28 AUGUST 2025

Addressing the risk of current transformer premature failures in Queensland

Project Specification Consultation Report

Preface

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

This Project Specification Consultation Report has been prepared in accordance with version 234 of the National Electricity Rules (NER), and the Regulatory Investment Test for Transmission (RIT-T) Instrument (November 2024) and RIT-T Application Guidelines (November 2024). The RIT-T Instrument and Application Guidelines are made and administered by the Australian Energy Regulator.

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

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

The main purpose of this document is to provide details of the identified need, credible options, technical characteristics of non-network options, and categories of market benefits likely to impact selection of the preferred option. In particular, it encourages submissions from potential proponents of feasible non-network options to address the identified need.

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

More information on how Powerlink applies the RIT-T process is available on Powerlink's website.

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

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

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Executive Summary

Premature failures of 275kV current transformers requires Powerlink to take action

Powerlink's network is experiencing some premature failures of a 275kV current transformer particular make and model (current transformer subset). These current transformers perform functions such as revenue metering, power system monitoring, telemetry, and protection system performance which are key to managing the network. Failures can also result in network and load interruptions as well as loss of containment of oil and sand.

Powerlink has 451 of the 275kV oil-filled current transformer subset installed at 23 substation sites throughout the transmission network. Since 2011, there have been fourteen failures of this current transformer subset. The failed 275kV current transformers had been in service for between 10 to 24 years, well before the 40-year lifespan expected of a typical current transformer. Seven failed routine maintenance testing, and seven failed while energised, demonstrating an elevated risk associated with sites where the current transformer subset is installed.

The correlation between time in service and likelihood of failure presents a risk to network reliability and operational stability, increasing the probability of unplanned outages and safety risks.

Powerlink must therefore take action to:

- avoid the increasing likelihood of unserved energy arising from failures of the current transformer subset in Queensland;
- avoid network and load interruptions due to loss of critical revenue metering, power system monitoring, telemetry, and protection system performance functions associated with failures of the current transformer subset; and
- remove the need for restricted access zones (RAZ). These hinder routine operational and maintenance activities that support the reliable operation of the network.

Powerlink has implemented measures to manage safety risks

Powerlink has established RAZs of 30 metres around each current transformer subset while they are energised to manage safety risk in the vicinity. The RAZs ensure that no personnel approach an energised current transformer subset and be exposed to risk of injury.

Powerlink is required to apply the Regulatory Investment Test for Transmission (RIT-T)

The estimated capital cost of the most expensive credible option for the program of work required to address the network and safety risks associated with the current transformer subsets in northern, central and southern Queensland meets the minimum threshold (currently $8 million) to apply the RIT-T. As the identified need for the proposed investment is to meet reliability and service standards specified within Powerlink's Transmission Authority, guidelines and standards published by the Australian Energy Market Operator (AEMO), and Powerlink's ongoing compliance with Schedule 5.1 of the National Electricity Rules (NER), it is classified as a reliability corrective action under the NER. The identified need is not discussed in AEMO's most recent Integrated System Plan (ISP) and is therefore subject to the application and consultation process for RIT-T projects that are not actionable ISP projects.

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

Summary of Credible Option

Option	Description	Breakdown of costs ($m, 2025)	Total Cost of option ($m, 2025)	Indicative annual O&M costs ($m, 2025)
1	Replacement of identified CTs Northern Queensland by 2029	9.69	86.35	0.45
	Replacement of identified CTs Central Queensland by 2029	8.76		
	Replacement of identified CTs Southern Queensland (Surat and Metro) by 2031	67.90		

Note: O&M denotes operations and maintenance.

Given that the functions performed by the current transformers are essential for Powerlink to meet its regulatory and operational compliance obligations as a Transmission Network Service Provider and cannot be fully replicated or eliminated through alternative options, replacement of the subset of current transformers is the only credible network option identified at the Project Specification Consultation Report (PSCR) stage. This option directly addresses the major risks resulting from premature failure of the current transformer subset installed across Powerlink's network.

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

Powerlink does not consider non-network options are likely to be able to meet the identified need to address the risk of the 275kV current transformer subset premature failures on Powerlink's network. A non-network solution would be unable to fully replicate the functionality that current transformers provide in the operation of the transmission network. However, for completeness, this PSCR includes information on the required technical characteristics for non-network options.

Lodging a submission with Powerlink

Powerlink is seeking written submissions on this PSCR, on or before **28 November 2025**, particularly on the credible option presented in this PSCR.

Please address submissions to:

Manager Network and Alternate Solutions
Powerlink Queensland
PO Box 1193
VIRGINIA QLD 4014
Telephone: (07) 3860 2111
Email: networkassessments@powerlink.com.au

1. Introduction

1.1. Powerlink asset management and obligations

Powerlink's asset management approach ensures assets are managed in a manner consistent with overall corporate objectives to deliver safe, cost effective, reliable and sustainable services. Powerlink's approach to asset management delivers value to customers and stakeholders by optimising whole of life cycle costs, benefits and risks, while ensuring compliance with relevant legislation, regulations and standards. This is underpinned by Powerlink's corporate risk management framework and international risk assessment guidelines and methodologies.

