding the assessed condition of the asset, Powerlink's ongoing operational maintenance practices are designed to monitor equipment condition and ensure any emerging safety risks are proactively managed.

## 3.5 Consequences of failure in an obsolete system

The duration of a fault is not only dependent on the nature and location of the fault, but also on the availability of a like for like replacement of the failed component. If a like for like replacement is available (i.e. same hardware and firmware as the failed device), then the replacement is often not complex and can generally be rectified within the timeframes specified by AEMO. If a like for like replacement is not available, then replacement is operationally and technically more complex due to:

- physical differences with the mounting and installation
- development and testing of new configurations and settings
- cabling, connectivity and protocol differences
- interoperability between other devices on site, and with remote ends (if applicable)
- non-standard settings / configuration requirements
- legislative requirements for professional engineering certification

All of the above complexities add time to fault resolution, typically resulting in a fault duration well in excess of 24 hours.

Given the specific nature of the Rules' obligations and the AEMO requirements relating to protection, control and monitoring systems, accepted good industry practice is often to replace the current ageing and obsolete secondary systems when they reach the end of their technical service lives, rather than letting them run to failure. Due to the condition and obsolescence issues with the secondary systems at Cairns, there is a significant risk of breaching the mandated obligations and requirements if the secondary systems (excluding those associated with the capacitor bank) are left to operate beyond December 2024.

A summary of the equipment condition issues and associated possible consequences of failure of the equipment is given in Table 3.2.

[25] The commissioning date of all credible network options identified in this RIT-T has been delayed by 24 months to December 2024 from the proposed commissioning date advised in the 2019 TAPR of December 2022. This is due to the necessary staging of the outage plans associated with this project and the efficient co-ordination of these outages with other projects in the Cairns area. In order to manage any safety or network risks that may emerge resulting from the extended delivery timeframe of this project, additional inspections will be undertaken to closely monitor the condition of the ageing and obsolete systems. Corrective actions will be identified and implemented as required.

Table 3.2: Summary of equipment condition issues and potential consequences of failure

| Equipment | Condition/Issue | Potential consequence of failure |
|---|---|---|
| Protection and Control for High Voltage Bay | • Obsolescence and limited availability of spares; no longer supported by the manufacturer<br>• Increasing failure rates due to ageing electronic components | • Failure to operate or slow clearance resulting in Rules violation, plant damage, safety and supply risks<br>• Prolonged outages of equipment placing load at risk and resulting in less reliable supply to customers<br>• Unable to comply with Power System Data Communication Standard<br>• Unable to comply with the Power System Security Guidelines<br>• Increased failures resulting in less reliable supply to customers |
| Metering Equipment | • Obsolescence and limited availability of spares; no longer supported by the manufacturer<br>• Increasing failure rates due to ageing electronic component | • Unable to restore metering installation upon malfunction within the 2 business day requirement of the Rules[26] |
| SCADA System | • Obsolescence and limited availability of spares; no longer supported by the manufacturer<br>• Increasing failure rates due to ageing electronic components | • Unable to comply with Power System Data Communication Standard<br>• Increased failures resulting in less reliable supply to customers |

### 3.5.1 Fleet-wide implications of obsolescence

In addition to the site specific impacts of obsolescence at Cairns substation, it is also important to note the compounding impact of equipment obsolescence occurring across the fleet of secondary systems assets installed in the Powerlink network. When a particular equipment type or model is no longer supported by the manufacturer, and limited spares are available to service the fleet of assets, running multiple secondary systems to failure across the network increases the likelihood of concurrent systemic faults that would overwhelm Powerlink's capacity to undertake corrective maintenance or replacement projects. This would leave Powerlink in breach of the Rules, the AEMO standards and its jurisdictional obligations.

## 4 Required technical characteristics for non-network options

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 (DSM) initiatives.

Powerlink identified in its Transmission Annual Planning Reports (TAPRs) 2018 and 2019 an expectation that action would be required at Cairns Substation to maintain reliability of supply

[26] National Electricity Rules, Version 121, 2 May 2019, Clause 7.8.10 Metering installation malfunctions

requirements in the Far North transmission zone[27]. Powerlink has considered the operation of the existing embedded generation in the region in establishing this requirement.

