Appendices

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Appendix A Planning criteria, responsibilities and processes

This appendix provides an overview of Powerlink's planning criteria, responsibilities and processes.

A.1 Powerlink's asset planning criteria

The Queensland Government amended Powerlink's N-1 criterion in 2014 to allow for increased flexibility. The planning standard permits Powerlink to plan and develop the transmission network on the basis that load may be interrupted during a single network contingency event. The following limits are placed on the maximum load and energy that may be at risk of not being supplied during a critical contingency:

- will not exceed 50 megawatts at any one time
- will not be more than 600 megawatt hours in aggregate.

The risk limits can be varied by:

- a connection or other agreement made by the transmission entity with a person who receives or wishes to receive transmission services, in relation to those services, or
- agreement with the Queensland Energy Regulator.

Powerlink is required to implement appropriate network or non-network solutions in circumstances where the limits set out above are exceeded or when the probability weighted economic cost of load at risk of not being supplied justifies the cost of the investment. Therefore, the planning standard has the effect of deferring or reducing the extent of investment in network or non-network solutions required. Powerlink will continue to maintain and operate its transmission network to maximise reliability to customers.

Powerlink's transmission network planning and development responsibilities include developing recommendations to address emerging network limitations, including the risks arising from ageing network assets remaining in-service. These responsibilities also extend to joint planning with other network service providers (NSP) to determine the most cost-effective solution regardless of the asset boundaries.

Energex and Ergon Energy (part of the Energy Queensland Group) are the two major Distribution Network Service Providers (DNSPs) in Queensland and were issued amended Distribution Authorities from July 2014. The service levels defined in the Distribution Authorities differ to that of Powerlink's authority. Joint planning accommodates these different planning standards by applying the planning standard consistently with the owner of the asset which places load at risk during a contingency event.

Powerlink has established policy frameworks and methodologies to support its planning standard. These are being applied in various parts of the Powerlink network where possible emerging limitations are being monitored.

A.2 Planning processes

Powerlink has obligations that govern how it should address forecast network limitations. These obligations are prescribed by the *Electricity Act 1994* (Electricity Act), the National Electricity Rules (NER) and Powerlink's Transmission Authority.

The Electricity Act requires that Powerlink ensure as far as technically and economically practicable, that the transmission grid is operated with enough capacity (and if necessary, augmented or extended to provide enough capacity) to provide network services to persons authorised to connect to the grid or take electricity from the grid[1].

It is a condition of Powerlink's Transmission Authority that it meets licence and NER requirements relating to technical performance standards during intact and contingency conditions. The NER sets out minimum performance requirements of the network and connections and requires that reliability standards at each connection point be included in the relevant connection agreement.

The requirements for initiating solutions to meet forecast network limitations, procurement of system strength or inertia services, or the need to address the risks arising from ageing network assets remaining in-service, including new regulated network developments or non-network solutions, are set out in the NER[2]. Planning processes require consultation with Australian Energy Market Operator (AEMO), Registered Participants and interested parties, including customers, generators, DNSPs and other Transmission Network Service Providers (TNSPs).

New network developments and reinvestments are proposed to meet these legislative and NER obligations. Each of these clauses prescribes a slightly different consultation process. The Regulatory Investment Test for Transmission (RIT-T) is the most common NER consultation process undertaken by Powerlink. Powerlink continues to publish information and consult with potential providers of non-network solutions for the provision of system security service needs as identified by AEMO.

1 *Electricity Act 1994* (Qld), section 34(2).
2 National Electricity Rules, clauses 5.14.1, 5.16.4, 5.16A, 5.20B, 5.20C and 5.22.14.

A.3 Integrated planning of the shared network

Significant inputs to Powerlink's network planning process are the:

- forecast of customer electricity demand, including demand side management (DSM), and its location
- location, capacity and arrangement of existing, new and retiring generation (including embedded generation)
- condition and performance of assets and an assessment of risks arising from ageing network assets remaining in-service
- assessment of future network capacity to meet the required planning criteria and efficient market outcomes, including system strength and the potential to facilitate future storage requirements to firm intermittent renewable generation and help address minimum demand.