1.2. Overview of the Regulatory Investment Test for Transmission

The purpose of a Regulatory Investment Test for Transmission (RIT-T) is to identify the preferred investment option that meets the identified network need. The preferred option maximises the present value of economic benefits, taking into account changes to Australia's greenhouse gas emissions where relevant. If the identified need is for a reliability corrective action, the preferred option may have a net economic cost.[1]

Powerlink applies the RIT-T to potential prescribed (regulated) investments in the transmission network where the estimated capital cost of the most expensive option exceeds $8 million.[2] The identified need referred to in this RIT-T – addressing the risk of current transformer failures in northern, central and southern Queensland – is not included in the Australian Energy Market Operator's (AEMO's) most recent Integrated System Plan (ISP), published in June 2024. As such, this RIT-T is subject to the application and consultation process for RIT-T projects that are not actionable ISP projects.[3]

This Project Specification Consultation Report (PSCR) is the first step in the RIT-T process.[4] The PSCR:

- describes the reasons why Powerlink has determined that investment is necessary (the identified need), together with the assumptions used in identifying this need, including whether the need is as an actionable project in AEMO's latest ISP;
- provides potential proponents of non-network solutions with information on the technical characteristics that a non-network solution would need to deliver, in order to assist proponents to consider whether they could offer an alternative solution;
- describes the credible option(s) that Powerlink currently considers may address the identified need;
- explains which (if any) categories of market benefits Powerlink expects to be material, or not material, for this RIT-T;
- describes how customers and stakeholders have been engaged with regarding the identified need; and
- provides stakeholders with the opportunity to comment on the credible option(s) presented.[5]

More information on the RIT-T process is provided in Appendix 1. Powerlink's compliance with RIT-T requirements in the National Electricity Rules (NER) and the RIT-T Application Guidelines is set out in Appendix 2.

[1] National Electricity Rules, clause 5.15A.1(c) and chapter 10, glossary ('net economic benefit').
[2] National Electricity Rules, clauses 5.15.3(a) and (b)(2) set the threshold at $5 million. The Australian Energy Regulator's (AER) latest cost threshold review increased the value to $8 million for three years from 1 January 2025.
[3] National Electricity Rules, rule 5.16.
[4] This RIT-T consultation process has been prepared in accordance with clauses 5.16.4(b) to (g) of the National Electricity Rules and AER, *Regulatory Investment Test for Transmission Application Guidelines*, November 2024.
[5] National Electricity Rules, clause 5.16.4(b).

2. Customer, non-network and community engagement

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

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

2.1. Powerlink takes a proactive approach to engagement

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

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

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

2.2. Working collaboratively with Powerlink's Customer Panel

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

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

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

2.3. Transparency on future network requirements

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

Powerlink's 2024 TAPR identified an expectation that action would be required to manage the risk of current transformer failure. No submissions proposing credible and genuine non-network options have been received by Powerlink 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.

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

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

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

2.5. Community engagement

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

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

- The International Association for Public Participation (IAP2) spectrum[6], noting each stakeholder group has unique needs and requires an individual assessment on the spectrum;
- Powerlink's Stakeholder Engagement Framework, Community Engagement Strategy and Reflect Reconciliation Action Plan; and
- the Energy Charter Landholder and Community Better Practice Engagement Guide; and Better Practice Social Licence Guideline.

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

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

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

[6] Refer to IAP2's website.

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

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

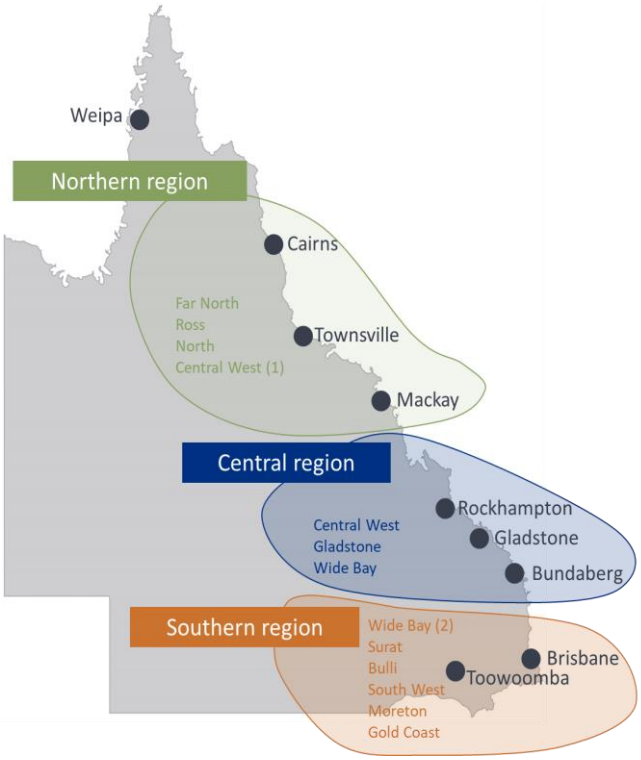
3. Identified Need

The identified need is the objective Powerlink seeks to achieve by investing in the network in accordance with the NER.[7] The RIT-T Application Guidelines note that network and non-network options can address the identified need.[8]

3.1. Geographical overview

Figure 3.1 provides an overview of where the 275kV current transformer subset is located within the northern, central and southern regions of Powerlink's network.

