06.
Future network requirements

This chapter discusses potential investments required on the transmission network within the 10-year outlook period. It includes information on forecast network limitations, supporting planning criteria and processes, the management of assets and network risks, Regulatory Investment Tests for Transmission (RIT-Ts), Priority Transmission Investments (PTIs), and the most recent connection point proposals anticipated to require connection to the transmission network. This chapter also discusses major projects referenced in the 2024 Integrated System Plan (ISP).

Key highlights

- As we move towards 80% renewables by 2035, Powerlink continues to be proactive and adapt to shifts in an increasingly uncertain, technically complex and dynamic operating environment.
- Powerlink applies a flexible and integrated approach to efficient investment decision making, taking into consideration multiple factors including:
  - assessing whether an enduring need exists for assets and investigating alternate network configuration opportunities and/or non-network solutions, where feasible, to manage asset and network risks, including the potential impacts of the energy transformation
  - the role of emerging technologies and assessing a range of technical factors and dynamic changes in Powerlink's operating environment to ensure network resilience
  - enabling opportunities for the connection of new firming generation and variable renewable energy (VRE) generation where technically and economically feasible
  - actively seeking opportunities to identify and implement more cost effective solutions as demonstrated by Powerlink's Asset Reinvestment Review (ARR), and whenever possible, making use of transmission line and transformer refits or non-network solutions (and services) that avoid or delay the need to establish new transmission network infrastructure.
- The changing generation mix (and associated peak to average production ratios of VRE plant) may lead to increased constraints across critical grid sections. Powerlink considers these potential constraints holistically as part of the planning process and in conjunction with the Queensland Energy and Jobs Plan (QEJP) and findings of the most recent Integrated System Plan (ISP).

6.1 Introduction

Powerlink Queensland (Powerlink) is the appointed Jurisdictional Planning Body (JPB) by the Queensland Government and is therefore responsible for transmission network planning within Queensland. Powerlink's obligation is to plan the transmission system to reliably and economically supply load, while managing risks associated with the condition and performance of existing assets in accordance with the requirements of the National Electricity Rules (NER), Queensland's *Electricity Act 1994* (the Act) and its Transmission Authority. As the designated Renewable Energy Zone (REZ) Delivery Body (RDB) for Queensland, Powerlink is also responsible for the planning and development of Renewable Energy Zones (REZs) in the state.

The NER[1] requires the Transmission Annual Planning Report (TAPR) to provide a forecast of constraints and inability to meet the network performance requirements set out in Schedule 5.1 of the NER, or relevant legislation or regulations of a participating jurisdiction over one, three and five years. In addition, there is a requirement[2] to provide estimated load reductions that would defer forecast limitations for a period of 12 months and to state any intent to issue request for proposals for augmentation, replacement of network assets or non-network alternatives. The TAPR must be consistent with the TAPR Guidelines[3] and include information pertinent to all proposed:

- augmentations to the network and replacements of network assets[4]
- network asset retirements or asset de-ratings that would result in a network constraint in the 10-year outlook period[5]
- inertia and system strength requirements[6].

1 NER, Clause 5.12.2(c)(3).
2 NER, Clause 5.12.2(c)(4).
3 NER, Clause 5.12.2(c).
4 NER, Clause 5.12.2(c)(5).
5 NER, Clause 5.12.2(c)(1A).
6 NER, Clause 5.20B.4(h) and 5.20C.3(f) and (g).

This chapter on proposed future network developments contains:

- discussion on Powerlink's planning criteria, processes and integrated planning approach to network development
- information regarding assets reaching the end of their technical service life and options to address the risks arising from ageing assets remaining in-service, including asset reinvestment, non-network solutions, potential network reconfigurations, asset retirements or de-ratings
- identification of emerging future limitations[7] with potential to affect supply reliability including estimated load reductions required to defer these forecast limitations by 12 months[8]
- a statement of intent to issue request for proposals for augmentation, the proposed replacement of ageing network assets or non-network alternatives identified as part of the annual planning review[9]
- a summary of network limitations over the next five years[10]
- a table summarising possible connection point proposals
- the manner in which proposed augmentations and the replacement of network assets relate to AEMO's most recent ISP[11] and 2023 System Security Reports.

Where appropriate, all transmission network, distribution network or non-network alternatives are considered as options for investment. Submissions for non-network alternatives to proposed investments are invited by contacting NetworkAssessments@powerlink.com.au.

6.2 Planning criteria, responsibilities and processes

6.2.1 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 50MW at any one time
- will not be more than 600MWh 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, or the need to address the risks arising from ageing network assets remaining in-service, through joint planning.

7 Identification of forecast limitations in this chapter does not mean that there is an imminent supply reliability risk. The NER requires identification of limitations which are expected to occur some years into the future, assuming that demand for electricity is consistent with the forecast in this TAPR.
8 NER, Clause 5.12.2(c)(4)(iii).
9 NER, Clause 5.12.2(c)(4)(iv).
10 NER, Clause 5.12.2(c)(3).
11 NER, Clause 5.12.2(c)(6).

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 their respective 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 in place to support its planning standard. These are being applied in various parts of the Powerlink network where possible emerging limitations are being monitored.

6.2.2 Planning processes

Powerlink has obligations that govern how it should address forecast network limitations. These obligations are prescribed by the Act, the NER and Powerlink's Transmission Authority.

The 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'[12].

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[13]. 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 RIT-T is the most common NER consultation process undertaken by Powerlink and is discussed further in Section 6.6. In July 2024, Powerlink commenced consultation on the first candidate Priority Transmission Investment (PTI) under the Energy (Renewable Transformation and Jobs) Act 2024 (ERTJ Act) (refer to Section 6.10). Powerlink continues to publish information and consult with potential providers of non-network solutions for the provision system security service needs as notified by AEMO.

6.2.3 Integrated planning of the shared network

Significant inputs to the 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 limiting transmission losses, system strength and the potential to facilitate future storage requirements to firm intermittent renewable generation and help address minimum demand.

[12] Refer to Section 34(2) of the Act.
[13] NER, clauses 5.14.1, 5.16.4, 5.16A, 5.20B, 5.20C and 5.22.14.

The 10-year forecasts of electrical demand and energy across Queensland are used, 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 renewable developments including REZs
- 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, for example 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[14]. The objective of this joint planning is to identify the most cost effective solution, regardless of asset boundaries, including potential non-network solutions.

Powerlink must maintain its current network so that the risks arising from the condition and performance of existing assets are appropriately managed. Powerlink undertakes a program of asset condition assessments to identify emerging asset condition related risks.

As assets approach the end of their technical service life, Powerlink examines a range of options to determine the most appropriate reinvestment strategy, applying a flexible and integrated approach which takes into account multiple factors. Consideration is given to optimising the topography and capacity of the network, taking into account current and future network needs, including future renewable generation and other developments associated with the transforming energy system such as decarbonisation through electrification and emerging industries relating to hydrogen.

In many cases, power system flows and patterns have changed over time. As a result, the on-going network capacity requirements need to be re-evaluated. Individual asset reinvestment decisions are not made in isolation, and reinvestment in assets is not necessarily undertaken on a like-for-like basis. Rather, asset reinvestment strategies and decisions take into account enduring need, the role of transmission in the energy transformation and the inter-related connectivity and characteristics of the high voltage (HV) system that are considered across an area or transmission corridor. The consideration of potential non-network solutions forms an important part of this flexible and integrated planning approach.

The integration of condition, demand based limitations and energy transformation objectives delivers cost effective solutions that address both reliability of supply and risks arising from assets approaching end of technical service life.

Powerlink considers a range of strategies and options to address emerging asset related condition and performance issues. This planning process includes consideration of a broad range of options to address identified needs described in Table 6.1. Powerlink considers options in the context of future capacity, together with opportunities to implement new cost efficient and technically feasible technologies where appropriate.

In accordance with the NER, information regarding proposed transmission reinvestments within the 10-year outlook period must be published in the TAPR and TAPR templates.

Table 6.1 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, e.g. 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. An increase in network capacity may also unlock synergies to support the development of a REZ.
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 refit	Powerlink utilises a transformer reinvestment strategy called transformer refit to extend the service life of a transformer to provide cost benefits through the deferral of the timing for a future transformer replacement. Transformer refit 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, e.g. switching of transmission lines or redispatch of generation in order to defer or negate network investment.

6.2.4 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.

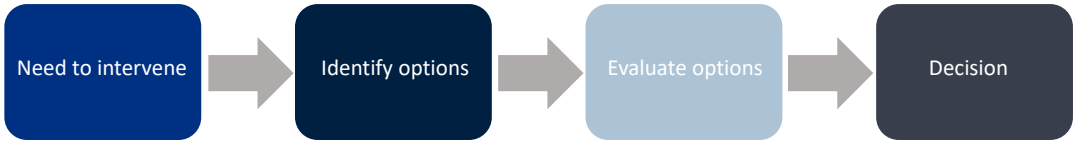
The reinvestment criteria framework

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 6.1) 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 6.1 Asset Reinvestment Process



Asset reinvestment review

During 2023 Powerlink completed a review of its asset reinvestment approach and criteria to ensure consistency with contemporary asset management and risk-based decision frameworks. The ARR Working Group was established to ensure customers and the Australian Energy Regulator (AER) were actively involved in the review and its recommendations.

The aim of the review was to consider the prudency and efficiency of network reinvestment and the associated risk-based economic assessments[14]. The ARR Working Group Report was published on 30 May 2023. A key recommendation included modelling existing and alternative bundling approaches for future transmission line refit investment decisions, and to progress the most cost effective solution based upon detailed condition and cost information, while allowing for the developing network needs to support the energy transformation. 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.

In September 2024, Powerlink reported back to the Customer Panel on progress made in embedding the recommendations from this review into business processes.

6.3 Monitoring the changing outlook for the Queensland region

Powerlink is actively monitoring the changing outlook for the Queensland region and considering the impact of emerging technologies, withdrawal of coal-fired generation and the integration of VRE and firming generation in future transmission plans. These plans include:

- non-network solutions
- reinvesting in assets to extend their end of technical service life
- removing some assets without replacement
- determining optimal parts of the network for new connection (in particular renewable generation) as discussed in Chapter 2
- replacing existing assets with assets of a different type, configuration or capacity
- investing in assets to maintain planning standards and deliver efficient market outcomes
- investing in assets and/or non-network solutions to meet Powerlink's obligations for inertia, system strength and voltage control (refer to Section 6.8).

[14] Refer to the AER's Industry practice application note for asset replacement planning.

Powerlink anticipates that there will be significant expansion of the transmission network required over the next 10 years to achieve 80% renewables by 2035. Powerlink is committed to early engagement and working in partnership with communities, local government and other stakeholders to deliver the new energy future. This includes working together to identify opportunities which deliver positive outcomes and long-term benefits as the energy system evolves, particularly in developing new transmission infrastructure in key parts of the state.

6.3.1 Possible impacts of the energy transformation

Due to the energy transformation, there is the potential to have significantly changed requirements for transmission infrastructure in the 10-year outlook period. Given Powerlink's integrated planning approach (refer to Section 6.2.3), these requirements may result in the need for new or alternate investments that impact the proposed future network and non-network solutions discussed in this Chapter and possible non-network solutions identified in Chapter 5. Any changes will be updated in subsequent TAPRs.

6.4 Forecast capital expenditure

The external environment in which Powerlink operates continues has become more complex in recent years with challenges such as rising inflation and interest rates, and disruption to supply chains and materials shortages, intensifying.

In a report for Energy Networks Australia and the Clean Energy Council, KPMG observed in August 2022 that as Australia constructs more transmission projects to meet the needs of the energy system, the availability of highly-trained engineers and other specialists needed for the projects will become more limited. KPMG also indicated that, for major projects, supply chain pressure was resulting in up to 40% increases in capital expenditure and at least a 5% increase in operational expenditure[15].

In September 2023, AEMO reported that transmission cost estimates had increased approximately 30% in real terms compared to equivalent cost estimates for the 2022 ISP and, in the 2024 ISP, added that future cost reductions were unlikely. Also in the 2024 ISP, AEMO commented that the investments required by the ISP imply the need for thousands of critical energy assets – including utility-scale generators and batteries, high voltage transmission lines and cables, synchronous condensers and transformers – and the people needed to install and operate them. Further, AEMO noted that international demand for the materials, technologies and expertise to deliver a global energy transformation could increase Australia's exposure to risks associated with competition for investment and skills[16].

The Reserve Bank of Australia (RBA) recently reported that global inflation has eased in most economies in 2024, however growth in China has significantly declined in the June quarter. The RBA also noted that inflationary pressures are expected to take longer than expected to return to target in Australia and are anticipated to decrease circa mid-2026 while the demand for goods and services continues to exceed supply[17].

6.5 Forecast network limitations

Forward planning allows Powerlink adequate time to identify emerging limitations and to implement appropriate network and/or non-network solutions to maintain transmission services which meet the planning standard in its Transmission Authority (refer to Section 6.2.1).

Emerging limitations may be triggered by thermal plant ratings (including fault current ratings), protection relay load limits, voltage stability and/or transient stability. Appendix H lists the indicative maximum short circuit currents and fault rating of the lowest rated plant at each Powerlink substation and voltage level, accounting for committed projects listed in Chapter 9 and existing and committed generation listed in Chapter 7.

---

15 KPMG, Market sounding report on transmission, report for Energy Networks Australia and the Clean Energy Council, August 2022.

16 AEMO, 2023 Transmission Expansion Options Report, September 2023; AEMO, 2024 Integrated System Plan, final report, June 2024.

17 Reserve Bank of Australia, Statement on Monetary Policy, August 2024.

Based on Powerlink's Central scenario forecast, Queensland's transmission delivered maximum demand is expected to have steady growth with an average annual increase of 3.1% per annum over the next 10-years.

Notwithstanding network limitations which may result from new loads, such as in the Gladstone zone due to electrification of industry, Powerlink does not anticipate undertaking any significant augmentation works during this period based on load growth alone. However, the changing generation mix (and associated peak to average production ratios of VRE plant) may lead to increased constraints across critical grid sections. Powerlink will consider these potential constraints, including the effects of falling minimum demand, holistically with the emerging condition based drivers as part of the planning process and in conjunction with the most recent QEJP and ISP.

In Powerlink's Revenue Determination 2023-27[18], projects that could be triggered by the commitment of large mining or industrial block loads were identified as contingent projects. Contingent projects and their triggers are discussed in detail in Chapter 8.

6.5.1 Summary of forecast system security limitations within the next five years

Powerlink has identified that due to declining minimum demand, changing nature of load and increasing penetration of VRE generation, there is an emerging need for additional reactive plant in various zones in Queensland to manage potential over-voltages[19].

Table 6.2 summarises limitations identified in Powerlink's transmission network.

Table 6.2 Limitations in the five-year outlook period

Limitation	Zone	Reason for anticipated limitation	Time limitation may be reached			Reference
			1-year outlook (2024/25)	3-year outlook (up to 2027/28)	5-year outlook (up to 2029/30)	
System strength shortfall at Gin Gin	Central West	AEMO declared system strength shortfall December 2021	From 31 March 2023 (1)			Section 6.8.1
Inertia shortfall	State-wide	AEMO declared system strength shortfall December 2022		From 2027/28 (2)		Section 4.2.1

Notes:

(1) Refer to AEMO's December 2021 System Security Reports and Update to 2021 System Security Reports and Powerlink's Expression of Interest (EOI), Request for System Security Services in central, southern and the broader Queensland regions. Powerlink published a Final Report in December 2023 and has entered into a System Strength Services Agreement with the Townsville Power Station owner, Ratch Australia as discussed in Section 6.8.1.

(2) AEMO's December 2023 Inertia Report reduced the quantum and delayed the timing (by one year) of the previously identified inertia shortfall declared in December 2022 to 1,660MWs as discussed in Section 4.2.1.

Based on AEMO's Step Change scenario forecast there are no other network limitations forecast to occur in Queensland in the next five years[20].