Powerlink has consulted with Registered Participants, Powerlink's Non-Network Engagement Stakeholder Register and interested parties on the proposed investment at this substation as part of the TAPR publication and associated engagement activities.

No submissions proposing credible and genuine non-network options were received from prospective solution providers in the normal course of business or in response to the TAPRs. As a result, Powerlink is currently not aware of any non-network options that could be adopted.

Due to the nature of secondary systems, Powerlink believes that it is unlikely for there to be an economically and technically feasible non-network option. However, Powerlink welcomes submissions from proponents who consider that they could offer a non-network solution in full or in part by December 2024 on an ongoing basis, and will investigate the feasibility of any potential non-network option proposed or otherwise identified.

This PSCR provides a further opportunity for providers of feasible non-network options to submit details of their proposals for consideration.

## 4.1 Criteria for proposed network support services

Non-network solutions may include, but are not limited to, local generation or demand side management initiatives, and would be required to be available on a firm basis. The location(s) of any proposed non-network solution will determine the exact levels of support required and be considered on a case by case basis

Under system normal, to maintain required reliability standards, a non-network local generation solution would need injection at Cairns substation of up to 55 MW and up to approximately 1000 MWh per day, based on the energy provided via the Cairns transformers through the previous years, and accounting for Powerlink's current forecast of the Transmission Connection Point. The injection would have to be at the Cairns substation 22kV as the Cairns distribution is not a meshed network and is currently fed radially from its H039 Woree injection.

Powerlink has identified the following common criteria that must be satisfied if proposed network support services are to meet supply requirements[28].

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[29].

[27] This relates to the standard geographic definitions (zones) identified within the Powerlink's Transmission Annual Planning Report, which is published annually by 30 June.
[28] Powerlink's Network Support Contracting Framework has been developed as a general guide to assist potential non-network solution providers. This framework outlines the key contracting principles that are likely to appear in any non-network support agreement.
[29] The National Electricity Rules prevent a generator that is providing network support from setting 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 will form part of the option economic assessment.

Reliability

- Proposed services must be capable of reliably meeting electricity demand under a range of conditions and, if a generator must meet all relevant National Electricity Rules requirements related to grid connection.
- Powerlink has obligations under the National Electricity Rules, 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 at Cairns Substation.

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

Powerlink has developed two credible network options to address the secondary system condition risks and compliance obligations at Cairns Substation:

- Option 1: Replacement in existing building by December 2024.
- Option 2: Replacement in new building by December 2024.

A summary of these options is given in Table 5.1.

Table 5.1: Summary of credible options

| Option | Description | Indicative project costs ($million, 2019/20) | Indicative annual average O&M costs ($million, 2019/20) |
|---|---|---|---|
| Option 1<br>Replacement in existing building by December 2024 | Replacement of secondary systems into new panels in the existing building by December 2024 | 9.14 | 0.023 |
| Option 2<br>Replacement in new building by December 2024. | Replacement of secondary systems in a new building by December 2024 | 7.84 | 0.026 |

Both credible options address the major risks resulting from the deteriorated condition of ageing and obsolete secondary systems at Cairns Substation to allow Powerlink to meet its reliability of supply and safety obligations under its Transmission Authority and the Electricity Act 1994 by the replacement of the deteriorated protection systems and associated equipment.

None of these options has been discussed by the Australian Energy Market Operator (AEMO) in its most recent National Transmission Network Development Plan (NTNDP)[30].

## 5.1 Option 1: Replacement of secondary systems in existing building by December 2024

This option involves the onsite replacement of the secondary systems at Cairns Substation, within the spare space of the existing building by December 2024 and seeks to optimise the service life of the existing infrastructure. This option includes a contingency to deal with the potential disturbance of asbestos in the building and the installation of a new termination rack within the building.

Powerlink is the proponent of this option.

Table 5.2: Main project components for the Option 1

| Option 1 | Description | Indicative cost ($million, 2019/20) |
|---|---|---|
| RIT - Project | | |
| Replacement in existing building by December 2024 | Replacement of the following protection, control and monitoring systems in new panels located in the existing building by December 2024:<br>• 3x Feeder Bays<br>• 2x Transformer Bays<br>• All metering equipment<br>• All non-bay equipment | 9.14 |
| **TOTAL** | | **9.14** |

[30] 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 NTNDP. The 2018 NTNDP is currently the most recent NTNDP.