Figure 3.1: Overview of 275kV current transformer regional locations



Notes:

(1) Geographical zones as described in Powerlink's TAPR

[7] National Electricity Rules, chapter 10 (definition of 'identified need')
[8] AER, *Application Guidelines, Regulatory Investment Test for Transmission*, November 2024, page 13.

(2) Southern region includes substation sites within the Surat and Moreton zones

3.2. Background

Current transformers are installed at substations to measure and monitor the current flowing through transmission lines. They are a crucial component of the transmission network that perform functions including revenue metering, power system monitoring, telemetry, and protection system performance. These functions are critical in helping Powerlink meet its regulatory and operational compliance obligations as a Transmission Network Service Provider.

Current transformers can be of many different types and constructions (toroidal, optical, dry type, post type, etc.). The majority of post type current transformers in transmission networks are either gas-insulated sulphur hexafluoride (SF6) or oil-filled. A typical current transformer has an expected service life of approximately 40 years and they are tested every three years as part of routine maintenance. A failure of a current transformer can lead to network interruptions and involuntary load curtailment for customers. This is because Powerlink may be required to de-energise the equipment being monitored by the current transformer if it were to fail in service. Failure can also damage nearby equipment and cause potential harm to individuals in the vicinity.

As part of routine maintenance testing of the current transformer subset, seven were identified to be at high risk of failure and immediately removed from service. The failure details are shown in Incident Numbers 2 to 7 and 9 in Table 3.1.

There have been a further seven failures of this current transformer subset since 2011. These failures resulted in the loss of containment of oil and sand up to a diameter of 17 metres. These incidents did not result in any personnel injury, as no one was within range of the oil and sand at the time of failure. The failure details are shown in Incident Numbers 1, 8, 10, and 11 to 14 in Table 3.1.

Table 3.1: Details of 275kV current transformer failures on Powerlink's network

Incident Number	Failure type	Years in service	Date of failure	Consequence	Consequence comment
1	Loss of containment	10	30/10/2011	N/A	N/A
2	Testing failure	23	31/10/2011	N/A	N/A
3	Testing failure	23	18/04/2013	N/A	N/A
4	Testing failure	23	18/01/2016	N/A	N/A
5	Testing failure	24	10/06/2016	N/A	N/A
6	Testing failure	23	02/06/2018	N/A	N/A
7	Testing failure	24	09/11/2018	N/A	N/A
8	Loss of containment	17	26/11/2019	Fire	Debris (approximately 5 metres)
9	Testing failure	23	1/07/2020	N/A	N/A
10	Loss of containment	13	19/08/2020	Oil spill	Oil and sand (distance not recorded)
11	Loss of containment	18	29/11/2023	Fire	Debris and oil spray (approximately 16 metres)
12	Loss of containment	18	23/01/2024	Oil spill	Oil and sand only (approximately 2 metres)
13	Loss of containment	18	27/07/2024	Fire	Debris (approximately 17 metres)
14	Loss of containment	19	11/06/2025	Fire	Debris (approximately 10 metres)

Table 3.2 lists the quantity of 275kV current transformer subset per substation site in each region.

Table 3.2: Quantity of 275kV current transformer subset per substation in each region

Region	Substation	Quantity
Northern	Nebo	18
	Ross	6
	Chalumbin	3
	Strathmore	27
	Subtotal	**54**
Central	Broadsound	8
	Calvale	4
	Wurdong	9
	Larcom Creek	21
	Subtotal	**42**
Southern	Tarong	81
	Braemar	14
	Millmerran	3
	Halys	60
	Western Downs	15
	South Pine	5
	Belmont	18
	Mudgeeraba	4
	Woolooga	36
	Palmwoods	6
	Mt England	29
	Middle Ridge	18
	Goodna	12
	Abermain	12
	Teebar Creek	21
	Greenbank	21
	Subtotal	**355**
	Total Quantity	**451**

3.2.1. Powerlink has implemented measures to manage safety risks

Powerlink has established restricted access zones (RAZ) of 30 metres around each current transformer subset while they are energised to manage safety risks. However, these RAZs create significant access challenges at the affected substations, hindering routine operational and maintenance activities and further exacerbating the network reliability risks associated with this subset.

3.3. Description of identified need

Powerlink's Transmission Authority requires it to plan and develop the transmission network in accordance with good electricity industry practice, having regard to the value that end users of electricity place on the quality and reliability of electricity services. It allows load to be interrupted during a critical single network contingency, provided the maximum load and energy will not exceed 50 megawatts (MW) at any one time, or will not be more than 600 megawatt hours (MWh) in aggregate.[9] The Transmission Authority is also subject to a broader obligation under the *Electricity Act 1994* (the Electricity Act) that Powerlink operate, maintain (including repair and replace if necessary) and protect its transmission grid to ensure the adequate, economic, reliable and safe transmission of electricity.[10]

Premature failures present a risk to network reliability and operational stability, increasing the probability of unplanned outages and network disruptions.