[18] Information on Powerlink's Revenue Proposal for the regulatory period is available on Powerlink's website.
[19] Refer to NER Clause 5.12.2(c)(3).
[20] Refer to NER Clause 5.12.2(c)(3).

6.5.2 Summary of forecast network limitations beyond five years

The timing of forecast network limitations may be influenced by a number of factors such as load growth, industrial developments (including electrification of existing industrial processes), new and retiring generation, the planning standard and joint planning with other Network Service Providers (NSP). As a result, it is possible for the timing of forecast network limitations identified in a previous year's TAPR to change. However, there were no forecast network limitations identified in Powerlink's transmission network in the 2023 TAPR which fall into this category in 2024.

Based on Powerlink's Central scenario forecast there is approximately 1,000MW of additional load connected in the Gladstone zone by 2031. This load is associated with electrification of existing customers' processes. The impact of this additional load is discussed in sections 6.10.2 and 8.2.3.

6.6 Consultations

Consultation processes for proposed transmission investments and funded augmentations are conducted under the NER. These processes include:

- RIT-Ts
- Expressions of Interest (EOIs), and
- Funded augmentations.

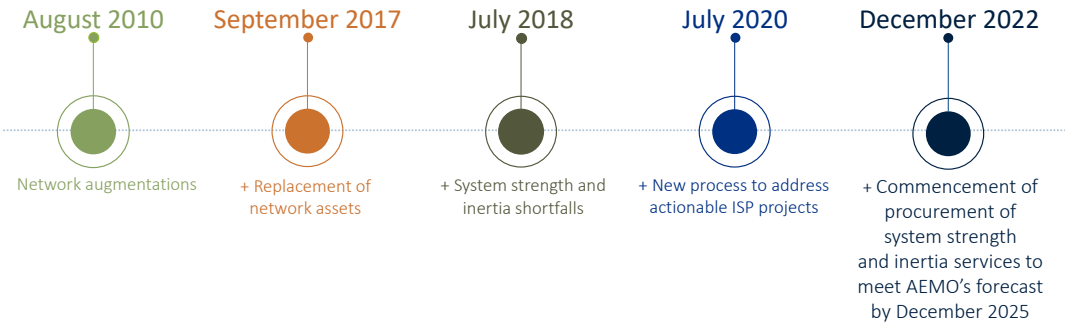
All consultation documents are published and made available on Powerlink's website.

Section 1.5.2 describes the PTI consultation process in relation to state-based planning and development under the ERTJ Act.

6.6.1 RIT-T consultation process

Since commencement of the RIT-T consultation process in 2010, the requirements to call for proposals for transmission investments over the RIT-T cost threshold (currently $7 million) have been incrementally extended to address a range of transmission investment needs (refer to Figure 6.2) and are progressed under the provisions of clauses 5.16.4 and 5.16A.4 of the NER.

Figure 6.2 Chronological development and expansion of the RIT-T process for proposed transmission network investments



6.6.2 Current consultations – proposed transmission investments

Powerlink carries out separate consultation processes for each proposed regulated transmission investment where the estimated capital cost of the most expensive credible option is over $7 million by utilising the applicable RIT-T consultation process. The majority of RIT-T consultations undertaken by Powerlink relate to projects which are not actionable ISP projects (refer to Figure 6.3).

Figure 6.3 Overview of the RIT-T consultation process for projects which are not actionable ISP projects

The consultations completed since publication of the 2023 TAPR are listed in Table 6.3 (refer to Table 9.7).

Table 6.3 RIT-T consultations completed since publication of the 2023 TAPR

Consultation
Maintaining power transfer capability and reliability of supply at Kemmis
Addressing the reliability of supply to Nebo local area
Addressing the secondary systems condition risks at Sumner

RIT-T consultations currently underway are listed in Table 6.4.

Table 6.4 RIT-T consultations currently underway

Consultation (1)	Reference
Addressing system strength requirements in Queensland from December 2025	Section 6.8.2
Maintaining reliability of supply to Mansfield	Section 6.11.5

PTI consultations currently underway are listed in Table 6.5.

Table 6.5 PTI consultations currently underway

Consultation (1)	Reference
Gladstone Project	Section 6.10.2

Note:

(1) The public consultations listed reflect the status as at 30 September 2024.

6.6.3 Future consultations – proposed transmission investments

Anticipated consultations

Notwithstanding consideration of the QEJP and power system security requirements, Powerlink's capital expenditure program of work in the 10-year outlook period will focus on investment in the transmission network to manage the risks arising from ageing assets remaining in-service. These emerging risks are discussed in Section 6.9 to 6.11. Table 6.6 summarises consultations Powerlink anticipates undertaking within the next 12 months under the RIT-T to address either the proposed investment in a network asset or limitation.

Table 6.6 Anticipated consultations in the forthcoming 12 months (to October 2025)

Consultation (1)	Reference
Maintaining reliability of supply to Kamerunga and Cairns northern beaches	Section 6.9.1
Maintaining reliability of supply and addressing condition risks at Ingham South	Section 6.9.2
Addressing the secondary systems condition risks of the Strathmore SVC	Section 6.9.3
Maintaining reliability of supply to Gladstone South	Section 6.10.2
Maintaining reliability of supply at Ashgrove	Section 6.11.5
Addressing the secondary systems condition risks at Molendinar	Section 6.11.6
Managing the risk of Trench Capacitive Voltage Transformer Failure	Section 6.12

Notes:

(1) The anticipated consultations listed in Table 6.6 reflect the RIT-T status as of 30 September 2024.

(2) Future candidate PTIs are discussed in the Queensland SuperGrid Infrastructure Blueprint and commencement of consultation is subject to government direction.

Actionable and future ISP projects

The 2024 ISP identified Queensland to New South Wales Interconnector (QNI) Connect as an 'actionable' project to support the expected increase in renewable generation in Queensland and New South Wales, and to share renewable energy and firming services between the states as a means of displacing high fuel cost generation with lower cost VRE generation (refer to Section 6.17.3). Powerlink and Transgrid are required to publish a Project Assessment Draft Report by 25 June 2026.

The 2024 ISP did not identify additional preparatory activities for any future ISP projects.

6.6.4 Connection point proposals

Planning of new or augmented connections involves consultation between Powerlink and the connecting party, determination of technical requirements and completion of connection agreements. New connections can result from joint planning with the relevant DNSP (Energex or Ergon Energy) or be initiated by generators or customers.

Table 6.7 lists connection works that are anticipated to be required within the 10-year outlook period.

Table 6.7 Connection point commitments (1)

Connection point name (2)	Proposal	Zone
Broadsound Solar Farm	New Solar Farm	Central West
Lotus Creek Wind Farm	New Wind Farm	Central West
Boulder Creek Wind Farm	New Wind Farm	Central West
Woolooga Battery energy storage system (BESS)	New BESS	Wide Bay
Western Downs BESS	New BESS	Bulli
Ulinda Park BESS	New BESS	Bulli
MacIntyre Wind Farm (3)	New Wind Farm	Bulli
Wambo Wind Farm Stage 2	New Wind Farm	South West
Greenbank BESS (3)	New BESS	Moreton

Notes:

(1) AEMO's definition of 'committed' from the System Strength Impact Assessment Guidelines Version 2.2 (effective 1 July 2024) has been adopted for connection point proposals identified in the TAPR. The connection point proposals listed are as at 9 October 2024.

(2) When Powerlink constructs a new line or substation as a non-regulated customer connection (e.g. conventional generator, renewable generator, mine or industrial development), the costs of acquiring easements, constructing and operating the transmission line and/or substation are paid for by the company making the connection request.

(3) The listed connection point commitment is in progress (refer to Table 9.2).

Table 6.8 summarises connection point activities[21] undertaken by Powerlink since publication of the 2023 TAPR. Powerlink has also received a record number of customer enquiries during 2023/24 (refer to Figure 6.4). Figure 6.5 shows the cumulative number of customer applications per month since publication of the 2023 TAPR. Further details on potential new generation connections are available in the relevant TAPR template located on Powerlink's TAPR portal as noted in Appendix E.

Table 6.8 Connection point activities

Generator Location	Number of Applications	Number of Connection Agreements	Generator Type and Technology
North	4	0	BESS
Central	14	3	Load, Wind Farm, Solar Farm and BESS
South	16	6	Load, Wind Farm, Solar Farm, BESS and Gas
Total	34	9	

[21] More broadly, key connection information in relation to the NEM can be found on AEMO's website.

Figure 6.4 Customer enquiries per month since publication of the 2023 TAPR

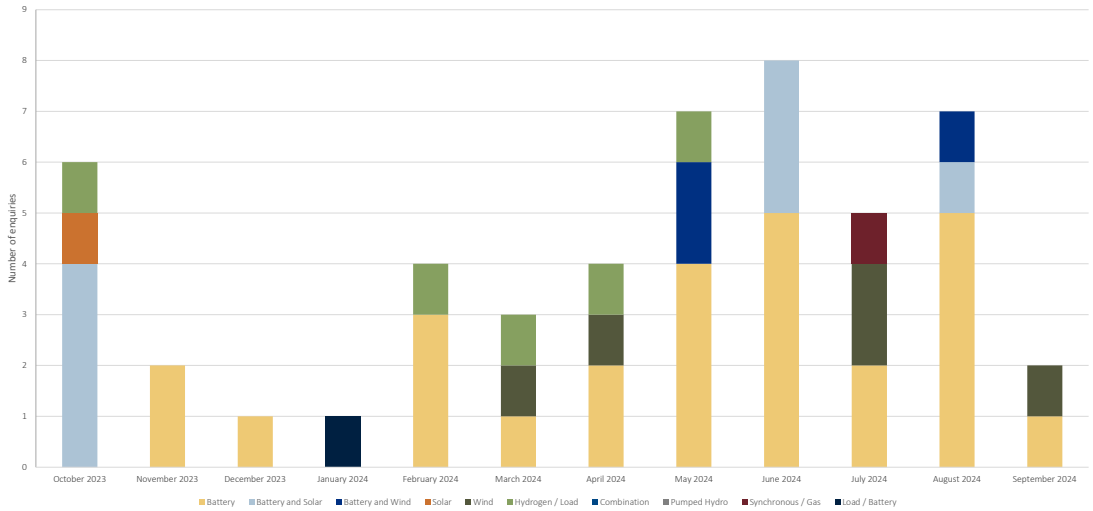
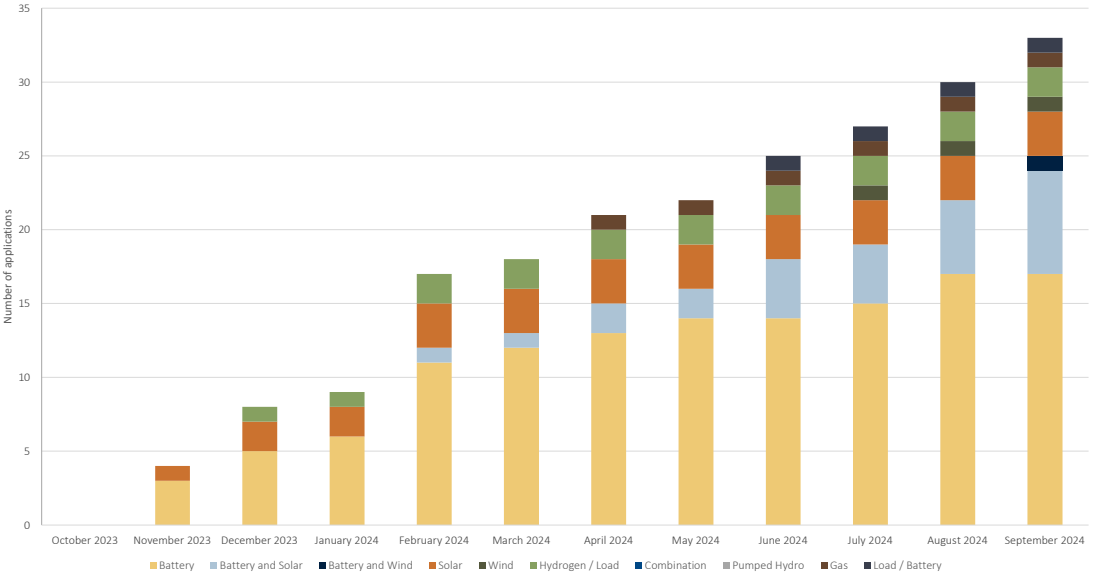


Figure 6.5 Cumulative customer applications per month since publication of the 2023 TAPR



6.7 Proposed network developments

Powerlink's regulated capital expenditure program of work will continue to focus on risks arising from the condition and performance of existing aged assets, as well as emerging limitations in the capability of the network as the external environment shifts to net zero emissions. Other than the Gladstone Project which commenced the PTI consultation process in July 2024, the proposed future network developments discussed in this chapter do not include investments in new transmission is needed under the energy transformation as discussed in the QEJP and set out in the Queensland SuperGrid Infrastructure Blueprint (Infrastructure Blueprint) released by the Queensland Government in September 2022 (refer to sections 2.2 to 2.5 and Chapter 8).

As the Queensland transmission network experienced considerable growth in the period from 1960 to 1980, there are a large number of transmission assets ranging from 40 to just beyond 60 years old. A number of these assets are approaching the end of their technical service life and investment in some form is required within the 10-year outlook period to manage risks related to safety, reliability and other factors.

In conjunction with condition assessments and risk identification, as assets approach their anticipated end of technical service life, possible investment options undergo detailed planning studies to confirm alignment with future investment, optimisation and delivery strategies. These studies enable Powerlink to:

- improve and further refine options under consideration
- identify other options from those originally specified, including a consideration of the broader energy transformation where appropriate, which may deliver a greater benefit to customers.

Information regarding possible investment alternatives, network limitations and anticipated timing is updated annually in the TAPR and includes discussion on significant changes which have occurred since publication of the previous year's TAPR.