### 5.2 Option 2: Replacement of secondary systems in new building by December 2024

Option 2 involves the offsite construction of a new modular building fitted out with the replacement secondary systems, then relocated to site for final commissioning by December 2024. This Option minimises mobilisation costs and outages.

Powerlink is the proponent of this option.

Table 5.3: Main project components for Option 2

| Option 2 | Description | Indicative cost ($million, 2019/20) |
|---|---|---|
| RIT - Project | | |
| Replacement in a new building by December 2024 | Replacement of the following protection, control and monitoring systems in a new modular building by December 2024:<br>• 3x Feeder Bays<br>• 2x Transformer Bays<br>• All metering equipment<br>• All non-bay equipment | 7.84 |
| **TOTAL** | | **7.84** |

### 5.3 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[31].

## 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 TNSP can demonstrate that a specific category is unlikely to be material.

### 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) between options, set out in this PSCR, may impact the ranking of the credible options under consideration and that this class of market benefit could be material. 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

The AER has recognised a number of classes of market benefits may not be material in the RIT-T assessment and so do not need to be estimated[32].

A discussion of each market benefit under the RIT-T that is considered not material is presented below:

- **changes in patterns of generation dispatch**: replacement of secondary systems by itself does not affect transmission network constraints or affect transmission flows that would

[31] 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.
[32] AER, Application guidelines, Regulatory investment test for transmission, December 2018

change patterns of generation dispatch. It follows that changes through different patterns of generation dispatch are not material to the outcome of the RIT-T assessment

- **changes in voluntary load curtailment**: a secondary systems fault by itself does not affect prices in the wholesale electricity market. It follows that changes in voluntary load curtailment will not be material for the purposes of this RIT-T
- **changes in costs for other parties**: the effect of replacing secondary systems under the credible options considered are localised to the substation they are located at and do not affect the capacity of transmission network assets and therefore are unlikely to change generation investment patterns (which are captured under the RIT-T category of 'costs for other parties')
- **differences in the timing of expenditure**: credible options for secondary systems replacement do not affect the capacity of transmission network assets, the way they operate, or transmission flows. Accordingly, differences in the timing of expenditure of unrelated transmission investments are unlikely to be affected
- **changes in network losses**: credible options are not expected to provide any changes in network losses as replacing secondary systems does not affect the characteristics of primary transmission assets
- **changes in ancillary services cost**: there is no expected change to the costs of Frequency Control Ancillary Services (FCAS), Network Control Ancillary Services (NCAS), or System Restart Ancillary Services (SRAS) due to credible options under consideration. These costs are therefore not material to the outcome of the RIT-T assessment
- **competition benefits:** Powerlink does not consider that any of the credible options will materially affect competition between generators, and generators' bidding behaviour and, consequently, considers that the techniques required to capture any changes in such behaviour would involve a disproportionate level of effort compared to the additional insight it would provide
- **option value**: Powerlink does not consider that the identified need for the options considered in this RIT-T is affected by uncertain factors about which there may be more clarity in future. As a consequence, option value is not a relevant consideration for this RIT-T.

### 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

Consistent with the RIT-T Application Guidelines 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[33].

As characterised in the RIT-T Application Guidelines, the Base Case itself is not a credible option to meet the identified need. Specifically, the Base Case reflects a state of the world in which the condition and obsolescence issues arising from the ageing assets are only addressed

[33] AER, Application Guidelines, Regulatory Investment Test for Transmission, December 2018

through standard operational activities, with escalating safety, financial, environmental and network risks.

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

The Base Case for Cairns secondary systems 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 Cairns 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[34]. An overview of the framework is available on Powerlink's website[35] and the principles of the Framework have been used to calculate the risk costs of the Cairns Base Case. The framework includes the modelling methodology and general assumptions underpinning the analysis.