This presents Powerlink with a range of reliability of supply, safety and compliance risks which put at risk Powerlink's ongoing compliance with the reliability and service standards set out in the NER, Powerlink's Transmission Authority and applicable regulatory instruments.

Powerlink must therefore take action to:

- avoid the increasing likelihood of unserved energy arising from failures of the current transformer subset in Queensland;
- avoid network and load interruptions due to loss of critical revenue metering, power system monitoring, telemetry, and protection system performance functions associated with failures of the current transformer subset; and
- remove the need for RAZs that hinder routine operational and maintenance activities that support the reliable operation of the network.

As the proposed investment is to meet reliability and service standards arising from Powerlink's Transmission Authority and to ensure Powerlink's ongoing compliance with Schedule 5.1 of the NER, it is a reliability corrective action under the NER.[11] 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.[12]

3.4 Assumptions and requirements underpinning the identified need

The need to invest is driven by Powerlink's obligations to address the increasing risks to supply, safety and property arising from the condition of the category of 275kV current transformers. If not addressed, these risks

[9] Transmission Authority No. T01/98, section 6.2(c).
[10] *Electricity Act 1994* (Qld), section 34(1)(a).
[11] National Electricity Rules, clause 5.10.2 (definition of 'reliability corrective action').
[12] National Electricity Rules, clause 5.15A.1(c).

can lead to failures and extend the time taken to recover from outages, due to the time taken to install a replacement.

The *Electrical Safety Act 2002* also requires Powerlink to operate its network in a manner that ensures electrical risk to a person or property has been eliminated, so far as is reasonably practicable; or if it is not reasonably practicable to eliminate electrical risk to the person or property, the risk has been minimised so far as is reasonably practicable.[13]

Powerlink's must also plan, design, maintain and operate its network to meet the power quality standards and reliability obligations set out in the NER and in its Transmission Authority.[14]

It follows that the premature failures of the identified 275kV current transformer subset located across Powerlink's network compels Powerlink to undertake reliability corrective actions if it is to continue to meet its jurisdictional obligations and the standards for reliability of supply set out by AEMO and in the NER.

3.5 Consequences of failure

Powerlink has assessed the consequences of failure for a particular asset and risk scenario on a case-by-case basis, taking into account the type of asset, location of the asset, network connectivity, and operating and environmental conditions.

In the case of the category of 275kV current transformers requiring replacement for this RIT-T, the following safety, network, financial and environmental potential consequences have been identified.

Safety

- potential safety impacts to field personnel working in the vicinity of current transformers when loss of containment occurs with potential for fire and arcing nearby

Network

- interruptions to supply and extended outages
- reduced transfer limits and different patterns of generation dispatch

Financial

- replacement of a failed asset in an emergency manner
- damage to adjacent items of plant in the event of oil and sand release or fire
- clean-up and remediation of oil and other contaminants
- costs associated with supply of diesel generators or other sources of supply during prolonged outages
- delays to projects, rescheduling of planned works, and other business disruption costs

Environmental:

- loss of containment of oil
- release of greenhouse gases (SF6) into the environment

[13] *Electrical Safety Act 2002* (Qld), section 29.

[14] National Electricity Rules, Schedules 5.1a (System Standards) and 5.1.2 (Network Reliability), and Transmission Authority Number T01/98, Section 6, as amended 30 June 2014.

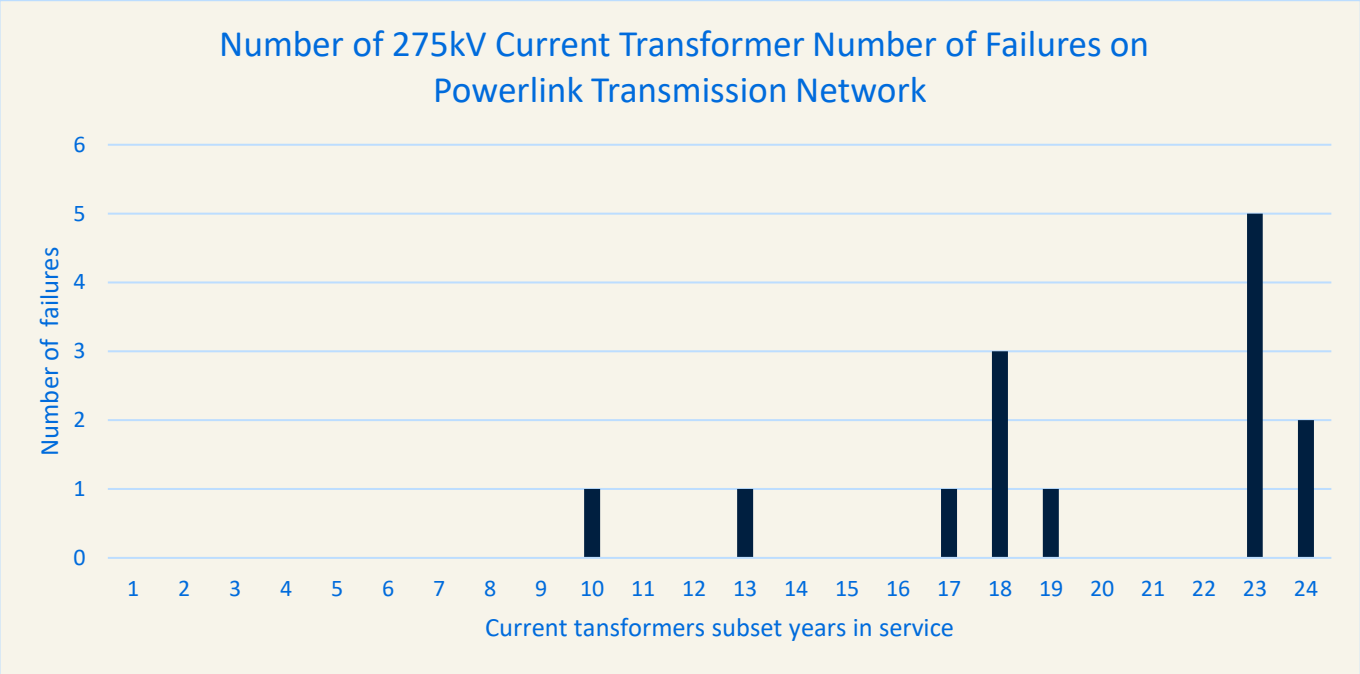
3.6 Likelihood of 275kV current transformer failure