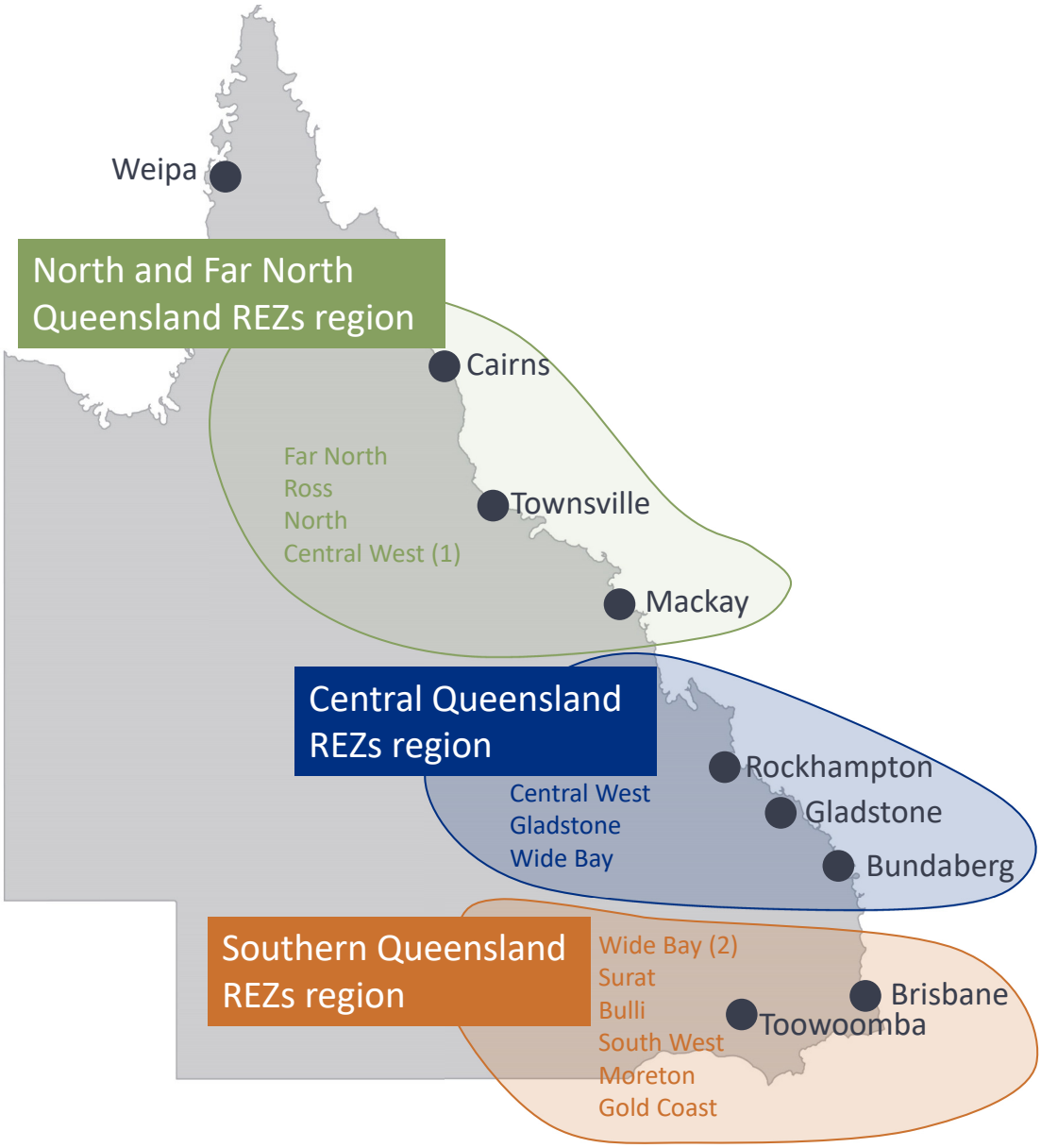
The indicative cost of potential projects identified in this chapter are updated each year to keep pace with external project cost increases being experienced broadly across many industries (refer to Section 6.4). Where there may be other factors materially influencing the updated indicative cost, such as a more granular view of condition and project scope, these factors are noted in the summary table in Appendix D which summarises all proposed network investments for the 10-year outlook period. It should be noted that the indicative cost of potential projects also excludes known and unknown contingencies.

Other than the outcomes set out in the 2023 System Security and Inertia Reports (refer to Section 6.8) and actionable projects identified in AEMO's 2024 ISP (refer to Section 6.17), based on the current information available, the possible network developments discussed in this chapter are not recommended or required as a result of the findings of the General Power System Risk Review and ISP. Powerlink also reviews the rating of assets throughout the transmission network periodically and has not identified any required asset de-ratings that would result in a system limitation as part of the 2024 annual planning review.

6.7.1 Geographical context

Powerlink has analysed investment needs and potential limitations across Powerlink's standard geographic zones (refer to sections 6.9 to 6.11). To provide geographical context, the reinvestment needs, and network limitations are broadly aligned with Queensland's renewable energy regions in Queensland, as shown in Figure 6.6.

Figure 6.6 Queensland's renewable energy regions



Notes:

(1) The Central West zone traverses the Northern and Central regions

(2) The Wide Bay zone traverses the Central and Southern regions

6.7.2 Investment context, timeframes and description

Powerlink's planning overview (10-year outlook period of the TAPR) considers a range of options to address identified needs. When considering the replacement of existing assets, in conjunction with the broader network topology and changing external environment, Powerlink may also identify potential network reconfigurations or other options to realise synergies and efficiencies in developing the transmission network which would be economically assessed under the RIT-T (if applicable).

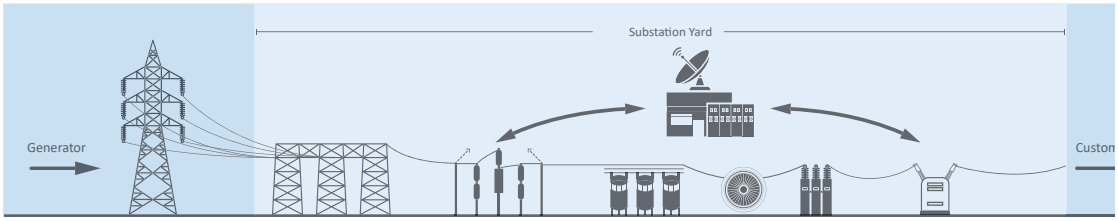
Information in relation to potential projects, alternatives and possible commissioning needs is revised annually based on the latest information available at the time of publication. Refer to Appendix D for the complete list of proposed network investments within the 10-year outlook period. Significant timing and cost differences are noted in the analysis of this program of work.

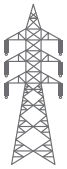
Possible network investments needs (which includes reinvestment, augmentations and/or the procurement of power system security services) likely to require RIT-T consultation within the five-year outlook period, from July 2024 to June 2030 are discussed in this Chapter. Where applicable PTI consultation is also discussed.

Powerlink takes a value-driven approach to the management of asset risks to ensure an appropriate balance between reliability and the cost of transmission services which ultimately benefits customers. Each year, taking the most recent assessment of asset condition and risk into consideration, Powerlink reviews possible commissioning dates and, where safe, technically feasible and prudent, capital expenditure is delayed. As a result, there may be timing variances between the possible commissioning dates identified in the 2023 TAPR and 2024 TAPR and TAPR Templates.

The functions performed by the major transmission network assets discussed in this chapter are illustrated in Figure 6.7.

Figure 6.7 The functions of major transmission assets





Transmission line

A transmission line consists of tower structures, high voltage conductors and insulators and transports bulk electricity via substations to distribution points that operate at lower voltages.

Substation

A substation, which is made up of primary plant, secondary systems, telecommunications equipment and buildings, connects two or more transmission lines to the transmission network and usually includes at least one transformer at the site.

A substation that connects to transmission lines, but does not include a transformer, is known as a switching station.

- Substation bay

  A substation bay connects and disconnects network assets during faults and also allows maintenance and repairs to occur. A typical substation bay is made up of a circuit breaker (opened to disconnect a network element), isolators and earth switches (to ensure that maintenance and repairs can be carried out safely), and equipment to monitor and control the bay components.

- Static VAR Compensator (SVC)

  A SVC is used where needed, to smooth voltage fluctuations, which may occur from time-to-time on the transmission network. This enables more power to be transferred on the transmission network and also assists in the control of voltage.

- Synchronous condenser

  A synchronous condenser is a large rotating machine connected to the transmission network with no driving force (spins freely). It is similar to a synchronous generator but does not produce energy. It helps the power system with voltage control, system strength, and inertia.

- Capacitor Bank

  A capacitor bank maintains voltage levels by improving the 'power factor'. This enables more power to be transferred on the transmission network.

- Transformer

  A transformer is used to change the voltage of the electricity flowing on the network. At the generation connection point, the voltage is 'stepped up' to transport higher levels of electricity at a higher voltage, usually 132kV or 275kV, along the transmission network. Typically at a distribution point, the voltage is 'stepped down' to allow the transfer of electricity to the distribution system, which operates at a lower voltage than the transmission network.

- Reactor

  Reactors may be connected directly to a transmission line or a bus at the substation. Line reactors are used to limit the remote end voltage of a long high voltage line when energising (and carrying no load). Bus reactors are typically higher rated and used especially during light load conditions to avoid high voltages which may occur on the network.

Secondary systems

Secondary systems equipment assists in the control, protection and safe operation of transmission assets that transfer electricity in the transmission network.

Telecommunication systems

Telecommunication systems are used to transfer a variety of data about the operation and security of the transmission network including metering data for AEMO.

6.8 Power system security requirements

6.8.1 Power system security services in central, southern and broader Queensland regions

AEMO and Powerlink are responsible for the planning and delivery of power system security services in Queensland. In December 2021 AEMO declared an immediate:

- Reliability and Security Ancillary Service (RSAS) gap of approximately 120 Megavolt Ampere absorbing reactive (MVAr) power in South East Queensland (SEQ), increasing to 250MVAr absorbing reactive power by 2026, and
- system strength shortfall of 44 to 65MVA at the Gin Gin system strength node for the period 2021/22 to 2026/27, against the minimum (post-contingency) three phase fault level of 2,250MVA at the node[22].

Powerlink's final reports identified non-network solutions to address the AEMO declarations, specifically:

- a Network Support Agreement with CleanCo Queensland for the operation of CleanCo's Wivenhoe Pumped Hydro Power Station to absorb reactive power, and
- the addition of a clutch to the Townsville Power Station, owned by Ratch Australia, by mid-2025 to meet the system strength shortfall[23].

6.8.2 Addressing system strength requirements in Queensland from December 2025

In October 2021, the Australian Energy Market Commission (AEMC) made the Efficient Management of System Strength on the Power System Rule (System Strength Rule)[24]. The System Strength Rule:

- evolved the 'do no harm' framework which required connecting generators to self-assess their impact on the local network's system strength levels, and self-remediate any adverse impacts, and
- established a new framework for the supply and demand of system strength in the National Electricity Market (NEM).

As of 2 December 2022, Powerlink, as the System Strength Service Provider (SSSP) in Queensland, is required to take action to plan, procure and make available system strength services as set out in the 10-year forecast provided in AEMO's annual System Strength Reports[25].

AEMO published the first System Strength Report under the new framework in December 2022. The report set minimum three phase fault level requirements, and provided a 10-year forecast of utility-scale inverter-based resource (IBR) generation, for each of Queensland's five system strength nodes[26]. Powerlink must meet minimum fault level requirements by December 2025, and procure system strength to meet the efficient level of IBR in the 10-year forecast. In March 2023, Powerlink commenced the RIT-T process, publishing a Project Specification Consultation Report (PSCR). The PSCR sought to identify solutions to meet the minimum and efficient fault levels of system strength.

To replicate dispatch that has historically met minimum fault level requirements, and deliver sufficient system strength to meet the minimum system strength requirements identified by AEMO, the PSCR indicated Powerlink sought:

- seven synchronous machines or equivalent plant online in Central Queensland, in the order of 350MVA each
- two hydro-electric machines or equivalent plant in North Queensland, in the order of 20MVA each
- four synchronous machines or equivalent plant online in Southern Queensland, in the order of 400MVA each.

To meet efficient system strength requirements, Powerlink estimated that up to a further eight synchronous machines or equivalent plant are required within the 10-year outlook period, comprising four by 2030, and four by 2033.

22 AEMO, 2021 System Security Reports, December 2021.
23 Powerlink, Power System Security Consultations.
24 AEMC, Efficient Management of System Strength on the Power System, October 2021.
25 Refer to Schedule 5.1.14 of the NER.
26 AEMO, 2022 System Strength Report, December 2022.

The PSCR proposed two credible options to address the minimum and efficient levels of system strength:

- seek to procure system strength services to meet the identified need in its entirety for both the minimum and efficient levels of system strength
- hybrid solution to procure system strength services together with the installation and commissioning of up to eight 200MVA synchronous condensers (network component) for both the minimum and efficient levels of system strength required by December 2030. The number of synchronous condensers actually required would depend on Powerlink's assessment of submissions received to the PSCR. The PSCR provided an indicative capital cost of the network component of this option of up to $752 million (2023/24 prices). Annual operating and maintenance costs were anticipated to be up to approximately $15 million (2023/24 prices).

For both options, Powerlink indicated system strength services would need to be able to commence availability in the period between December 2025 and December 2030.

The PSCR also noted the potential for the credible options to have a material inter-network[27] impact by increasing the fault level by at least 10MVA on the Queensland to New South Wales Interconnector.

Submissions to the PSCR closed in July 2023 and since that time Powerlink has been working with proponents of non-network solutions to inform the technical and economic analysis for the optimal portfolio of solutions anticipated to be required. Powerlink will publish the Project Assessment Draft Report (PADR) in November 2024, which will identify the proposed preferred option to provide minimum and efficient levels of system strength.

6.9 North and Far North region

The North and Far North region includes proposed network investments located within the Far North, Ross and North zones and broadly aligns with the North and Far North Queensland REZs region stretching between Mackay and Cairns, encompassing the northern most extent of Powerlink's transmission network (refer to Figure 6.6). The North and Far North region also includes a number of candidate REZ areas in North and Far North Queensland identified in the Queensland Renewable Energy Zone Roadmap and the 2024 ISP optimal development pathway.

6.9.1 Far North zone

Existing network

The Far North zone is supplied by a 275kV transmission network with major injection points at Chalumbin, Tully South and Woree, and a coastal 132kV network from Yabulu South to Woree. This network supplies the Ergon Energy distribution network feeding the surrounding areas of Turkinje and Cairns, from Tully to Cooktown. The network also connects various renewable generators including the hydro power stations at Barron Gorge and Kareeya, Mt Emerald Wind Farm near Walkamin and Kaban Wind Farm near Tumoulin (refer to Figure 6.8).

[27] Refer to NER rule 5.21.

Figure 6.8 Far North zone transmission network

Possible load driven limitations

Based on Powerlink's Central scenario forecast, there is no additional capacity forecast to be required as a result of load driven network limitations in the Far North zone within the next five years to meet reliability obligations.

Existing and committed generation and connection applications

Table 6.9 lists existing generators connected to the Powerlink transmission network in the Far North zone.

Table 6.9 Existing generators in the Far North zone

Name	Technology	Capacity (MW) (1)
Barron Gorge	Hydro-electric	66
Kareeya (including Koombooloomba)	Hydro-electric	93
Mt Emerald Wind Farm	Wind	180
Kaban Wind Farm	Wind	152

Note:

(1) Capacity listed for existing generation as expected over summer 2024/25.

Possible network investments within five years

Network investments (which include reinvestments and augmentations) in the Far North zone are related to addressing the risks arising from the condition of the existing network assets which, without corrective action, could result in Powerlink being exposed to breaching a number of its jurisdictional network, safety, environmental and NER obligations.

By addressing the condition of these assets, Powerlink is seeking to ensure it can deliver a safe, cost effective and reliable supply of electricity to customers in the Far North zone into the future. This may result in like-for-like replacement, non-network solutions, network reconfiguration, asset retirement, line refit or replacement with an asset of lower capacity.

Joint RIT-T consultation – Maintaining reliability of supply to Kamerunga and Cairns northern beaches area

Woree to Kamerunga 132kV transmission lines and Kamerunga 132/22kV Substation

Anticipated joint RIT-T consultation with Ergon Energy	
Asset details	Transmission line constructed in 1963 Life extension in 2014 on certain components nearing end of technical service life Kamerunga Substation established in 1976
Project driver	Transmission line - emerging condition risks due to structural corrosion Substation – emerging condition, obsolescence and compliance risks on 132kV primary plant and secondary systems and risks related to a potential future flood event
Project timing	December 2028
Proposed network solution	Rebuild the existing double circuit transmission line with a new double circuit transmission line (overhead/underground alignment) from Woree to Kamerunga substations and associated Ergon works Replacement of primary plant including additional switching functionality and secondary systems upfront with AIS technology on an adjacent substation site at Kamerunga and associated Ergon works Construction of a new building to contain 22kV primary and secondary systems by December 2028 at an estimated cost of $200 million
Possible non-network solutions	Potential non-network solutions would need to provide supply to the 22kV network of up to a peak 70MW, and up to a peak 1,200MWh per day on a continuous basis. This transmission line also facilitates the Barron Gorge Hydro Power Station connection in the area

The Woree to Kamerunga 132kV double circuit transmission lines, provides critical supply to the Cairns northern beaches region, as well as connecting the Barron Gorge Hydro Power Station to the transmission network. A significant proportion of the transmission line traverses built-up residential areas, including a significant number of encroachments on the existing feeder easement. There are a number of major and minor road crossings causing access and construction work challenges. Replacement on a new easement has potential construction and social benefits with investigations for easement alternatives currently underway.

Kamerunga Substation is located in western Cairns and provides bulk electricity supply to Ergon Energy's distribution network in the northern Cairns region which includes Kamerunga, Smithfield and the northern beach areas, and also provides connection to the Barron Gorge Power Station. The area surrounding the substation is residential and located along the flood plain of the Barron River.