## 7.3 Base Case assumptions

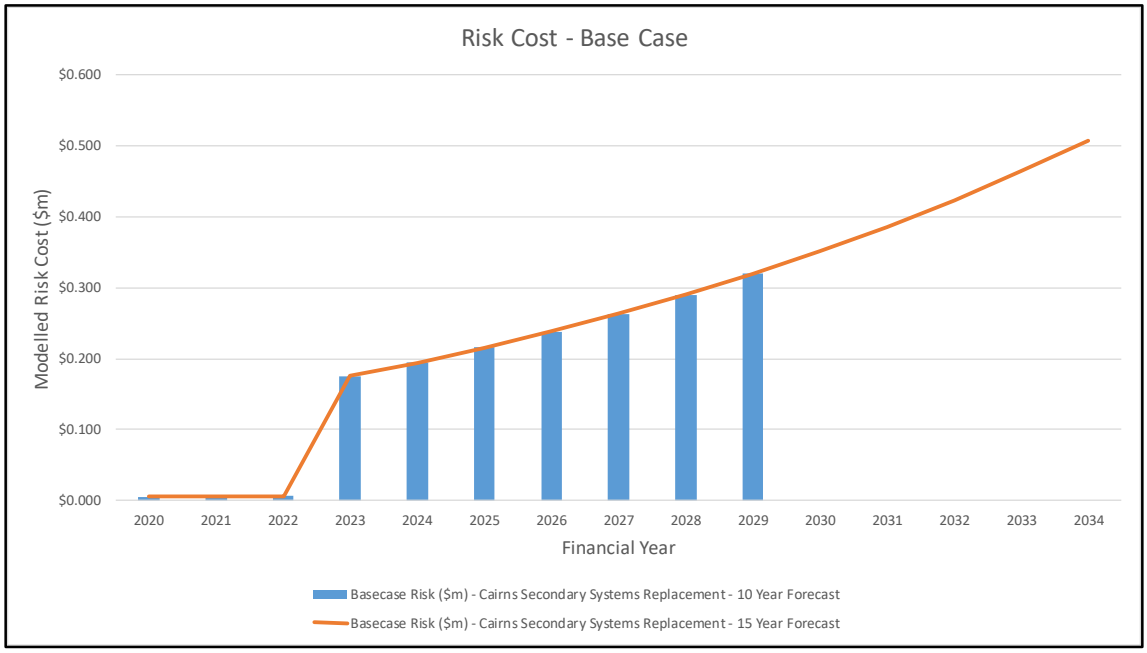
In calculating the potential unserved energy (USE) arising from a failure of the ageing and obsolete secondary systems at Cairns substation, the following modelling assumptions have been made:

- 132/22kV Transformer 4 at Cairns substation has been decommissioned under an operational project;
- spares for secondary system items have been assumed to be available prior to the point of expected spares depletion, as after this point the cost and time to return the secondary system back to service increases significantly;
- historical load profiles have been used when assessing the likelihood of unserved energy under concurrent failure events;
- unserved energy generally accrues under concurrent failure events, and consideration has been given to potential feeder trip events within the wider area; and
- Cairns substation supplies a mixture of residential and commercial load types. Historical load data has been analysed to approximate the ratio of residential to commercial load, resulting in a VCR of $28,064/MWh. The most relevant residential and commercial VCR values published within the AER's 2019 Value of Customer Reliability Review Final Report have been used to determine this VCR.

The 15 year forecast of risk costs for the Base Case is shown in Figure 7.1.

[34] AER Industry practice application note, Asset Replacement Planning, January 2019
[35] 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




Based upon the assessed condition of the ageing secondary systems at Cairns, the total risk costs are projected to increase from $5,000 in 2020 to $507,000 in 2034. The main areas of risk cost are network risks that involve reliability of supply through the failure of deteriorated secondary systems modelled as probability weighted unserved energy[36], and financial risk costs associated mostly with the replacement of failed assets in an emergency. These risks increase over time as the condition of equipment further deteriorates, more equipment becomes obsolete 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 15 year period, from 2020 to 2034. A 15 year period takes into account the size and complexity of the secondary system replacement options.

There will be remaining asset life by 2034, at which point a terminal value is calculated to correctly account for capital costs under each credible option.

### 8.2 Discount rate

Under the RIT-T, a commercial discount rate is applied to calculate the NPV of the costs and benefits of credible options. Powerlink has adopted a real, pre-tax commercial discount rate of 5.90%[37] as the central assumption for the NPV analysis presented in this report.