The likelihood of consequence represents the moderating factors associated with the consequence. These factors can vary depending on the nature of the failure, the context and location of the asset, and preventative barriers or controls to mitigate the risk.

There have been seven containment failures of this current transformer subset since 2011, and a further seven that failed maintenance testing. The fourteen current transformer subset that failed had been in service for only 10 to 24 years. This is significantly short of the typical 40-year service life for this type of equipment and demonstrates a correlation between time in service and likelihood of failure (refer to Figure 3.1).

Figure 3.1: 275kV current transformer subset failure

Data includes containment failures and failed tests.



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.

A non-network solution that would allow Powerlink to avoid replacement of current transformers must be able to replicate the functionality, capacity, and reliability of the entire substation where these current transformers are located.

Powerlink is not aware of any technically feasible non-network options that are capable of meeting the identified need, but invites submissions from proponents of such options.

4.1. Common criteria for proposed network support services

Powerlink has identified the following common criteria that must be satisfied if proposed network support services are to meet supply requirements.[15]

Size and location

- Proposed solutions must be large enough, individually or collectively, to avoid replacement of current transformers at the substations described in Table 3.2. However, the level of support depends on the location and type of network support offered.
- 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 on a continuous basis over a period of years and would be required to provide notice of cessation of network support services several years in advance to allow Powerlink to address the identified need in time to meet its reliability of supply obligations.
- If a generation service is proposed (either standalone or in conjunction with other services), such operation will be required regardless of the market price.
- Proponents of generation services are advised that network support payments are intended for output that can be demonstrated to be additional to the plant's normal operation in the NEM.
- Where there are network costs associated with a proposed non-network option, including asset decommissioning, these costs form part of the scope of a non-network option and will be included in the overall cost of a non-network option as part of the RIT-T cost-benefit analysis.

Reliability

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

Timeframe and certainty

- Proposed services must be able to be implemented in sufficient time to meet the identified need as shown in Table 5.1, 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.

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

Duration

- The agreement duration for any proposed service will provide sufficient flexibility to ensure that Powerlink is pursuing the most economic long run investment to address the condition risks arising from the 275kV current transformers.

5. Potential credible network options to address the identified need

Powerlink has developed one credible network option that is capable of addressing the identified need. This option addresses the identified need of maintaining existing electricity services, ensuring an ongoing reliable, safe and cost-effective supply to customers in northern, central and southern Queensland and to minimise the risk in the Powerlink sites where this 275kV current transformer subset is installed.

Option 1 seeks to address the risks associated with current transformer subset premature failures in northern, central and southern Queensland by replacement of the current transformer subset through a state-wide replacement program. Under Option 1, design will commence in 2026, construction works will commence in 2026, and commissioning will be completed by July 2031.

A summary of this option is shown in Table 5.1.

Table 5.1: Summary of credible option

Option	Description	Breakdown of costs ($m, 2025)	Total Cost of option ($m, 2025)	Indicative annual O&M costs ($m, 2025)
1	Replacement of identified current transformers Northern Queensland by 2029	9.69	86.35	0.45
	Replacement of identified current transformers Central Queensland by 2029	8.76		
	Replacement of identified current transformers Southern Queensland (Surat and Metro) by 2031	67.90		

Note: O&M denotes operations and maintenance.

The credible option addresses the major risks resulting from the identified current transformer subset to allow Powerlink to meet its reliability of supply and safety obligations under its Transmission Authority, the Electricity Act and Schedule 5.1 of the NER, by the replacement of the current transformer subset across Powerlink's network.

Powerlink does not consider that the credible option being considered will have a material inter-network impact, based on AEMO's screening criteria.[16]

[16] National Electricity Rules, clause 5.16.4(b)(6)(ii). AEMO has published guidelines for assessing whether a credible option is expected to have a material inter-network impact.

5.1. Options considered but not progressed

Powerlink's initial assessment considered two options, other than the credible option discussed in this PSCR, that potentially met the identified need. Table 5.2 summarises the reasons the additional options could not be included as credible options to be assessed in this PSCR.