In August 2019, Powerlink published a Project Assessment Conclusions Report (PACR) to address the emerging condition risks at Kamerunga Substation. Based on information received subsequent to the conclusion of the consultation process, Powerlink has identified a material change in circumstances[28] which has resulted in the identification of an additional credible option not assessed under the RIT-T and significant cost increases across all options. This has resulted in a change to the preferred option recommended in the PACR requiring reapplication of the RIT-T.

Given this change and the network requirements in the area to address the emerging transmission line structural corrosion risks between Woree and Kamerunga substations in a similar timeframe, Powerlink is undertaking a RIT-T which captures the broader network need in the Kamerunga, Cairns and northern beaches area[29].

Possible network solutions

- Maintaining the existing 132kV network topology by replacing the existing double circuit transmission line with a new double circuit transmission line from Woree and Kamerunga substations by December 2028
- Replacement of primary plant including additional switching functionality and secondary systems upfront with AIS technology on an adjacent substation site by December 2028, and
- Construction of a new building to contain 22kV primary and secondary systems by December 2028.

or

[28] Refer to NER Clause 5.16.4(z3).
[29] Refer to NER Clause 5.16.3(e).

- Replacing the existing 132kV double circuit transmission line with a new double circuit 132kV transmission line, part underground on a new alignment, and part overhead from Woree and Kamerunga substations by December 2028
- Establish a new substation to replace existing primary plant including additional switching functionality with AIS technology and secondary systems on an adjacent site by December 2028, and
- Construction of a new building to contain 22kV primary plant and secondary systems by December 2028.

As a joint planning project with Ergon Energy (Ergon), and given the credible options identified include potential works by Ergon over the Regulatory Investment Test for Distribution (RIT-D) minimum cost threshold (currently $6 million), this RIT-T is also being undertaken to discharge Ergon from its obligation to undertake a RIT-D[30].

Powerlink considers the proposed network solution will not have a material inter-network impact.

Transmission lines

Ross to Chalumbin to Woree 275kV transmission lines

Potential consultation	Maintaining reliability of supply in the Cairns region Stage 2 - Addressing the condition risks of the transmission towers between Ross and Chalumbin
Asset details	Constructed in 1989
Project driver	Emerging condition risks due to structural corrosion
Project timing	June 2029
Proposed network solution	Refit the double circuit transmission line between Ross (via Guybal Munjan) and Chalumbin substations, at an estimated cost of $35 million by June 2029
Possible non-network solutions	The Ross to Chalumbin transmission lines provide injection to the north area of close to 400MW at peak and up to 3,000MWh per day. The network configuration also facilitates generator connections in the area and provides system strength and voltage support for the region.

Although renewable generation in Far North Queensland is increasingly suppling load in the Cairns region (refer to Figure 7.11), the 275kV and 132kV transmission system plays a critical role in maintaining reliability of supply by connecting generation in Central and North Queensland to this region.

Remote supply to the Cairns region is delivered through the inland 275kV network to Ross, near Townsville. From Ross it is transferred via a 275kV transmission line to Chalumbin, continuing via a second 275kV transmission line from Chalumbin to the Woree Substation on the outskirts of Cairns[31]. These 275kV transmission lines also provide connections to the Mt Emerald Wind Farm, the Kaban Wind Farm and Kareeya Power Station. As a result of the funded augmentation consultation undertaken by Powerlink to facilitate the development of Stage 1 of the Far North Queensland REZ, a third 275kV connection into Woree Substation was energised in June 2024, with the remaining works at Tully and Yabulu South substations expected to be completed by December 2024.

Due to environmental sensitivities and geographic conditions in the Cairns region, to ensure reliability of supply to customers, the delivery of the required renewal works will be complex and need to be completed outside of summer peak load and the wet season.

The double circuit 275kV transmission lines between Ross and Chalumbin (via Guybal Munjan) substations is 244km in length and comprises 528 steel lattice towers. The line traverses the rugged terrain of the northern Queensland tropical rainforest, passing through environmentally sensitive, protected areas and crossing numerous regional roads and rivers. This section of the transmission line is deteriorating at a slower rate than assets on the Chalumbin to Woree section due to its location on the western side of the Great Dividing Range.

30 Refer to NER Clause 5.14.1(e).

31 In June 2022 Powerlink completed the RIT-T, Maintaining Reliability of Supply in the Cairns region Stage 1 to address the more complex and advanced condition risks of the transmission towers between Davies Creek and Bayview Heights which form part of Chalumbin to Woree section of the transmission line (refer to Table 9.5).

Powerlink considers the proposed network solution will not have a material inter-network impact.

Substations

Chalumbin 275/132kV Substation

Anticipated consultation	Maintaining reliability of supply at Chalumbin
Asset details	Established in 1988
Project driver	Condition driven replacement to address risks on 275/132kV primary plant
Project timing	June 2028
Proposed network solution	Selective 275/132kV primary plant replacement at an estimated cost of $9 million by June 2028
Possible non-network solutions	Powerlink is not aware of any non-network proposals that can address this requirement in its entirety. Potential non-network options would need to provide supply to the 132kV network of up to a peak 100MW, and up to a peak 965MWh per day on a continuous basis.

Chalumbin Substation is a major substation in the 275kV power transfer corridor between Ross and Far North zones and provides supply to the local 132kV network in the Cairns and Atherton tablelands regions.

Possible network solutions

- Replacement of all 275/132kV primary plant by June 2028
- Selective replacement of 275/132kV primary plant by June 2028.

Powerlink considers the proposed network solution will not have a material inter-network impact.

Possible asset retirements in the 10-year outlook period[32]

Retirement of the 132kV transmission lines between Chalumbin and Turkinje substations.

Condition assessment has identified emerging condition risks arising from the condition of the 132kV transmission line between Chalumbin and Turkinje around 2030. At this time, an option would be to establish a 275kV substation and cut into an existing 275kV circuit between Chalumbin and Woree substations. Should this option proceed, there will be an opportunity to retire the existing 132kV transmission line from Chalumbin to Turkinje substations.

Refer to Table 6.21 for possible asset retirements beyond the 10-year outlook period.

6.9.2 Ross zone

Existing network

The 132kV network between Collinsville and Townsville was developed in the 1960s and 1970s to supply mining, commercial and residential loads. The 275kV network within the zone was developed more than a decade later to reinforce supply into Townsville and Far North Queensland. Parts of the 132kV network are located closer to the coast in a high salt laden wind environment leading to accelerated structural corrosion. Townsville is supplied by a 132kV transmission network to the south and west of the greater load area providing supply to Ergon Energy's 66kV distribution network. Connection points are located at the Townsville South 132/66kV, Townsville East 132/66kV, Dan Gleeson 132/66kV, Garbutt 132/66kV, and Alan Sherriff 132/11kV substations (refer to figures 6.9 and 6.10).

[32] Operational works, such as asset retirements, do not form part of Powerlink's capital expenditure budget.

Figure 6.9 Northern Ross zone transmission network

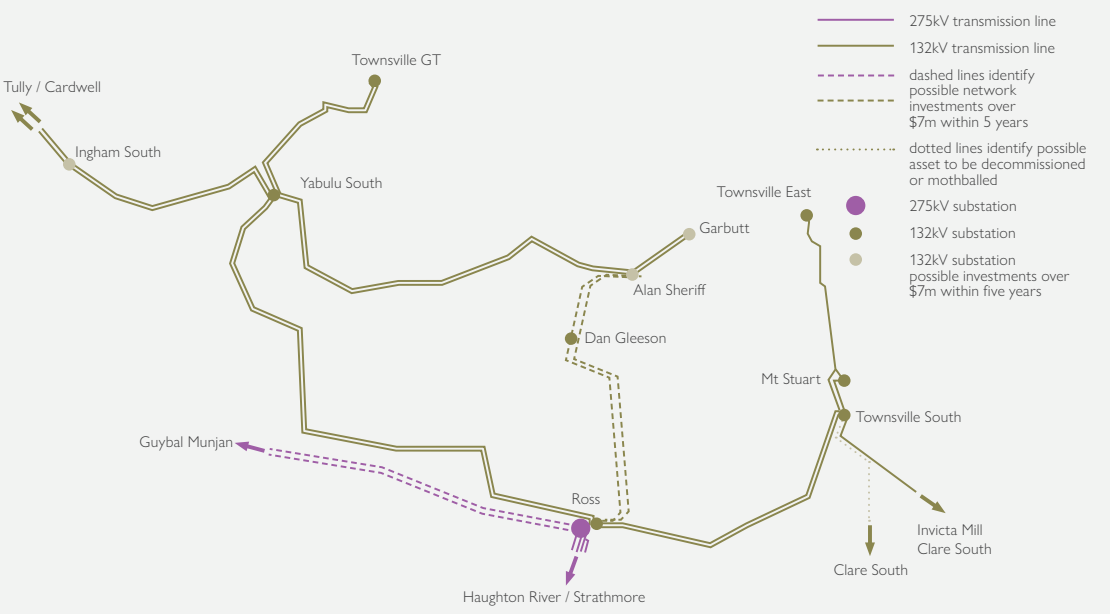


Figure 6.10 Southern Ross zone transmission network

Possible load driven limitations

Based on Powerlink's Central scenario forecast, there is no additional capacity forecast to be required as a result of load driven network limitations in the Ross zone within the next five years to meet reliability obligations.

Existing and committed generation and connection applications

Table 6.10 lists existing and committed generators or direct connect customers connected to the Powerlink transmission network and connection applications.

Table 6.10 Existing and committed generators or direct connect customers and connection applications in the Ross zone

Name	Status (1)	Technology	Capacity (MW) (2)	Forecast completion date
Townsville	Existing	Gas turbine	150	
Mt Stuart	Existing	Gas turbine	387	
Clare	Existing	Solar PV	100	
Haughton	Existing	Solar PV	100	
Ross River	Existing	Solar PV	116	
Sun Metals	Existing	Solar PV	121	
Kidston Pumped Hydro Storage	Committed	Hydro-electric	250	2025
Yabulu Battery Energy Storage System (BESS)	Application	BESS	200	2025
Mt Fox Energy Park BESS	Application	BESS	300	2026
Pinnacles BESS	Application	BESS	400	2027
Burdekin BESS	Application	BESS	500	2027
Pacific Hydro - Haughton BESS	Application	BESS	200	2027
Yabulu Solar PV Farm	Application	Solar PV	75	2025
Pacific Hydro - Haughton SF - Stage 2	Application	Solar PV	300	2027
Gawara Baya (Upper Burdekin Wind Farm)	Application	Wind	400	2026
Mt Fox Energy Park Wind Farm	Application	Wind	291	2026
Kidston Wind Farm	Application	Wind	204	2026

Notes:

(1) Application information is sourced from AEMO's Key Connection Information Data File August 2024.

(2) Capacity listed for existing generation as expected over summer 2024/25.

Possible network investments within five years

Network investments (which includes reinvestment and augmentations) in the Ross zone are related to addressing the risks arising from the condition of the existing network assets, which without corrective action, would result in Powerlink being exposed to breaching a number of its jurisdictional network, safety, environmental and NER obligations.

By addressing the condition of these existing assets, Powerlink is seeking to ensure it can safely deliver an adequate, economic, and reliable supply of electricity to meet the load requirements of customers in the Ross zone into the future. This may result in like-for-like replacement, non-network solutions, network reconfiguration, asset retirement, line refit or replacement with an asset of lower capacity.

Transmission lines

Ross to Dan Gleeson 132kV transmission line

Potential consultation	Maintaining reliability of supply to between Ross and Dan Gleeson
Asset details	Constructed in 1963 and operates in an aggressive tropical coast environment
Project driver	Emerging condition risks due to structural corrosion
Project timing	June 2028
Proposed network solution	Refit of the transmission line between Ross and Dan Gleeson substations, at an estimated cost of $8 million by June 2028
Possible non-network solutions	The Ross to Dan Gleeson transmission lines provide part of the injection to the Townsville Central Business area. Potential non-network solutions would need to provide equivalent support of close to 130MW at peak and up to 800MWh per day.

Electricity supply to the Townsville Central Business District is provided from Ross Substation by 132kV transmission lines to Dan Gleeson, Alan Sherriff and Garbutt substations.

Possible network solutions

- Line refit works on steel lattice structures by June 2028
- Rebuild the 132kV transmission line between Ross and Dan Gleeson substations by June 2028.

Powerlink considers the proposed network solution will not have a material inter-network impact.

Substations

Ingham South 132kV Substation

Anticipated consultation	Maintaining reliability of supply and addressing condition risks at Ingham South
Asset details	Established in 2005
Project driver	Condition driven replacement to address emerging obsolescence and compliance risks on 132kV primary plant and secondary systems
Project timing	December 2027
Proposed network solution	Full replacement of primary plant and secondary systems at an estimated cost of $27 million by December 2027
Possible non-network solutions	Potential non-network solutions would need to provide supply to the 66kV network at Ingham South of up to 20MW and up to 280MWh per day. The non-network solution would be required for a contingency and to be able to operate on a continuous basis until normal supply is restored. Supply would also be required for planned outages.

Ingham South Substation is a major injection point into Ergon Energy's 66kV distribution network providing supply to Ingham and the surrounding area.

Possible network solutions

- In-situ replacement of primary plant and secondary systems by December 2027
- Minimum extension of the substation platform to replace primary plant and secondary systems by December 2027.

Powerlink considers the proposed network solution will not have a material inter-network impact.

Garbutt 132kV Substation

Anticipated consultation	Addressing the secondary systems condition risks at Garbutt
Asset details	Established in late 1950s, last replacement in 2004
Project driver	Condition driven replacement to address emerging obsolescence and compliance risks on 132kV secondary systems
Project timing	June 2027
Proposed network solution	Full replacement of primary plant and secondary systems at an estimated cost of $10 million by June 2027
Possible non-network solutions	Potential non-network solutions would need to provide supply to the 66kV network at Garbutt Substation of up to 120MW and up to 860MWh per day. The non-network solution would be required for a contingency and to be able to operate on a continuous basis until normal supply is restored. Supply would also be required for planned outages.

Garbutt Substation is a major injection point into Ergon Energy's 66kV distribution network providing supply to the Townsville area.

Possible network solutions

- In-situ replacement of secondary systems by June 2027
- Full secondary systems replacement by June 2027.

Powerlink considers the proposed network solution will not have a material inter-network impact.

Alan Sherriff 132kV Substation

132kV secondary systems replacement

Anticipated consultation	Addressing the secondary systems condition risks at Alan Sherriff
Asset details	Established in 2002
Project driver	Condition driven replacement to address emerging obsolescence and compliance risks on 132kV secondary systems
Project timing	June 2027
Proposed network solution	Full replacement of primary plant and secondary systems at an estimated cost of $14 million by June 2027
Possible non-network solutions	Potential non-network solutions would need to provide supply to the 66kV network at Alan Sherriff of up to 35MW and up to 225MWh per day. The non-network solution would be required for a contingency and to be able to operate on a continuous basis until normal supply is restored. Supply would also be required for planned outages.

Alan Sherriff Substation is a major injection point into Ergon Energy's 11kV distribution network providing supply to the Townsville area.

Possible network solutions may include:

- In-situ replacement of secondary systems by June 2027
- Full secondary systems replacement by June 2027.

Powerlink considers the proposed network solution will not have a material inter-network impact.

Possible asset retirements within the 10-year outlook period

Current planning analysis has not identified any potential asset retirements in the Ross zone within the 10-year outlook period. Refer to Table 6.21 for possible asset retirements beyond the 10-year outlook period.