[36] Unserved Energy is modelled using a Value of Customer Reliability (VCR) consistent with that published by AER in their *Value of Customer Reliability Review, Final Report*, 2019.

[37] This indicative commercial discount rate has been calculated on the assumptions that a private investment in the electricity sector would hold an investment grade credit rating and have a return on

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 3.47%[38] and an upper bound discount rate of 8.33% (i.e. a symmetrical upwards adjustment).

### 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. The number and choice of reasonable scenarios must be appropriate to the credible options under consideration.

The choice of reasonable scenarios must reflect any variables or parameters that are likely to affect the ranking of the credible options, where the identified need is reliability corrective action[39].

Powerlink has considered capital costs and discount rate sensitivities individually and in combination and found that these variables do not affect the relative rankings of the credible options or the identification of the preferred option. As sensitivities (both individually and in combination) do not affect ranking results, Powerlink has elected to present the one central scenario in Table 8.1.

Table 8.1: Reasonable scenario assumed

| Key variable/parameter | Central scenario |
|---|---|
| Capital costs | 100% of central capital cost estimate |
| Discount rate | 5.90% |

## 9 Cost benefit analysis and identification of the 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 options relative to base case ($m)

| Option | Central Scenario NPV relative to Base Case ($m) | Ranking |
|---|---|---|
| Option 1<br>Replacement of secondary systems into new panels in the existing building by December 2024 | -4.11 | 2 |
| Option 2<br>Replacement of secondary systems in a new building by December 2024 | -3.25 | 1 |

Both credible options will address the identified need on an enduring basis. Option 2 is ranked first, with Option 1 being $0.85 million more expensive compared to Option 2 in NPV terms.

equity equal to an average firm on the Australian stock exchange, as well as a debt gearing ratio equal to an average firm on the Australian stock exchange.

[38] A discount rate of 3.47% is based on the AER's Final Decision for Powerlink's 2017-2022 transmission determination, which allowed a nominal vanilla WACC of 6.0% and forecast inflation of 2.45% that implies a real discount rate of 3.47%. See AER, Final Decision: Powerlink transmission determination 2017-2022 | Attachment 3 – Rate of return, April 2017, p 9.

[39] AER, Final Regulatory Investment Test for Transmission, June 2010, version 1, paragraph 16, p. 7

Figure 9.1 sets out the breakdown of capital cost, operational maintenance cost and 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 the Base Case and each credible option (NPV $m)

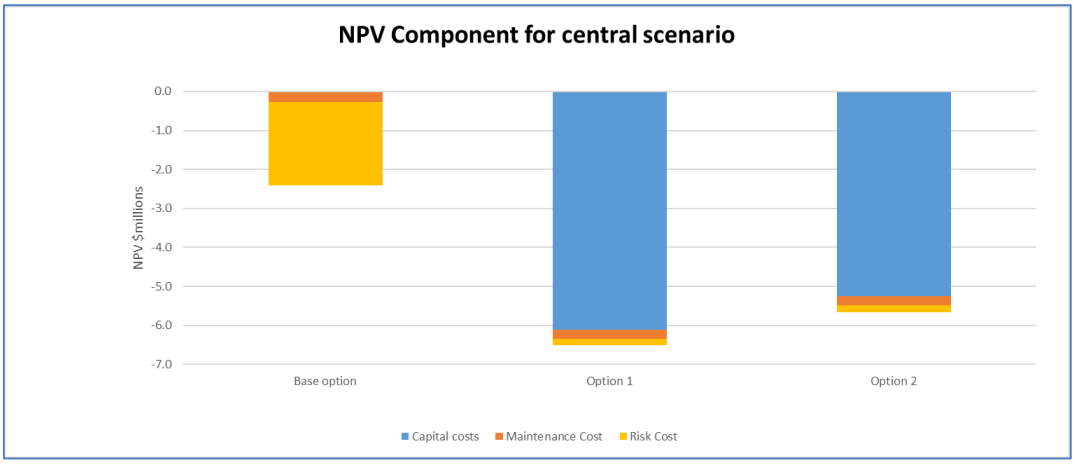



Figure 9.1 illustrates that both credible options will reduce the risk cost compared to the Base Case. Due to the lower capital cost component, Option 2 results in a more favourable NPV outcome relative to the Base Case when compared to Option 1.