Table 5.2: Options considered but not progressed

Option	Reason(s) for not progressing
Replacement of the identified current transformers and existing live tank circuit breakers with dead-tank circuit breakers including current transformers as one item	Prohibitive cost due to significant site works required including civil, electrical and secondary system changes and disproportionate to the magnitude of the estimated cost of the credible option being considered. It would be cost effective only in few cases where circuit breakers are nearing their end of serviceable life. Longer outage duration due to increased work.
Reducing safety risk through the use of diverter shields, enabling access to substations for maintenance and project activities(Note 1)	Lack of certainty of effectiveness as a trial of this option has not been fully assessed at the time of PSCR publication. Safety risk is not fully mitigated and smaller RAZs will remain. Reliability risk may not be adequately mitigated.

Note:

(1) The feasibility of this option will be further assessed prior to Project Assessment Draft Report (PADR) publication.

6. Materiality of Market Benefits

The NER requires RIT-T proponents to quantify a number of classes of market benefits for each credible option, unless the proponent can demonstrate that a specific category(ies) is/are unlikely to materially affect the outcome of the assessment of credible options.[17]

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

Powerlink considers the benefits that could be material are as follows:

- **Involuntary load shedding:** Powerlink considers that changes in involuntary load shedding (expected unserved energy) may be material to the RIT-T assessment.
- **Changes in patterns of generation dispatch**: Powerlink considers that variations in transmission network constraints or power flows may materially influence the outcome of the RIT-T assessment.

[17] National Electricity Rules, clauses 5.15A.2(b)(4), (5) and (6). See also AER, *Regulatory Investment Test for Transmission*, November 2024, paragraphs 10 to 13.

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

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

- **Changes in voluntary load curtailment**: replacement of at risk assets under the credible option 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 replacement of at-risk assets under the credible option 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**: the credible option for asset replacement does 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**: the credible option is not expected to provide any changes in network losses as replacing at risk assets 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 option under consideration. These costs are therefore not material to the outcome of the RIT-T assessment.
- **Changes in Australia's greenhouse gas emissions**: Powerlink does not consider that the credible option will materially affect Australia's greenhouse gas emissions, and the cost of quantifying any greenhouse gas emission benefits would involve a disproportionate level of effort compared to the additional insight it would provide.
- **Competition benefits:** Powerlink does not consider that the credible option will materially affect competition between generators, and generators' bidding behaviour and, consequently, considers that the techniques required to capture any changes in such behaviour would involve a disproportionate level of effort compared to the additional insight it would provide.
- **Option value**: Powerlink does not consider that the identified need for the option considered in this RIT-T is affected by uncertain factors about which there may be more clarity in future. As a consequence, option value is not a relevant consideration for this RIT-T.
- **Costs associated with social licence activities:** Powerlink does not consider that the cost of social licence activities is material given there is only one credible option under consideration in this RIT-T and therefore not material to the outcome of the RIT-T assessment.

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 cost-benefit analysis.

7. Base Case

7.1. Modelling a base case under the RIT-T

In a RIT-T that is not an actionable ISP project, the base case is the situation in which the RIT-T proponent does not implement a credible option to meet the identified need, and continues with business-as-usual (BAU) activities.[18]

The assessment undertaken in the PADR will compare the costs and benefits of credible options to address the risks arising from an identified need with a base case. As characterised in the RIT-T Application Guidelines, the base case reflects a state of the world in which the issues arising from these current transformers are only addressed through standard operational activities, with escalating safety, financial, environmental and network risks.[19]

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

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

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

8. Cost Estimation

8.1. Regulatory requirements

Where the estimated capital cost of the preferred option exceeds $103 million, a RIT-T proponent must:

- outline the process undertaken to ensure cost estimates are accurate to the extent practicable having regard to the purpose of the relevant stage of the RIT-T, noting the inclusion of RIT-T reopening triggers apply at the PADR stage;
- for all credible options, including the preferred option, apply the Association for the Advancement of Cost Engineering (AACE) cost estimation classification system, or identify an alternative system/arrangements and explain why the alternative is more appropriate/suitable than the AACE system.[20]

Further, for each credible option a RIT-T proponent must specify to the extent practicable and in a manner that is fit-for-purpose for the stage of the RIT-T:

- key inputs and assumptions adopted in deriving the cost estimate;
- main components of the cost estimate;

[18] AER, *Regulatory Investment Test for Transmission*, November 2024, glossary ('base case').
[19] AER, *Application Guidelines, Regulatory Investment Test for Transmission*, November 2024, page 21.
[20] AER, *Application Guidelines, Regulatory Investment Test for Transmission*, November 2024, pages 28-29.
NER, clauses 5.15.3(a) and (b)(7) set the threshold at $100 million The AER's latest cost threshold review increased the value to $103 million for three years from 1 January 2025.