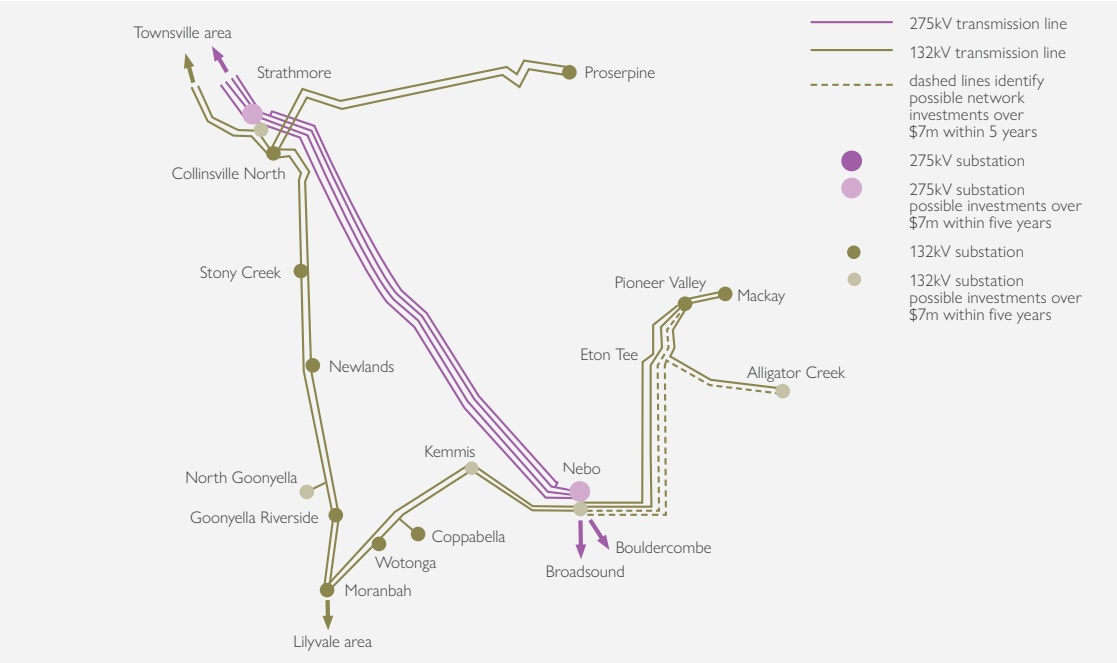
6.9.3 North zone

Existing network

Three 275kV circuits between Nebo (in the south) and Strathmore (in the north) substations form part of the 275kV transmission network supplying the North zone. Double circuit inland and coastal 132kV transmission lines supply regional centres and infrastructure related to mines, coal haulage and ports arising from the Bowen Basin mines (refer to Figure 6.11).

The coastal network in this zone is characterised by transmission line infrastructure in a corrosive environment which make it susceptible to premature ageing.

Figure 6.11 North zone transmission network



Possible load driven limitations

Powerlink's Central scenario forecast has approximately 100MW of additional load connected in the Northern Bowen Basin by 2033. This is associated with load increases on EQL's network and from Powerlink's direct connected customers. Taking into consideration the risks associated with the condition of the ageing network assets in the Northern Bowen Basin, and the magnitude and location of load, possible network options to, and within the Northern Bowen Basin may include:

- Installation of flow control devices on the 132kV network to improve the sharing of power flow in the Bowen Basin within the capability of the existing transmission assets
- Construction of new 132kV transmission lines between the Nebo, Broadlea and Peak Downs areas
- Construction of 132kV transmission line between Moranbah and a future substation north of Moranbah
- Advance the rebuild of the 132kV transmission lines that supply the Northern Bowen Basin area as higher capacity 132kV lines with associated capacitive compensation for voltage control. The existing 132kV lines are forecast to reach their end of technical service in the 2040s.

Powerlink will undertake further planning studies and provide an update in the 2025 TAPR, which may identify the need to undertake a RIT-T.

High voltages associated with light load and low power transfer conditions are currently managed with existing reactive sources. As a result, voltage control is forecast to become increasingly challenging for longer durations. This is discussed in Section 7.6.2.

Existing and committed generation and connection applications

Table 6.11 lists existing generators connected to the Powerlink transmission network and connection applications in the North zone.

Table 6.11 Existing generators and connection applications in the North zone

Name	Status (1)	Technology	Capacity (MW) (2)	Forecast completion date
Daydream	Existing	Solar PV	150	
Hamilton	Existing	Solar PV	57	
Hayman	Existing	Solar PV	50	
Whitsunday	Existing	Solar PV	57	
Rugby Run	Existing	Solar PV	65	
The Central BESS	Application	BESS	500	2026
Nebo BESS	Application	BESS	900	2028
Bowen Basin Sun Farm	Application	Solar PV	130	2026
Brampton Solar PV Farm	Application	Solar PV	58	2027

Notes:

(1) Application information is sourced from AEMO's Key Connection Information Data File August 2024.

(2) Capacity listed for existing generation as expected over summer 2024/25.

Possible network investments within five years

Network investments (which includes reinvestment and augmentations) in the North zone are related to addressing the risks arising from the condition of the existing network assets, which without corrective action, would result in Powerlink being exposed to breaching a number of its jurisdictional network, safety, environmental and NER obligations.

By addressing the condition of these existing assets, Powerlink is seeking to ensure it can safely deliver an adequate, economic, and reliable supply of electricity to meet the load requirements of customers in the North zone into the future. This may result in like-for-like replacement, non-network solutions, network reconfiguration, asset retirement, line refit or replacement with an asset of lower capacity.

Transmission lines

Nebo to Eton Tee 132kV transmission line

Potential consultation	Maintaining reliability of supply in the Nebo area
Asset details	Constructed in 1977
Project driver	Emerging condition risks due to structural corrosion
Project timing	December 2027
Proposed network solution	Refit the transmission line between Nebo Substation and Eton Tee, at an estimated cost of $31 million by December 2027
Possible non-network solutions	The Nebo to Eton Tee transmission lines provides part of the injection to the Mackay area. A non-network solution would need to supply close to 80MW at peak and up to 200MWh per day.

Nebo Substation forms part of the interconnected 275kV network between Gladstone and North Queensland and is a transformation point to 132kV, to allow supply to local mining and domestic loads in the Central Queensland area. The establishment of Alligator Creek Substation in 1982 resulted in one circuit in and out at the Eton Tee point, followed by a reconfiguration in 2007 when Pioneer Valley Substation was established.

Possible network solutions

- Line refit works on steel lattice structures between Nebo Substation and Eton Tee by December 2027
- Rebuild the 132kV transmission line between Nebo Substation and Eton Tee by December 2027.

Powerlink considers the proposed network solution will not have a material inter-network impact.

Substations

Strathmore 275/132kV Substation

Anticipated consultation	Addressing the Static VAr Compensator (SVC) secondary systems condition risks at Strathmore
Asset details	Established in 2007
Project driver	SVC secondary systems condition risks at Strathmore Substation
Project timing	June 2026
Proposed network solution	Full replacement of secondary systems associated with the SVC at Strathmore at an estimated cost of $12 million by June 2026
Proposed non-network solutions	Potential non-network solutions would need to provide dynamic voltage support of up to 260MVAr capacitive and 80MVArs inductive.

Strathmore Substation is a major injection point to supply Ergon Energy's distribution network and Powerlink's direct connected customers in the Northern Bowen Basin.

Possible network solutions may include:

- Secondary systems replacement while retaining the existing thyristor valves and SVC cooling system by June 2026
- Secondary systems replacement and replacing the thyristor valves including associated cooling system by June 2026.

Powerlink considers the proposed network solution will not have a material inter-network impact.

Nebo 275/132kV Substation

Anticipated consultation	Addressing the Static VAr Compensator (SVC) primary plant and SVC transformer condition risks at Nebo
Asset details	Established in 1987
Project driver	SVC primary plant and SVC transformer condition risks at Nebo Substation
Project timing	December 2029
Proposed network solution	Full replacement of primary plant and transformer associated with the SVC at Nebo at an estimated cost of $8 million by December 2029
Proposed non-network solutions	Potential non-network solutions would need to provide dynamic voltage support of up to 260MVAr capacitive and 80MVArs inductive.

Nebo Substation forms part of the interconnected 275kV network between Gladstone and North Queensland and is a transformation point to 132kV, to allow supply to local mining and domestic loads in the Central Queensland area.

Possible network solutions

- Selected replacement of SVC 275kV primary plant and associated transformer by December 2029
- Full replacement of SVC 275kV primary plant and associated transformer by December 2029.

Powerlink considers the proposed network solution will not have a material inter-network impact.

Possible asset retirements within the 10-year outlook period

Pioneer Valley to Eton tee 132kV transmission line

Subject to the outcome of further analysis, Powerlink may retire this inland transmission line at the end of its service life anticipated around 2028. Should it proceed, the retirement will also result in the 132kV network reconfiguration from Nebo to Pioneer Valley and Alligator Creek substations, essentially creating a separate double circuit line into each substation.

Refer to Table 6.21 for possible asset retirements beyond the 10-year outlook period and Table 9.8 for confirmed asset retirements in the North zone.

6.10 Central region

The Central region includes proposed network investments located within the Central West and Gladstone zones that broadly align with the Central Queensland REZs region (refer to Figure 6.6). This region:

- hosts some of Powerlink's largest industrial customers together with significant coal-fired generation
- offers considerable opportunities for the development of new industries
- is pivotal to supply power to northern and southern Queensland
- plays a major role in supporting industry, rail systems and mines, and
- includes several potential future REZs to be developed in the next 10 years as outlined in the updated REZ Roadmap released in March 2024 (refer to Section 2.5.2).

The Central region has high quality solar and wind resources and long-term industrial and hydrogen production potential, as well as existing energy-intensive industries that are seeking to decarbonise through either electrification of existing processing facilities and/or conversion to loads powered by VRE generation. These factors, in combination with the anticipated reduced operation of existing coal-fired power stations, will significantly impact the transmission capacity required to maintain reliability of supply in the Gladstone zone and power system security. Powerlink anticipates that power transfers will reach the secure limits and result in network congestion (refer to Section 8.2.5).

The utilisation of the transmission network in the Central region depends on both the generation dispatch and supply and demand balance within the Central West and Gladstone zones, and northern and southern Queensland. In addition, the significant increase in VRE generation is changing the generation mix and impacting the operation of existing coal-fired generators within the region, which in turn, is further affecting the utilisation of existing transmission infrastructure. This has been most evident across the Central to North Queensland and Central to South Queensland grid sections and the Queensland to New South Wales Interconnector (QNI) (refer to sections 7.6.2, 7.6.5 and 7.6.10 respectively).

A shift in utilisation and material change in supply demand balance within the Gladstone zone has implications for investment in the transmission network. In July 2024, Powerlink commenced consultation on the Gladstone Project as a candidate Priority Transmission Investment (PTI) under the ERTJ Act (refer to Section 6.10.2).

Aligned with this need, the Gladstone Project has also been declared a Queensland Actionable Project in Australian Energy Market Operator's (AEMO) 2024 Integrated System Plan (ISP).

Potential future investments for the Central region are outlined in Section 8.2.5.

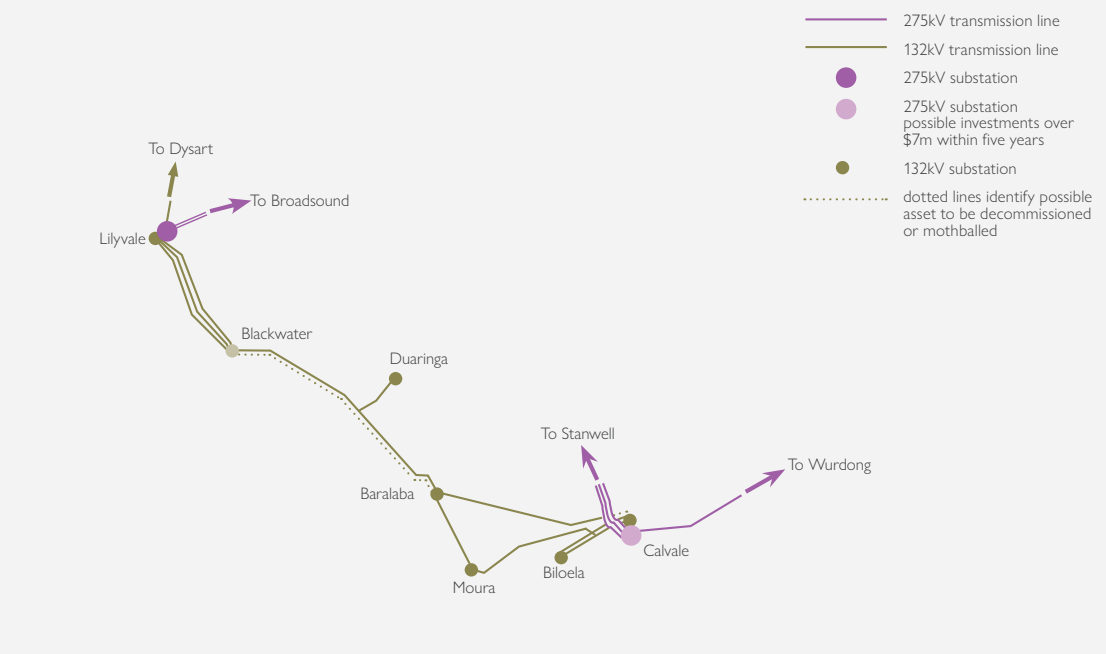
The investments outlined in Section 6.10 are based on Powerlink's Central scenario forecast in the 10-year outlook period. These requirements may result in the need for new investments that impact the proposed future network and non-network solutions identified in the geographical zones located within this region (refer to sections 6.10.1 to 6.11.1) and the Queensland SuperGrid Infrastructure Blueprint. Updates will be included in subsequent TAPR reviews.

6.10.1 Central West zone

Existing network

The Central West 132kV network was developed between the mid-1960s and late 1970s to meet the requirements of mining activity in the southern Bowen Basin. The 132kV injection points for the network are taken from Calvale and Lilyvale 275kV substations (refer to Figure 6.12). The network is located more than 150km from the coast in a dry environment, making infrastructure less susceptible to corrosion. As a result, transmission lines and substations in this region have met (and in many instances exceeded) their anticipated service life but will still require replacement or rebuilding in the near future.

Figure 6.12 Central West 132kV transmission network



Possible load driven limitations

Based on Powerlink's Central scenario forecast and the committed generation described in tables 7.1 and 7.2, there is no additional capacity forecast to be required in the Central West zone within the next five years to meet load driven reliability obligations. Discussions are continuing with potential large load customers in the area to firm up new load requirements.

Existing and committed generation and connection applications

Table 6.12 lists existing and committed generators connected to the Powerlink transmission network and connection applications.

Table 6.12 Existing and committed generators and connection applications in the Central West zone

Name	Status (1)	Technology	Capacity (MW) (2)	Timing
Stanwell	Existing	Coal-fired	1,460	
Callide B	Existing	Coal-fired	700	
Callide Power Plant	Existing	Coal-fired	868	
Moura	Existing	Solar PV	82	
Lilyvale Solar PV Farm	Existing	Solar PV	100	
Bouldercombe BESS	Existing	BESS	50	
Broadsound Solar PV Farm	Committed	Solar PV	296	2026
Clarke Creek	Committed	Wind	440	2025
Lotus Creek Wind Farm	Committed	Wind	276	2027
Boulder Creek	Committed	Wind	221	2027
Stanwell Power Station BESS	Application	BESS	350	2026
Moah Creek Solar Farm	Application	Solar PV	390	2028
Mount Hopeful Wind Farm	Application	Wind	350	2026
Specimen Hill Wind Farm	Application	Wind	323	2027
Banana Range Wind Farm	Application	Wind	480	2027
Blackwater Solar Farm and BESS	Application	Solar PV; BESS	270	2026
Boomer Green Energy Hub	Application	Wind; BESS	1,100	2027
Isaac Wind Farm- Clarke Creek Stage 2	Application	Wind	1,064	2028
Moah Creek Wind Farm	Application	Wind	415	2028

Notes:

(1) Application information is sourced from AEMO's Key Connection Information Data File August 2024.

(2) Capacity listed for existing generation over summer 2024/25.