Option 2 has a slight increase in operational maintenance costs when compared Option 1 due to the nominal maintenance requirements associated with retention of the old building for Ergon operations, in addition to the maintenance cost for the new building.

## 9.2 Sensitivity analysis

Powerlink has investigated the following sensitivities on key assumptions:

- a range from 3.47% to 8.33% discount rate
- a range from 75% to 125% of base capital expenditure estimates.
- a range from 75% to 125% of base operational maintenance expenditure.
- a range from 75% to 125% of base risk cost estimates.

As illustrated in Figure 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 costs has no impact on the identification of the preferred option. Option 2 is the preferred option under all scenarios tested.

Figure 9.2.1 Discount rate sensitivity

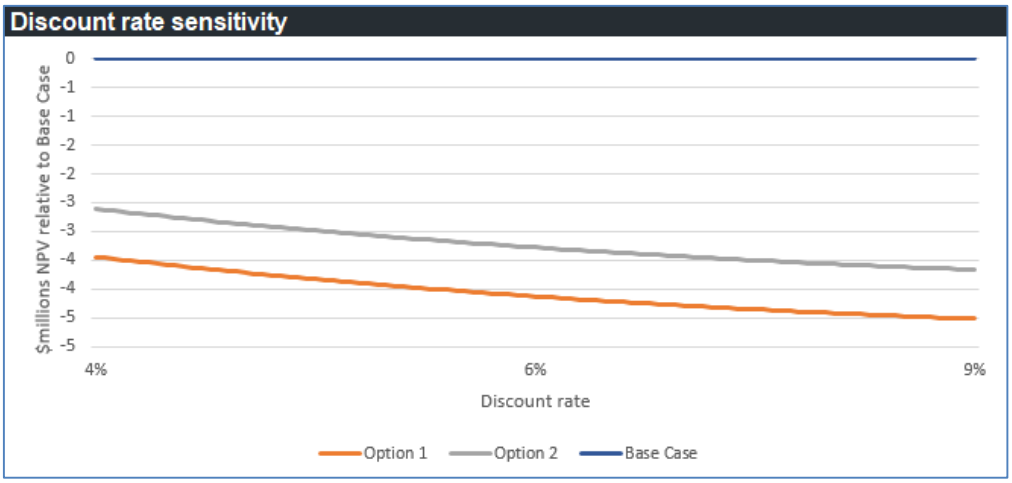



Figure 9.2.2 Capital cost sensitivity

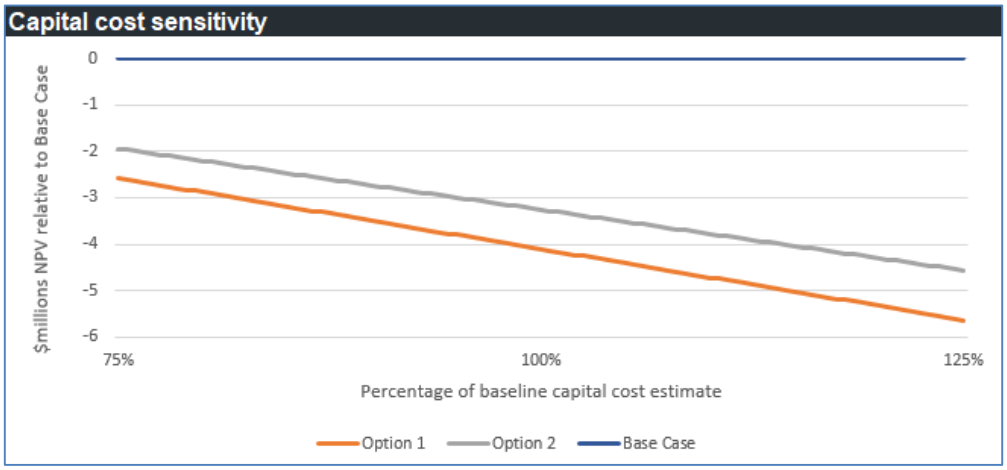



Figure 9.2.3 Risk cost sensitivity

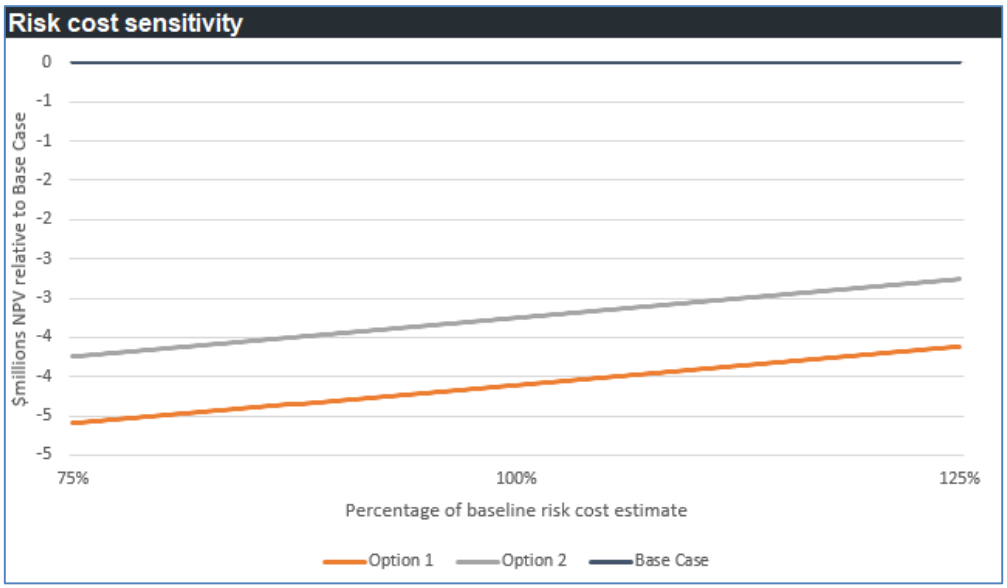
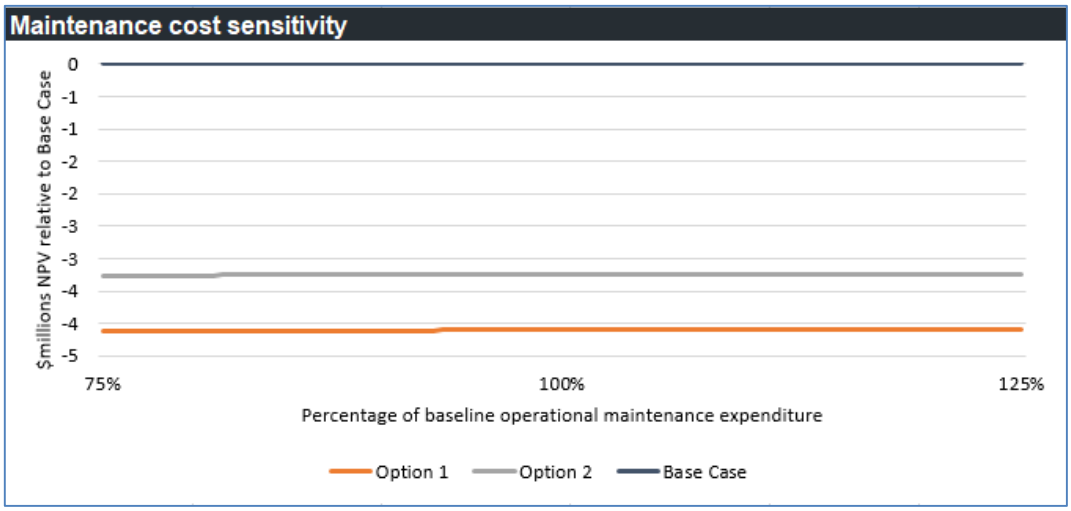