Powerlink uses 10-year forecasts of electrical demand and energy across Queensland, together with forecast generation patterns, to determine potential flows on transmission network elements. The location and capacity of existing, retiring and committed generation in Queensland is sourced from AEMO, unless modified following advice from relevant market participants. Information about existing and committed embedded generation and demand management within distribution networks is provided by DNSPs and AEMO.

Powerlink examines the capability of its existing network and the future capability following any changes resulting from:

- committed network projects (for both augmentation and to address the risks arising from ageing network assets remaining in-service)
- the impact of generation retirements on transmission network power flows, system strength and reactive power capability
- existing and future generation developments
- variances in Powerlink's operating environment or changes in technical characteristics such as minimum demand, inertia and system strength as the power system continues to evolve.

This includes consultation with the relevant DNSP in situations where the performance of the transmission network may impact on, or be impacted by, the distribution network, such as where the two networks operate in parallel.

Where potential flows could exceed network capability, Powerlink notifies market participants of these forecast emerging network limitations. If the capability violation exceeds the required reliability standard, joint planning investigations are carried out with DNSPs (or other TNSPs if relevant) in accordance with the NER[3]. The objective of this joint planning is to identify the most cost-effective solution, regardless of asset boundaries, including potential non-network solutions.

Powerlink maintains its network to manage risks associated with asset condition and performance. A program of asset condition assessments helps identify emerging risks.

As assets approach the end of their technical service life, Powerlink evaluates a range of reinvestment strategies, using a flexible, integrated approach. This considers network topography and capacity, current and future needs, including future generation developments, electrification and emerging industries.

Changing power system flows and patterns require ongoing reassessment of network capacity. Reinvestment decisions are made in context – not in isolation or on a like-for-like basis. Strategies reflect enduring need, the role of transmission in the energy transition and the interconnected nature of the high voltage (HV) system across regions or corridors. Non-network solutions are also considered as part of this integrated planning.

By combining asset condition, demand limitations and energy transition goals, Powerlink delivers cost-effective solutions that support reliability and address risks from aging infrastructure.

The planning process includes evaluating a broad range of options, as outlined in Table A.1, and considers future capacity needs and opportunities to adopt new, cost-effective and technically feasible technologies.

[3] AER, Industry Practice Application Note for Asset Replacement Planning, July 2024.

Table A.1 Examples of planning options

Option	Description
Non-network alternatives	Non-network solutions are not limited to but may include network support and system services from existing and/or new generation, DSM initiatives (either from individual providers or aggregators), and other forms of technologies (such as battery installations). These solutions may reduce, negate or defer the need for network investments.
Network reconfiguration	The assessment of future network requirements may identify the reconfiguration of existing assets as the most economical option. This may involve asset retirement coupled with the installation of plant or equipment at an alternative location that offers a lower-cost substitute for the required network functionality.
Asset de-rating or retirement	May include strategies to de-rate, decommission and/or demolish an asset and is considered in cases where needs have diminished in order to achieve long-term economic benefits.
Augmentation	Increases the capacity of the existing transmission network; for example, the establishment of a new substation, installation of additional plant at existing substations or construction of new transmission lines. This is driven by the need to meet prevailing network limitations and customer supply requirements, or where there may be net economic benefits to customers.
System Services	The assessment of future network requirements to meet overall power system performance standards and support the secure operation of the power system. This includes the provision of system strength services, inertia and reactive power services.
Reinvestment	Asset reinvestment planning ensures that existing network assets are assessed for their enduring network requirements in a manner that is economic, safe and reliable. This may result in like-for-like replacement, network reconfiguration, asset retirement, line refit or replacement with an asset of lower capacity. Condition and risk assessment of individual components may also result in the staged replacement of an asset where it is technically and economically feasible.
Line refit	Powerlink utilises a line reinvestment strategy called line refit to extend the service life of a transmission line and provide cost benefits through the deferral of future transmission line rebuilds. Line refit may include structural repairs, foundation works, replacement of line components and hardware, abrasive blasting and painting.
Transformer life extension	Powerlink utilises a transformer reinvestment strategy called transformer life extension to extend the service life of a transformer to provide cost benefits through the deferral of the timing for a future transformer replacement. Transformer life extension may include replacement of components such as high voltage bushings, tap changers and instruments, addressing sources of oil leaks such as replacement of gaskets and main lid sealing, replacement of transformer oil, and addressing radiator corrosion.
Operational measures	Network constraints may be managed during specific periods using short term operational measures; for example, switching of transmission lines or redispatch of generation in order to defer or negate network investment.