Possible network investments within five years

Any forecast network investments in the Central West zone are related to addressing the risks arising from the condition of the existing network assets which, without corrective action, would result in Powerlink being exposed to breaching a number of its jurisdictional network, safety, environmental and Rules obligations.

By addressing the condition of these existing assets, Powerlink is seeking to ensure it can safely deliver an adequate, economic, and reliable supply of electricity to meet the load requirements of customers in the Central West zone into the future. This may result in like-for-like replacement, non-network solutions, network reconfiguration, asset retirement, line refit or replacement with an asset of lower capacity.

Transmission lines

Bouldercombe to Nebo 275kV transmission line

Anticipated consultation	Maintaining reliability of supply to North Queensland
Asset details	Constructed in 1980
Project driver	Emerging condition risks due to structural corrosion
Project timing	December 2026
Proposed network solution	Refit the single circuit transmission line between Bouldercombe and Nebo substations, at an estimated cost of $15 million by December 2026
Possible non-network solutions	Potential non-network solutions would need to provide supply to Nebo and North Queensland loads of up to 90MW on the network, and up to 450MWh per day on a continuous basis. It would also need to provide equivalent system strength services.
Other possible network solutions considered include:	Rebuild the 275kV transmission line between Bouldercombe and Nebo substations
Market Impacts	Powerlink considers the proposed network solution will not have a material inter-network impact.

The 275kV transmission line between Bouldercombe and Nebo forms part of the Central Queensland to North Queensland (CQ-NQ) transmission network supplying North Queensland and FNQ. Built Section 1132 between Funnel Creek and Bouldercombe Substation is in an elevated position and is exposed to high rainfall and salt laden winds.

Possible network solutions

- Line refit works on the 275kV transmission line between Bouldercombe and Nebo substations
- Rebuild the 275kV transmission line between Bouldercombe and Nebo substations.

Powerlink considers the proposed network solution will not have a material inter-network impact.

Substations

Calvale 275/132kV Substation

Potential consultation	Maintaining reliability of supply at Calvale
Asset details	Established in the mid-1980s
Project driver	Addressing the 275kV primary plant condition risks
Project timing	December 2027
Proposed network solution	Selected primary plant replacement at Calvale Substation at an estimated cost of $18 million by December 2027
Possible non-network solutions	Calvale Substation is also a major transmission node in Central Queensland connecting power flows between northern, central and southern Queensland. It also facilitates connection of Callide B and Callide C generation and proposed Callide REZ (refer to Section 2.5.4), and also provides voltage support for the region. Potential non-network solutions would need as a minimum, to provide, supply to Moura and Biloela loads of more than 100MW on the 132kV network, and up to 2,000MWh per day on a continuous basis.
Other possible network solutions considered include:	Full primary plant replacement by December 2029
Market Impacts	Powerlink considers the proposed network solution will not have a material inter-network impact

Calvale Substation is a critical part of the Central West Queensland transmission network and provides connection to Callide B and Callide C generators and the proposed Callide REZ.

Possible network solutions

- Selected primary plant replacement by December 2029
- Full primary plant replacement by December 2029.

Powerlink considers the proposed network solution will not have a material inter-network impact.

Broadsound 275kV Substation

Potential consultation	Maintaining reliability of supply at Broadsound
Asset details	Established in 1983. Further extensions have been made with additions of 275kV feeders to the West, South and North
Project driver	Addressing the 275kV primary plant condition risks
Project timing	June 2028
Proposed network solution	Selected primary plant replacement at Broadsound Substation at an estimated cost of $19 million by June 2028
Possible non-network solutions	Broadsound Substation is primarily a major transmission node connecting power flows between north and central Queensland. It is also the hub to Lilyvale and central west loads. Potential non-network solutions would need as a minimum, to provide supply to Lilyvale and Blackwater loads of up to 250MW, and up to 6,000MWh per day on a continuous basis.
Other possible network solutions considered include:	Full primary plant replacement by June 2028
Market Impacts	Powerlink considers the proposed network solution will not have a material inter-network impact

Possible network solutions

- Selected primary plant replacement by June 2028
- Full primary plant replacement by June 2028.

Possible asset retirements within the 10-year outlook period[33]

Calvale to Moura to Baralaba 132kV transmission lines

Subject to the outcome of further analysis and RIT-T consultation, a new 132kV double circuit transmission line may be constructed between Calvale and Moura substations due to a step change in load growth at Moura Substation or end of technical service life of the existing single circuit transmission lines within the 10-year outlook period. The reconfiguration would allow Powerlink to mothball the existing single circuit transmission lines between Calvale and Baralaba, and Baralaba and Moura substations, and the Baralaba Substation, at the end of their technical service lives and be retired from service.

Baralaba to Blackwater 132kV transmission line

The 132kV inland transmission line was constructed in the mid-1960s to support the loads in the Central West area and due to network reconfiguration has no enduring need. This transmission line is mothballed as part of the economic end of technical service life strategy and is energised from Blackwater Substation (and disconnected at the Baralaba Substation) for maintenance purposes. The transmission line may be repurposed or rebuilt in part to facilitate new connections to Blackwater Substation in the future.

Refer to Table 6.21 for possible asset retirements beyond the 10-year outlook period.

[33] Operational works, such as asset retirements, do not form part of Powerlink's capital expenditure budget.

6.10.2 Gladstone zone

Existing network

The Gladstone 275kV network was initially developed in the 1970s with the Gladstone Power Station and has evolved over time with the addition of the Wurdong Substation and 275kV supply into Boyne Smelters Limited in the early 1990s (refer to Figure 6.13).

Figure 6.13 Gladstone transmission network

Possible load driven limitations

Powerlink's Central scenario forecast (discussed in Chapter 3) has approximately 1,800MW of additional anticipated load connected in the Gladstone zone by 2031. This load is associated with electrification of a component of the existing industrial processes and early stages of hydrogen production within the area. While Powerlink has no commitment from any direct connect customers to electrify existing industrial process, Powerlink is engaging with customers that appear committed to decarbonising their existing fossil fuelled operations and processes, with some uncertainty over time frames. There has also been a significant number of enquiries for the connection of new industrial processing loads in the Gladstone zone (refer to Table 3.1 and Section 8.2.5).

With reduced operation of Gladstone Power Station as the electricity industry transforms to a lower carbon future, in combination with electrification of existing industrial processes and development of new industry load, there will be a significant impact on the transmission capacity required to maintain reliability of supply in the Gladstone zone and power system security.

In response to these emerging limitations, Powerlink commenced consultation on the Gladstone project PTI under the ERTJ Act. This consultation commenced in July 2024 and is being undertaken to ensure that on-going reliability and security of supply is available to meet forecast electrical load in the Gladstone area and support the decarbonisation of major industries in anticipation of the closure of the Gladstone Power Station (refer to Section 8.2.5).

Existing and committed generation and connection applications

Table 6.13 lists existing generators connected to the Powerlink transmission network and connection applications.

Table 6.13 Existing generators and connection applications in the Gladstone zone

Name	Status (1)	Technology	Capacity (MW) (2)	Timing
Gladstone	Existing	Coal-fired	1,680	
Yarwun	Existing	Gas turbine	160	
Aldoga BESS (Larcom Creek Facility 1 BESS)	Application	BESS	400	2025
Wurdong BESS	Application	BESS	150	2026
Miriam Vale Renewable Energy Hub	Application	Solar PV; BESS	400	2027
Eurimbula Hybrid Facility	Application	Solar PV; BESS	1,186	2027

Notes:

(1) Application information is sourced from AEMO's Key Connection Information Data File August 2024.

(2) Capacity listed for existing generation as expected over summer 2024/25.

Possible network investments within five years

Network investments (which includes reinvestment and augmentations) in Gladstone zone are related to addressing the risks arising from the condition of the existing network assets, which without corrective action, would result in Powerlink potentially breaching a number of its jurisdictional network, safety, environmental and NER obligations.

By addressing the condition of these existing assets, Powerlink is seeking to ensure it can deliver a safe, cost effective and reliable supply of electricity to meet the load requirements of customers in the Gladstone zone into the future. This may result in like-for-like replacement, non-network solutions, network reconfiguration, asset retirement, line refit or replacement with an asset of lower capacity.

Transmission lines

Calliope River to Gladstone South 132kV transmission lines

Anticipated consultation	Maintaining reliability of supply to Gladstone South
Asset details	Constructed in 1977
Project driver	Emerging condition risks due to structural corrosion
Project timing	June 2030
Proposed network solution	Rebuild the double circuit transmission line between Calliope River and Gladstone South substations, at an estimated cost of $53 million by June 2030
Possible non-network solutions	Potential non-network solutions would need to provide supply to the 132kV network at Gladstone South of up to 160MW at peak and up to 1,820MWh per day. The non-network solution would be required for a contingency and to be able to operate on a continuous basis until normal supply is restored. Supply would also be required for planned outages.

The Calliope River to Gladstone South 132kV double circuit transmission line facilitates supply to Gladstone South Substation which is an Ergon Energy bulk supply point and the connection point for Queensland Alumina Limited (QAL).

Possible network solutions

- Rebuild the 132kV transmission line between Calliope River and Gladstone South substations
- Line refit works on steel lattice structures.

In making this investment decision Powerlink will also take into account the possible decarbonisation of existing fossil fuelled operations and processes that are currently supplied from this network. This may impact the scale and configuration of the optimal network investment. These development plans will be reported in subsequent TAPRs as more certainty and commitment of these additional loads emerge.

Powerlink considers the proposed network solution will not have a material inter-network impact.

Possible asset retirements within the 10-year outlook period[34]

Callide A to Gladstone South 132kV transmission double circuit line

The 132kV transmission line was constructed in the mid-1960s to support the loads in the Gladstone area. Due to reconfiguration in the area, this transmission line will be retired from service at the end of technical service life within the 10-year outlook period.

Refer to Table 6.21 for possible asset retirements beyond the 10-year outlook period.

6.11 Southern region

The Southern region includes proposed network investments located within the Wide Bay, Surat, Bulli, South West, Moreton and Gold Coast zones and broadly aligns with the Southern Queensland REZs region (refer to Figure 6.6). The Southern region includes a diverse range of industries and large load centres with considerable opportunity to connect renewable energy resources to the transmission network. It also includes the Queensland section of QNI. The Southern region also includes a number of candidate REZ areas in southern Queensland identified in the updated REZ Roadmap (refer to Section 2.5.2) and 2024 ISP.

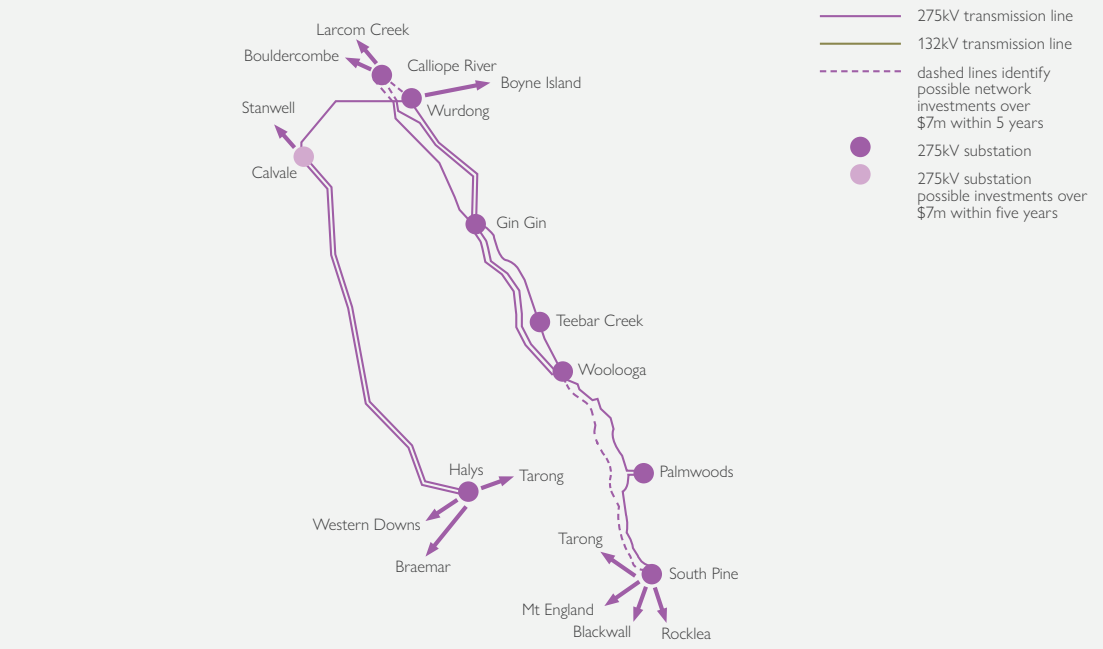
The investments outlined in Section 6.11 are based on Powerlink's Central scenario forecast in the 10-year outlook period. Given Powerlink's integrated planning approach, and the rapidly evolving environment of the energy transformation, these requirements may result in the need for new investments that impact the proposed future network and non-network solutions identified in the geographical zones located within this region (refer to sections 6.16 and 8.3), including the Queensland SuperGrid Infrastructure Blueprint and will be updated in subsequent reviews.

6.11.1 Wide Bay zone

Existing network

The Wide Bay zone supplies loads in the Bundaberg and Maryborough region and also forms part of Powerlink's eastern Central Queensland to South Queensland (CQ-SQ) transmission corridor. This corridor was constructed in the 1970s and 1980s and consists of single circuit 275kV transmission lines between Calliope River and South Pine (refer to Figure 6.14). These transmission lines traverse a variety of environmental conditions and as a result exhibit different corrosion rates and risk profiles.

Figure 6.14 CQ-SQ transmission network



[34] Operational works, such as asset retirements, do not form part of Powerlink's capital expenditure budget.

Possible load driven limitations

Based on Powerlink's Central scenario forecast discussed in Chapter 3, there is no additional load driven capacity forecast to be required in the Wide Bay zone within the next five years to meet reliability obligations.

Existing and committed generation and connection applications

Table 6.14 lists existing and committed generators connected to the Powerlink transmission network and connection applications.

Table 6.14 Existing and committed generators and connection applications in the Wide Bay zone

Name	Status (1)	Technology	Capacity (MW) (2)	Timing
Woolooga Energy Park	Existing	Solar PV	176	
Woolooga BESS	Committed	BESS	200	2025
Gin Gin BESS	Application	BESS	270	2026
Lower Wonga BESS	Application	BESS	200	2026
Teebar BESS	Application	BESS	400	2027
North Burnett Renewable Hub	Application	BESS	720	2027
Lower Wonga Solar Farm	Application	Solar PV	300	2025
Mt Rawdon Pump Hydro	Application	Hydro-electric	2,000	2029

Notes:

(1) Application information is sourced from AEMO's Key Connection Information Data File August 2024.

(2) Capacity listed for existing generation as expected over summer 2024/25.

Transmission network overview

In the NEM, generators compete for dispatch. Briefly, a generator's dispatch level depends on its bid in relation to other generators' bids, demand and available transmission capacity. Congestion occurs when transmission capacity prevents the optimum economic dispatch. Affected generators are said to be 'constrained' by the amount unable to be economically dispatched. Forecast of market constraint durations and levels are sensitive to highly uncertain variables including changes in bid behaviour, investment patterns, fuel cost dynamics, plant outages, weather conditions and demand levels. It is important to note that network congestion does not necessarily signal there is any load at risk or potential for loss of supply to customers.

In its current form, the CQ-SQ transmission network offers a great deal of flexibility for possible generation dispatches. However, it occasionally imposes constraints to market operation. In order for power from new and existing North Queensland (NQ) and Central Queensland (CQ) generating systems to make its way to southern Queensland and the southern states, it must be transferred through the CQ-SQ grid section. The utilisation may increase following the final releases of capacity associated with the commissioning of the QNI Minor project (refer to Section 6.14). In the future, pressure may build in transmitting power in a northerly direction with the advent of ubiquitous VRE and storage in SQ, providing supply to future expansive Gladstone demand (refer to Section 8.2.5).