- methodologies and processes applied to derive the cost estimate;
- reasons in support of key inputs and assumptions adopted and methodologies and processes applied; and
- the level of, and basis for, any contingency allowance that has been included in the cost estimate.[21]

At the PADR and PACR stages of a RIT-T, RIT-T proponents must include a quantification of costs, including a breakdown of operating and capital expenditure for each credible option.[22] At the PSCR stage however, information for each credible option is only required on total indicative capital and operating and maintenance costs, to the extent practicable.[23]

8.2. Basis of Estimation

The basis for the estimation of costs for the credible option presented in Table 5.1 of this PSCR is as described in Powerlink's Cost Estimation Methodology.[24] The estimates are informed by the level of specific project information available across the program of work and to the extent practicable for individual sites at the time of PSCR publication and will be updated accordingly in the PADR.

8.3. Key inputs and assumptions

Option 1: Replacement of current transformers in Northern and Central Region by 2029 and Southern Region by 2031

A Class 5 Estimate has been produced for Option 1 (see Table 5.1) with an accuracy range of -50% to +100%.

Powerlink has made the following scope assumptions in producing this estimate:

- The new current transformers will have Polymer insulators with SF6 gas and will be replaced on the existing foundations with either new structures or adaptor plates.
- All identified current transformers will be replaced under outage conditions.
- Sites are divided into three categories depending on accessibility; that is, easy, medium or hard as determined by the project team depending on the complexity to access the site due to restricted access zones. Construction methodology is developed for each scenario and included in the cost estimate.
- The cost estimate includes use of shipping containers as the solution for access to the sites, due to the RAZ zones.

Powerlink's Cost Estimation Methodology also provides context to the class of estimate discussed in this section.

9. Submission Requirements and Next Steps

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

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

[21] AER, *Application Guidelines, Regulatory Investment Test for Transmission*, November 2024, page 29.
[22] National Electricity Rules, clauses 5.16.4(k)(3) and (v)(1).
[23] National Electricity Rules, clause 5.16.4(b)(6)(v).
[24] The methodology is available on the RIT-T Consultations page of Powerlink's website.

9.1. Submissions from non-network providers

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

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

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

Powerlink will publish submissions on the PSCR, subject to any claim of confidentiality by the person making the submission. Where confidentiality over part or all of a submission is made, this should be clearly identified. Powerlink may also explore whether a redacted or non-confidential version of the submission can be made available.[25]

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

- with the consent of the person providing the information; or
- to the AER, Australian Energy Market Commission or any other regulator having jurisdiction over Powerlink under the NER or otherwise.[26]

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.

[25] AER, *Application Guidelines, Regulatory Investment Test for Transmission*, November 2024, page 70.
[26] National Electricity Rules, rule 8.6.

9.2. Next steps

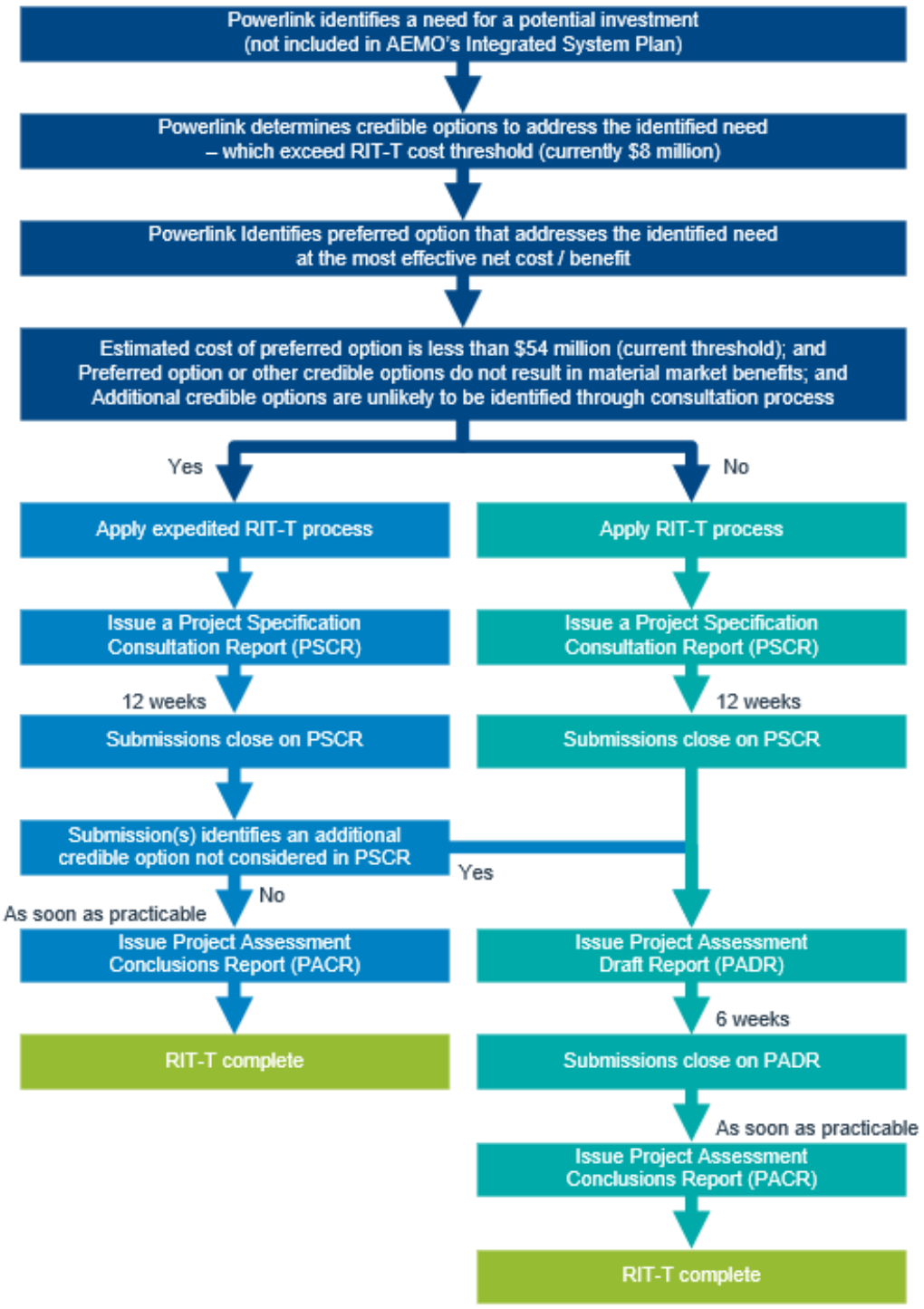
Powerlink intends to carry out the following process to assess what action, if any, should be taken to address future supply requirements.