Figure 9.2.4 Maintenance cost sensitivity

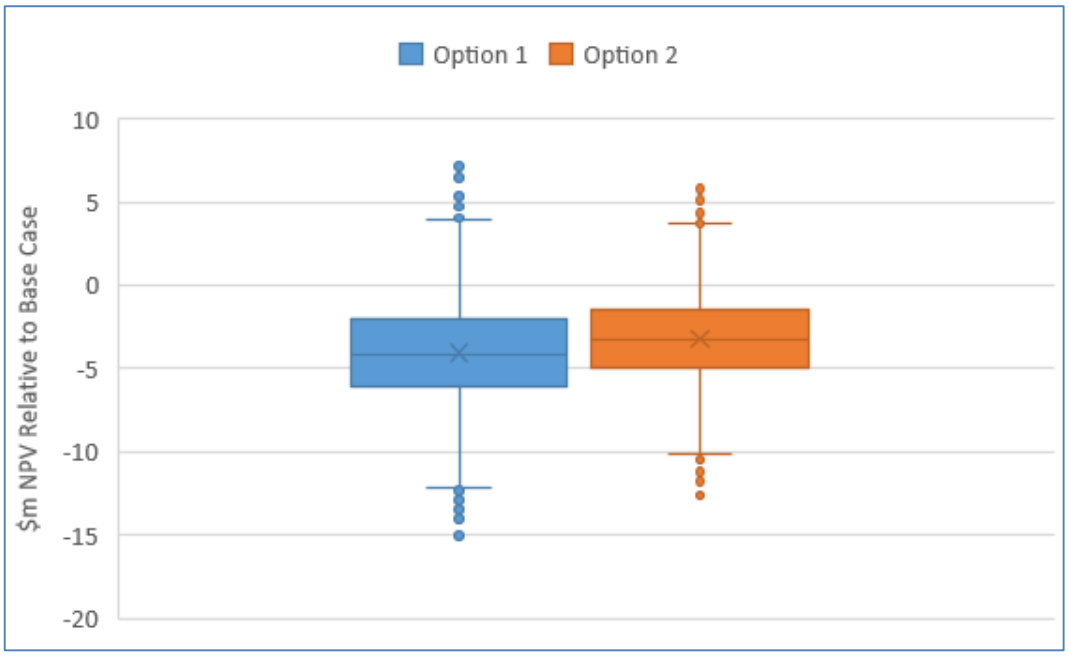



## 9.3 Sensitivity to multiple parameters

A Monte Carlo simulation was performed 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 is 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 9.3.

The Monte Carlo simulation results identify that Option 2 has marginally less statistical dispersion in comparison to Option 1 and its mean and median is the higher of the two options. This confirms that the preferred option, Option 2, 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




## 9.4 Conclusion

The result of the cost benefit analysis indicates that Option 2 provides the highest net economic benefit (lowest cost in NPV terms) over the 15 year analysis period. Sensitivity testing shows the analysis is robust to variations in the capital cost, risk cost and discount rate assumptions.

Option 2 is therefore considered to satisfy the requirement of the RIT-T and is the proposed preferred option.

# 10 Draft recommendation

Based on the conclusions drawn from the NPV analysis and the Rules requirements relating to the proposed replacement of transmission network assets, it is recommended that Option 2 be implemented to address the risks associated with the deteriorated condition of the aged and obsolete secondary systems infrastructure at Cairns Substation.

Implementing this option will ensure Powerlink's ongoing compliance with the Rules protection system requirements, AEMO's Communication Data Standard and Power System Security Guidelines, as well as the reliability standard within Powerlink's Transmission Authority.

Option 2 involves the full replacement of the Cairns secondary systems, in a new demountable building at an indicative capital cost of $7.84 million in 2019/2020 prices.

Under Option 2, design work will commence in late 2021, followed by fabrication of the new building and panels in mid-2023, with all work completed by December 2024.

# 11 Submissions requirements

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

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.

## 11.1 Submissions from non-network providers

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 clarify cost inputs and commercial terms.

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 RIT-T guidelines
- an assessment of the ability of the proposed service to meet the technical requirements of the Rules
- timing of the availability of the proposed service
- other material that would be relevant in the assessment of the proposed service.

As the submissions will be made public, any commercially sensitive material, or material that the party making the submission does not want to be made public, should be clearly identified. 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 Assessment and decision process

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 | 5 May 2020 |
| Part 2 | Submissions due on the PSCR<br>Have your say on the credible options and propose potential non-network options. | 31 July 2020 |
| Part 3 | Publication of the PACR<br>Powerlink's response to any further submissions received and final recommendation on the preferred option for implementation. | September 2020 |

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).

# Contact us


| | |
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