Possible network investments within five years

Network investments (which includes reinvestment and augmentations) in the Wide Bay zone are related to addressing the risks arising from the condition of the existing network assets, which without corrective action, would result in Powerlink potentially breaching a number of its jurisdictional network, safety, environmental and Rules' obligations.

By addressing the condition of these existing assets, Powerlink is seeking to ensure it can safely deliver an adequate, economic, and reliable supply of electricity to meet the load requirements of customers in the Wide Bay zone into the future. This may result in like-for-like replacement, non-network solutions, network reconfiguration, asset retirement, line refit, augmentation or replacement with an asset of lower capacity.

Transmission Lines

CQ-SQ transmission lines

The 2024 ISP identified the Central to Southern Queensland network project as an actionable Queensland project (Queensland SuperGrid South) that is anticipated to progress under the Energy (Renewable Transformation and Jobs) Bill 2023 (Qld), rather than under the ISP framework.[35] In July 2024, the Queensland Government announced an update to the SuperGrid strategy, with the second stage of the SuperGrid between Southern and Central Queensland to shift from the original coastal location to an inland route (refer to Section 2.4). Powerlink subsequently held the Queensland SuperGrid planning update webinar to share the outcome of the most recent planning studies and the anticipated benefits this change will provide by unlocking significant amounts of new renewable energy in the State, lowering costs for wind generation connections and reducing overall energy costs for Queenslanders.

Powerlink and AEMO (through the ISP process) will continue to investigate the impact of large-scale VRE generation investment in the Queensland region.

The coastal CQ-SQ transmission network between Calliope River and South Pine substations provides essential supply sharing between the generation in central and north Queensland and the loads in central and southern Queensland.

This corridor provides the major injection points at Gin Gin, Teebar Creek, Woolooga and Palmwoods 275/132kV for the Wide Bay and Sunshine Coast areas. The Ergon Energy 132kV and Energex 132/110kV sub-transmission systems supply bulk supply points along these areas. The corridor also provides connection to large-scale VRE and storage projects.

The coastal CQ-SQ transmission network assets are expected to reach the end of their technical service life within the next 20 years. A key consideration is that this corridor is comprised solely of single circuit 275kV towers that may make cost-effective refit strategies less viable compared to double circuit tower rebuilds in targeted sections.

With varying distance from the ocean, and localised industrial pollution, the Calliope River to South Pine 275kV single circuit transmission lines are subject to different environmental and atmospheric conditions and have, over time, experienced structural degradation at different rates.

Emerging condition and compliance risks have been identified on the following assets:

Within the next five years:

- One 275kV single circuit transmission line from Woolooga to South Pine built in 1972 (structural repair due to above ground corrosion).

Within the next six to 10 years:

- Three 275kV single circuit transmission lines from Calliope River to Wurdong Tee built in 1972, 1976 and 1981 (structural repair due to above ground corrosion)
- Three 275kV single circuit transmission lines from Wurdong Tee to Gin Gin built in 1972, 1976 and 1981 (structural repair due to above ground corrosion)
- One 275kV single circuit transmission lines from Gin Gin to Woolooga built in 1972 (structural repair due to above ground corrosion)
- One 275kV single circuit transmission line from Palmwoods to South Pine built in 1976 (structural repair due to above ground corrosion).

[35] 2024 ISP, p. 57.

The current long-term network strategy is to rebuild two of the 275kV single circuit transmission lines from Calliope River to South Pine as a high capacity double circuit at end of technical service life utilising high temperature conductor (HTC) technology. The third circuit between Calliope and Woolooga substations is expected to be economic to maintain in the medium-term through targeted refit. When this circuit is dismantled, Wurdong Substation would be supplied from Calliope River via a dedicated 275kV double circuit transmission line and single circuit 275kV transmission line from Calvale Substation.

Strategies to address the transmission line sections with advanced corrosion in the five-year outlook will be economically assessed in consideration of longer-term network needs based on future generation and network requirements. This will also consider increasing line ratings by increasing ground clearances where it is economic to do so. Given Powerlink's integrated planning approach and the fast evolving environment of the energy transition, these requirements may result in the need for new investments that impact the proposed future network and non-network solutions identified and will be updated in subsequent reviews of the Infrastructure Blueprint and TAPR. Such decisions will be undertaken using the PTI or RIT-T consultation process, where the benefits of non-network options will also be assessed.

The longer-term network solution options to address the condition based drivers include:

- network rationalisation (potentially three single circuits to one double circuit) involving a staged program of line rebuild of the coastal corridor as a new double circuit (HTC) 275kV transmission line at the end of the technical service life of the existing circuits
- network rationalisation (potentially three single circuits to one double circuit) involving a staged program of line rebuild of the coastal corridor as a new double circuit (HTC) 275kV transmission line at the end of the technical service life of the existing circuits, using a program of targeted line refits to defer rebuild of individual CQ-SQ sections (where this deferral is economic)
- network rationalisation (potentially three single circuits to one double circuit) at the end of the technical service life of the existing single circuits, followed by construction of a second (HTC) 275kV double circuit line (potentially staged in sections) to support load and generation development
- maintaining the existing three single circuit 275kV transmission lines through a combination of staged rebuild and line refit projects.

Powerlink will consider whether the proposed preferred option will have a material inter-network impact closer to the timing of the investment decision and as part of the option analysis.

Woolooga to South Pine 275kV transmission line

Potential consultation	Maintaining reliability of supply between Woolooga and South Pine
Asset details	Constructed in 1972
Project driver	Emerging condition and compliance risks related to structural corrosion
Project timing	June 2029
Proposed network solution	Line refit works on the 275kV transmission single circuit transmission line between Woolooga and South Pine substations at an estimated cost of $39 million by June 2029
Possible non-network solutions	Powerlink is not aware of any non-network proposals that can address this requirement in its entirety Powerlink would consider proposals from non-network providers that can significantly contribute to reducing the load requirements of south-east Queensland.

The 275kV transmission line between Woolooga and South Pine forms part of the critical CQ-SQ transmission network as discussed in this section.

Possible network solutions

- Rebuild the 275kV transmission lines between Woolooga and South Pine substations by June 2029, utilising HTC
- Line refit works on steel lattice structures by June 2029.

Powerlink considers the proposed network solution will not have a material inter-network impact.

Possible asset retirements within the 10-year outlook period

Current planning analysis has not identified any potential asset retirements in the Wide Bay zone within the next 10 years.

Refer to Table 6.21 for possible asset retirements beyond the 10-year outlook period.

6.11.2 Surat zone

Existing network

The Surat zone is defined as the area north west of Western Downs Substation. The area has significant development potential given the vast reserves of gas and more recently VRE. Utilisation of assets in the area is forecast to continue due to new developments of VRE projects, coal seam gas upstream processing facilities by multiple proponents, together with the supporting infrastructure and services (refer to Figure 6.15).

Figure 6.15 Surat Basin North West area transmission network

Possible load driven limitations

Based on Powerlink's Central scenario forecast discussed in Chapter 3, there is no additional load driven capacity forecast to be required as a result of network limitations in the Surat zone within the next five years to meet reliability obligations.

Existing and committed generation and connection applications

Table 6.15 lists existing generators connected to the Powerlink transmission network and connection applications.

Table 6.15 Existing generators and connection applications in the Surat zone

Name	Status (1)	Technology	Capacity (MW) (2)	Timing
Condamine	Existing	Gas turbine	139	
Columboola	Existing	Solar PV	162	
Gangarri	Existing	Solar PV	120	
Blue grass	Existing	Solar PV	148	
Edenvale Solar Park	Existing	Solar PV	146	
Wandoan	Existing	Solar PV	125	
Miles South BESS	Application	BESS	500	2026
Hopeland Solar Farm (Ulinda Park)	Application	Solar PV	250	2026
Pleasant Hills Solar Farm	Application	Solar PV	80	2026
Miles South Solar Project	Application	Solar PV	500	2026
Brigalow GT (Kogan Creek GT)	Application	Gas turbine	400	2026

Notes:

(1) Application information is sourced from AEMO's Key Connection Information Data File August 2024.

(2) Capacity listed for existing generation as expected over summer 2024/25.

Possible network investments within the five-year outlook period

Current planning analysis has not identified any assets requiring investment in the Surat zone within the five-year outlook period.

Possible asset retirements within the 10-year outlook period

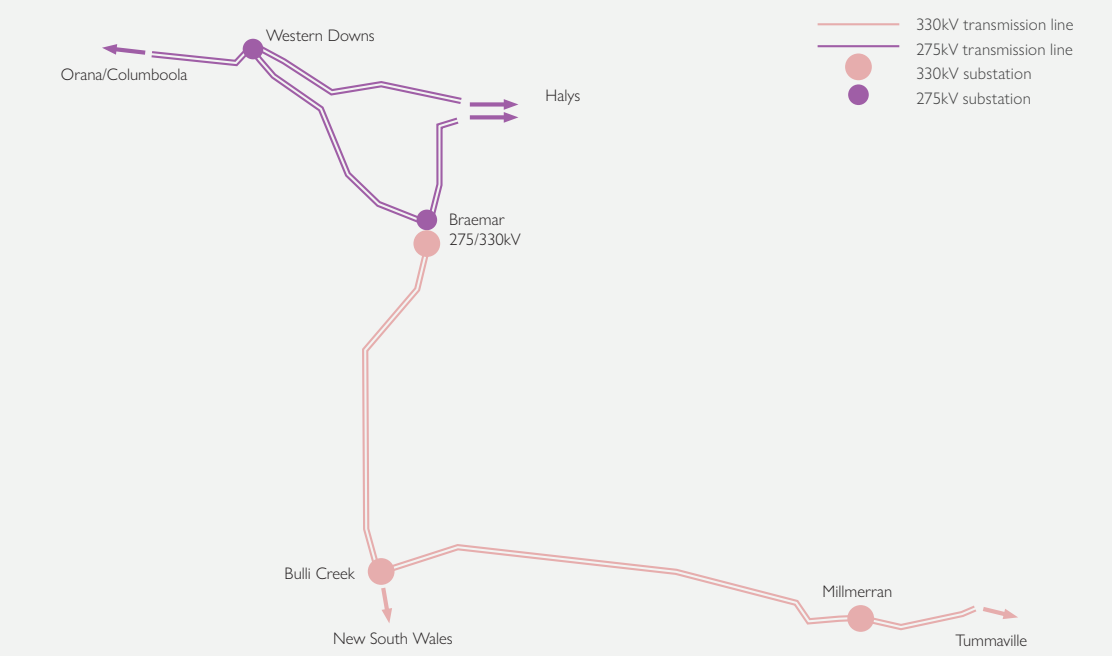
Current planning analysis has not identified any potential asset retirements in the Surat zone within the 10-year outlook period.

6.11.3 Bulli zone

Existing network

The Bulli zone is defined as the area surrounding Goondiwindi and the 330kV and 275kV network south of Kogan Creek Power Station and west of Millmerran Power Station (refer to Figure 6.16).

Figure 6.16 Bulli area transmission network



Possible load driven limitations

Based on Powerlink's Central scenario forecast discussed in Chapter 3, there is no additional load driven capacity forecast to be required as a result of network limitations in the Bulli zone within the next five years to meet reliability obligations.

Existing and committed generation and connection applications

Table 6.16 lists existing and committed generators connected to the Powerlink transmission network and connection applications.

Table 6.16 Existing and committed generators and connection applications in the Bulli zone

Name	Status (1)	Technology	Capacity (MW) (2)	Timing
Kogan Creek	Existing	Coal-fired	710	
Millmerran	Existing	Coal-fired	670	
Braemar 1	Existing	Gas turbine	501	
Braemar 2	Existing	Gas turbine	480	
Darling Downs	Existing	Gas turbine	563	
Western Downs Green Power Hub	Existing	Solar PV	400	
Chinchilla BESS	Existing	BESS	100	
Western Downs BESS	Committed	BESS	200	2024
Ulinda Park BESS	Committed	BESS	155	2025
MacIntyre Wind Farm	Committed	Wind	890	2025
Hopeland BESS	Application	BESS	175	2025
AGL - Madeline Downs BESS	Application	BESS	500	2026
Origin - Darling Downs BESS	Application	BESS	250	2026
Punchs Creek (Millmerran) Solar Farm	Application	Solar PV	600	2026
Hopeland Solar Farm (Ulinda Park)	Application	Solar PV	250	2026
Sixteen Mile Solar Farm and BESS	Application	Solar PV; BESS	350	2026
Dunmore Solar Farm and BESS	Application	Solar PV; BESS	400	2027
Beebo Solar Farm and BESS	Application	Solar PV; BESS	600	2028

Notes:

(1) Application information is sourced from AEMO's Key Connection Information Data File August 2024.

(2) Capacity listed for existing generation as expected over summer 2024/25.

Possible network investments within the five-year outlook period

The power transfer from the Bulli zone to south east Queensland can be limited by the thermal rating of a 1,300MVA 330/275kV transformer at Middle Ridge Substation. The incidence of congestion across this transformer is highly dependent on the amount of generation in the Bulli zone (including northerly power transfers on QNI) and the load in south east Queensland.

Two projects that can have a material impact on the incidence of congestion across Middle Ridge that are now committed include:

- QNI-Minor upgrade project
  Powerlink, Transgrid and AEMO are currently undertaking system tests to release additional capacity on QNI (both in a northerly and southerly direction). The final hold-point test, in a northerly direction, is planned to be at 950MW (refer to Section 6.14).
- 890MW MacIntyre Wind Farm (refer to tables 6.16 and 7.1).

Both these developments contribute to creating market conditions where limitations across the Middle Ridge transformer will likely emerge.

Powerlink is monitoring the utilisation and incidence of congestion across this corridor.

In order to provide additional transmission capacity to the market, Powerlink is designing a special protection scheme (SPS) that increases the allowable pre-contingent flow through the Middle Ridge transformers. The proposed SPS opens a 275kV circuit between Middle Ridge and Greenbank substations, combined with a run-back of generation following an outage of one of these transformers.

If further generation connects to the 330kV network near and between Bulli Creek and Middle Ridge substations, the incidence and severity of congestion across the Middle Ridge transformer is expected to increase to the point where the magnitude of required run-back will no longer be operationally viable.

Further options that will avail the market with additional transmission capacity include:

- a system splitting scheme coupled with a run-back of generation. The technical viability of a splitting scheme will take account of the impact on the system strength requirements of the inverter-based renewables connected in this zone.
- Implement a virtual transmission line option between the Bulli zone and south east Queensland by pairing a run-back of generation with a battery response in south east Queensland.
- Replace the existing 1,300MVA 330/275kV transformer at Middle Ridge with 1,500MVA 330/275kV transformer.