A.4 Powerlink's reinvestment criteria

Powerlink is committed to ensuring the sustainable long-term performance of its assets to deliver safe, reliable and cost-effective transmission services to customers, stakeholders and communities across Queensland. Powerlink demonstrates this by adopting a proactive approach to asset management that optimises whole of life cycle costs, benefits and risks, while ensuring compliance with applicable legislation, regulations, standards, statutory requirements, and other relevant instruments.

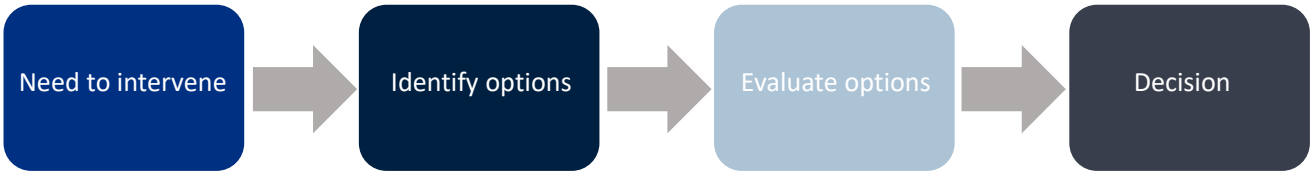
A4.1 The reinvestment criteria framework

The reinvestment criteria framework defines the methodology that Powerlink uses to assess the need and timing for intervention on network assets to ensure industry compliance obligations are met. The methodology aims to improve transparency and consistency within the asset reinvestment process, enabling Powerlink's customers and stakeholders to better understand the criteria to determine the need and timing for asset intervention. The reinvestment criteria framework is relevant where the asset condition changes so it no longer meets its level of service or complies with a regulatory requirement.

The trigger to intervene needs to be identified early enough to provide an appropriate lead time for the asset reinvestment planning and assessment process. The need and timing for intervention is defined when business as usual activities (including routine inspections, minor condition-based and corrective maintenance and operational refurbishment projects) no longer enable the network asset to meet prescribed standards of service due to deteriorated asset condition.

Powerlink's asset reinvestment process (refer to Figure A.1) enables timely, informed and prudent investment decisions to be made that consider all economic and technically feasible options including non-network alternatives or opportunities to remove assets where they are no longer required. An assessment of the need and timing for intervention is the first stage of this process.

Figure A.1 Asset Reinvestment Process



A4.2 Asset Reinvestment Review

In 2023 Powerlink completed a review of its approach to network asset reinvestment, with a focus on overhead transmission lines, to ensure consistency with contemporary asset management and risk-based decision frameworks. In particular, the review considered Powerlink's approach to line refit work that aims to achieve a life extension of a nominal 15 years across an entire asset, bundled in a single up-front intervention.

The Asset Reinvestment Review Working Group was established to ensure customers and the Australian Energy Regulator were actively involved in the review and its recommendations. The Asset Reinvestment Review Working Group Report was published in May 2023. A key recommendation in the report was for Powerlink to model existing and alternative bundling approaches for future transmission line refit investment decisions, and to progress the most cost-effective solution based on detailed condition and cost information, while allowing for developing network needs. It was also recommended that compliance works are only undertaken on structures where condition-based work is to be performed, and that Powerlink retain the existing asset definition for transmission lines[4].

[4] Powerlink Queensland, Asset Reinvestment Review, working group report, June 2023.