Part 1	PSCR Publication	29 August 2025
Part 2	Submissions due on PSCR Have your say on the credible options and propose non-network options	28 November 2025
Part 3	PADR Publication	January 2026
Part 4	Submissions due on PADR	March 2026
Part 5	Publication of PACR Powerlink's response to any further submissions received and final recommendation on the preferred option for implementation	April 2026

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

Appendix 1: RIT-T Process

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



Appendix 2: Compliance Checklists

NER Requirements for RIT-T

Table A2.1 outlines Powerlink's compliance with PSCR content requirements set out in sub-paragraphs (1) to (6) of clause 5.16.4(b) of the NER.

Table A2.1: NER Compliance Checklist

Sub-para	Requirement	Section of PSCR
(1)	Description of identified need	3.3
(2)	Assumptions used to identify the identified need	3.4
(3)	Technical characteristics of the identified need that a non-network option would be required to deliver	4.1
(4)	Discussion of identified need or credible options to meet the identified need in most recent ISP	N/A
(5)	Description of credible options	5
(6)	For each credible option, information about:	
	(i) technical characteristics of the option;	5
	(ii) whether the option is reasonably likely to have a material inter-network impact;	5
	(iii) the classes of market benefit that are likely / not likely to be material	6.1 – 6.2
	(iv) estimated construction timetable and commissioning date	5
	(v) indicative capital and operating and maintenance costs	5

N/A denotes not applicable.

RIT-T Application Guidelines Compliance Checklist

Table A2.2 outlines Powerlink's compliance with binding requirements included in the RIT-T Application Guidelines.

Table A2.2: RIT-T Application Guidelines Compliance Checklist

Section of Guidelines	Topic	Requirements	Section of PSCR
3.2.5	Social licence principles	Consider social licence issues in the identification of credible options, and include information about when and how social licence considerations have affected the identification and selection of credible options.	2.5
3.4.3	Value of emissions reduction	The VER, reported in dollars per tonne of emissions (CO2 equivalent), is used to value emissions within a state of the world. A RIT-T proponent is required to use the then prevailing VER under relevant legislation or, otherwise, in any administrative guidance.	N/A
3.5	Valuing costs	Costs are the present value of the following direct costs: • Constructing or providing the credible option; • Operating and maintenance costs; • Costs of complying with relevant laws, regulations and administrative requirements; and Costs of removing and disposing of existing assets (particularly for asset replacement programs).	5.1
3.5.3	Social licence costs	Provide the basis for any social licence costs, including any reference to best practice	N/A
3.5A.1	Cost estimation accuracy	Outline cost estimation process (as applicable to stage of the RIT-T)	8.2
3.5A.2	Cost estimation information	Details of inputs, assumptions and methodologies for each credible option (as applicable to the stage of the RIT-T)[27]	8.3
3.6	Market benefit classes	Apply market benefit classes consistently across all credible options	N/A
3.7.3	Market benefits	Calculation of changes in Australia's greenhouse gases	6.2
3.8.2	Sensitivities	Sensitivity analysis on all credible options	N/A*

[27] Although the provisions in section 3.5A.2 of the RIT-T Application Guidelines are not included in the table of binding requirements at Appendix C of the Guidelines, Powerlink has added them to the compliance checklist as the provisions are expressed as being binding in section 3.5A.2 of the Guidelines.

Section of Guidelines	Topic	Requirements	Section of PSCR
3.9.4	Contingency allowance	Details of any contingency allowance included in a cost estimate for a credible option	N/A
3.11.2	Concessional finance	Provide sufficient detail about a concessional finance agreement	N/A
4.1	Community engagement	Description of assessment of requirement for community engagement and, as applicable, how engagement has been undertaken and any relevant concerns sought to be addressed, and how the proponent plans to engage with stakeholder groups.	2.5

Notes:

N/A denotes not applicable.

** Powerlink will include sensitivity analysis in the PADR.*

Contact us

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