Possible asset retirements within the 10-year outlook period

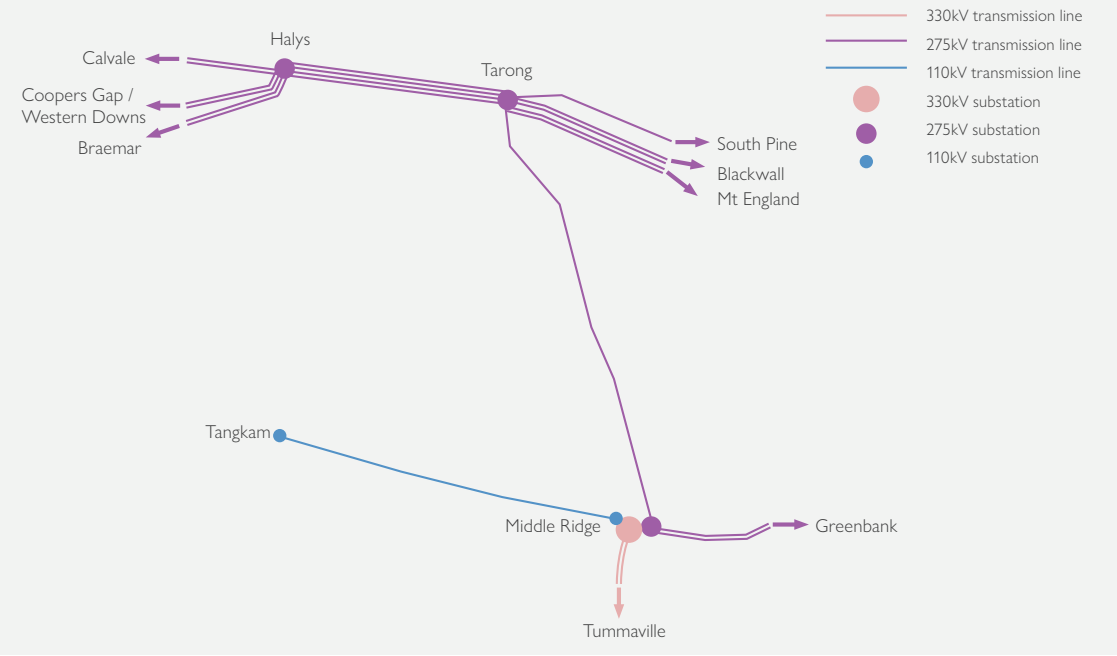
Current planning analysis has not identified any potential asset retirements in the Bulli zone within the 10-year outlook period.

6.11.4 South West zone

Existing network

The South West zone is defined as the Tarong and Middle Ridge areas west of Postman's Ridge (refer to Figure 6.17).

Figure 6.17 South West area 330kV and 275kV network



Possible load driven limitations

Based on Powerlink's Central scenario forecast discussed in Chapter 3, there is no additional load driven capacity forecast to be required as a result of network limitations in the South West zone within the next five years to meet reliability obligations.

Existing and committed generation and connection applications

Table 6.17 lists existing and committed generators connected to the Powerlink transmission network and connection applications.

Table 6.17 Existing and committed generators and connection applications in the South West zone

Name	Status (1)	Technology	Capacity (MW) (2)	Timing
Tarong North	Existing	Coal-fired	443	
Tarong	Existing	Coal-fired	1,400	
Oakey	Existing	Gas turbine	288	
Coopers Gap	Existing	Wind	440	
Wambo Wind Farm	Committed	Wind	245	2025
Wambo Wind Farm 2	Committed	Wind	247	2026
Tarong BESS	Application	BESS	300	2024
Tangkam BESS	Application	BESS	100	2025
Tumuruu Solar Farm and BESS	Application	BESS	464	2026
South Burnett BESS	Application	BESS	300	2027
Harlin Solar Farm	Application	Solar PV	400	2027
Tarong West Wind Farm	Application	Wind	436	2026
Toowoomba Pumped Hydro Storage Project (Big T)	Application	Hydro-electric	400	2026

Notes:

(1) Application information is sourced from AEMO's Key Connection Information Data File August 2024.

(2) Capacity listed for existing generation as expected over summer 2024/25.

Possible network investments within the five-year outlook period

Current planning analysis has not identified any assets requiring investment above the RIT-T cost threshold in the South West zone within the five-year outlook period.

Possible asset retirements within the 10-year outlook period[36]

Refer to Table 11.7 for confirmed asset retirements in the South West zone and Table 6.21 for possible asset retirements beyond the 10-year outlook period.

6.11.5 Moreton zone

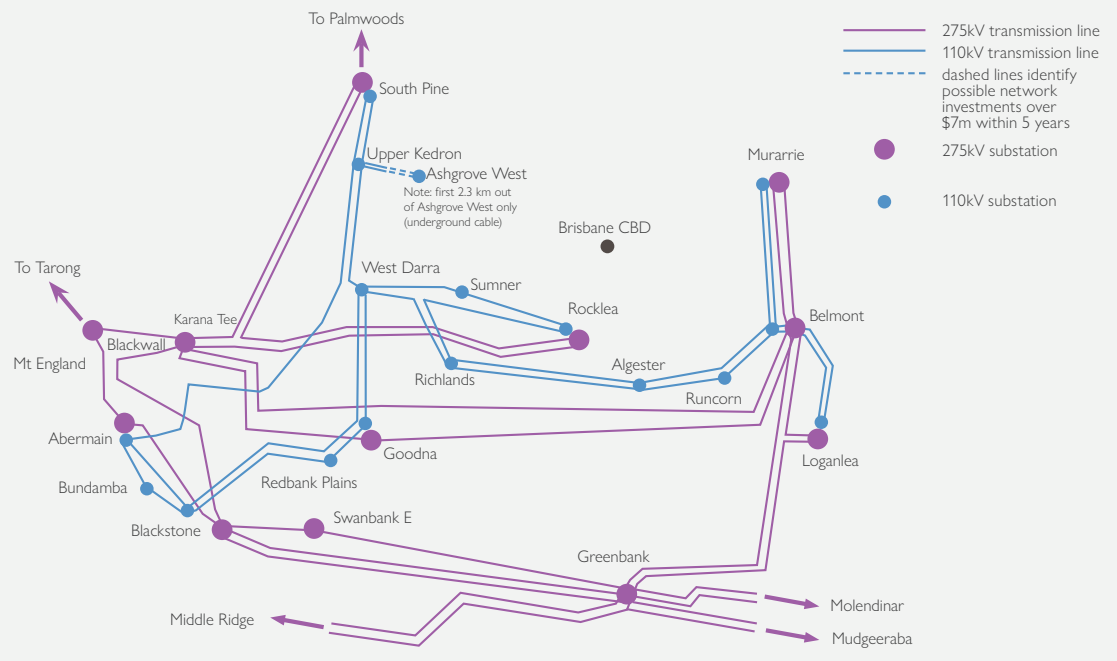
Existing network

The Moreton zone includes a mix of 275kV and 110kV transmission networks servicing a number of significant load centres in SEQ, including the Sunshine Coast, greater Brisbane, Ipswich and northern Gold Coast regions (refer to Figure 6.18).

Future investment needs in the Moreton zone are substantially arising from the condition and performance of 275kV and 110kV assets in the greater Brisbane area. The 110kV network in the greater Brisbane area was progressively developed from the early 1960s and 1970s, with the 275kV network being developed and reinforced in response to load growth from the early 1970s. Multiple Powerlink 275/110kV injection points now interconnect with the Energex network to form two 110kV rings supplying the Brisbane Central Business District (CBD).

[36] Operational works, such as asset retirements, do not form part of Powerlink's capital expenditure budget.

Figure 6.18 Greater Brisbane transmission network



Possible load driven limitations

Based on Powerlink's Central scenario forecast discussed in Chapter 3 and the committed generation described in tables 7.1 and 7.2, there is no additional load driven capacity forecast to be required in the Moreton zone within the next five years to meet reliability obligations.

Existing and committed generation and connection applications

Table 6.18 lists existing and committed generators connected to the Powerlink transmission network and connection applications.

Table 6.18 Existing and committed generators and connection applications in the Moreton zone

Name	Status (1)	Technology	Capacity (MW) (2)	Timing
Swanbank E	Existing	Gas turbine	350	
Wivenhoe	Existing	Hydro-electric	570	
Greenbank BESS	Committed	BESS	200	2025
Brendale (South Pine) BESS	Application	BESS	205	2026
Blackstone BESS 1	Application	BESS	250	2026
Abermain BESS	Application	BESS	125	2026
Blackstone BESS 2	Application	BESS	250	2027

Notes:

(1) Application information is sourced from AEMO's Key Connection Information Data File August 2024.

(2) Capacity listed for existing generation as expected over summer 2024/25.

Possible network investments within five years

Network investments (which includes reinvestment and augmentations) in the Moreton zone are related to addressing the risks arising from the condition of the existing network assets, which without corrective action, would result in Powerlink being exposed to breaching a number of its jurisdictional network, safety, environmental and Rules' obligations.

By addressing the condition of these existing assets, Powerlink is seeking to ensure it can safely deliver an adequate, economic, and reliable supply of electricity to meet the load requirements of customers in the Moreton zone into the future. This may result in like-for-like replacement, non-network solutions, network reconfiguration, asset retirement, line refit or replacement with an asset of lower capacity.

Transmission lines

The 110kV and 275kV transmission lines in the greater Brisbane area are located between 20km and 40km from the coast, traversing a mix of industrial, high density urban and semi-urban areas. The majority of assets are reasonably protected from the prevailing coastal winds and are exposed to moderate levels of pollution related to the urban environment. These assets have, over time, experienced structural corrosion at similar rates, with end of technical service life for most transmission line assets expected to occur towards the end of the 2020s and into the early 2030s.

With maximum demand expected to maintain low growth over the next 10 years and based on the development of the network over the last 40 years, planning studies have identified a number of 110kV transmission line assets that could potentially be retired. Given the uncertainty in future demand growth, Powerlink proposes to implement low cost maintenance strategies to keep the transmission lines inservice for a reasonable period. Future decommissioning remains an option once demand growth is better understood.

Detailed analysis will be on-going to evaluate the possible retirement of the following transmission lines at the end of technical service life:

- West Darra to Upper Kedron
- West Darra to Goodna
- Richlands to Algester.

This on-going review, together with further joint planning with Energex, may result in a future RIT-T.

Underground 110kV cable between Upper Kedron and Ashgrove West

Anticipated consultation	Maintain reliability of supply at Ashgrove
Asset details	Constructed in 1978
Project driver	Emerging condition, end of technical service life and compliance risks for the Upper Kedron to Ashgrove West underground cables
Project timing	June 2028
Proposed network solution	Replacement of the oil-filled cables with new cables in a new easement at an estimated cost of $31 million by June 2028
Possible non-network solutions	The Upper Kedron to Ashgrove West cables provide supply of up to 220MW at peak to Brisbane's inner north-west suburbs. Powerlink would consider proposals from non-network providers that can significantly contribute to reducing the requirement in this region, as this may present opportunities in reconfiguring the network that would otherwise not be able to meet Powerlink's planning standard. Non-network solutions may include but are not limited to local generation or DSM initiatives in the area.

The 110kV transmission line between Upper Kedron and Ashgrove West substations is one of the principal sources of supply to the north-west Brisbane area. The transmission line is predominantly overhead, with the final 2.3km long section to Ashgrove West Substation being underground cable.

Possible network solutions

- Replacement of existing cables with new cables in a new easement by June 2028
- Replacement of existing cables with new cables in the existing easement by June 2028.

Powerlink considers the proposed network solution will not have a material inter-network impact.

Karana Downs to South Pine 275kV transmission lines

Potential consultation	Maintaining reliability of supply to the western Moreton area
Asset details	Constructed in the mid-1970s
Project driver	Emerging condition risks due to structural corrosion
Project timing	June 2030
Proposed network solution	Line refit works on the 275kV transmission lines between Karana Downs and South Pine Substation at an estimated cost of $14m by June 2030
Possible non-network solutions	Powerlink is not aware of any non-network proposals that can address this requirement in its entirety. Powerlink would consider proposals from non-network providers that can significantly contribute to reducing the requirement in this region.

The 275kV double circuit transmission lines between Blackwall, South Pine and Rocklea substations support supply to the west and north of the Moreton zone.

Under certain load development scenarios and dispatch conditions, network limitations may emerge between Blackwall/Mt England and South Pine substations. These limitations may be addressed with the first stage of the SuperGrid (refer to Section 2.4 - high capacity 275kV double circuit line between Halys, Borumba and Woolooga substations). Prior to the commissioning of these transmission lines the limitations could be addressed by:

- Reconfiguring by establishing two tees at Karana Downs to form a double circuit between Blackwall and Rocklea and a double circuit from the Karana Downs tees to South Pine
- Constructing a new 275kV double circuit line from Blackwall to Karana Downs (on a vacant easement) and then reconfigure the network to form a double circuit line between Blackwall and Rocklea substations and a second double circuit line between Blackwall and South Pine substations.

Feasible network solutions to address the risks arising from these transmission lines may include:

- Maintaining the existing 275kV transmission line topography and capacity by way of a targeted line refit by June 2030
- Replacement at the end of technical service life of the existing single circuits between Karana Downs and South Pine with a new double circuit line, through staged rebuild.

Powerlink considers the proposed network solution will not have a material inter-network impact.

Substations

Ashgrove West 110/33kV Substation

Potential consultation	Addressing the secondary systems condition risks at Ashgrove West
Asset details	Established 1979
Project driver	Emerging condition and 110kV secondary systems compliance risks
Project timing	June 2027
Proposed network solution	Full replacement of the 110kV secondary systems at Ashgrove West Substation at an estimated cost of $22 million by June 2027
Possible non-network solutions	Powerlink would consider proposals from non-network providers that can significantly contribute to reducing the requirement in this region. Potential non-network options would need to provide supply of up to 220MW at peak to Brisbane's inner north west suburbs

Ashgrove West Substation was established to meet increased demand in the Brisbane CBD and the expanding residential areas to the north and west of Brisbane.

Possible network solutions

- Full replacement of all of the 110kV secondary systems upfront by December 2026
- Staged replacement on 110kV secondary systems by December 2026.

Powerlink considers the proposed network solution will not have a material inter-network impact.

Murarrie 275/110kV Substation

Potential consultation	Addressing the secondary systems condition risks at Murarrie
Asset details	Established in 2003
Project driver	Condition driven replacement to address risks on the 275kV and 110kV secondary systems
Project timing	December 2027
Proposed network solution	Selected replacement of the 110kV secondary systems at an estimated cost of $22 million by December 2027
Possible non-network solutions	Potential non-network options would need to provide supply into Murrarrie and the Central Business District. This can be up to 500MW and a peak of 5,700MWh per day on a continuus basis.

Murarrie Substation, located approximately 8km from the Brisbane CBD, was originally established to operate as a bulk supply point for industrial load around the Brisbane River and port area. Along with Belmont Substation, Murarrie provides supply to the eastern areas of Brisbane CBD.

Possible network solutions

- Replacement of all 110kV secondary systems by December 2027
- Selective replacement of 110kV secondary systems by December 2027.

Powerlink considers the proposed network solution will not have a material inter-network impact.

Abermain 275/110kV Substation

Potential consultation	Maintaining reliability of supply at Abermain
Asset details	Established in 1962
Project driver	Condition driven replacement to address risks on 275/110/33kV primary plant
Project timing	June 2030
Proposed network solution	Selective replacement of 275/110/33kV primary plant at an estimated cost of $8 million by June 2030
Possible non-network solutions	Potential non-network options would need to provide supply to the 110kV network of up to a peak 140MW, and up to a peak 1,050MWh per day on a continuous basis.

Abermain Substation is located approximately 40km south west of the Brisbane central business district and operates as a bulk supply point to the Energex 33kV network.

Possible network solutions

- Replacement of all 275/110/33kV primary plant by June 2030
- Selective replacement of 275/110/33kV primary plant by June 2030.

Powerlink considers the proposed network solution will not have a material inter-network impact.

Greenbank 275kV Substation

Potential consultation	Addressing the SVC secondary systems condition risks at Greenbank
Asset details	Installed in 2008
Project driver	Condition driven replacement to address risks on the 275kV SVC secondary systems
Project timing	June 2029
Proposed network solution	Full replacement of the 275kV SVC secondary systems at an estimated cost of $26 million by June 2029
Possible non-network solutions	Potential non-network options would need to provide equivalent dynamic voltage support of up to 400MVAr capacitive and 100MVArs inductive

Greenbank Substation, located approximately 40km from the coast, is a major node in the transmission network connecting the 330kV network from the Southern Downs area into south east Queensland. It is also the major switching station for the 275kV transmission lines supplying the Gold Coast and South Moreton areas.

Possible network solutions

- Replacement of all 275kV SVC secondary systems by June 2029
- Selective replacement of 275kV SVC secondary systems by June 2029.

Powerlink considers the proposed network solution will not have a material inter-network impact.

Possible asset retirements within the 10-year outlook period

Loganlea 110/33kV transformer

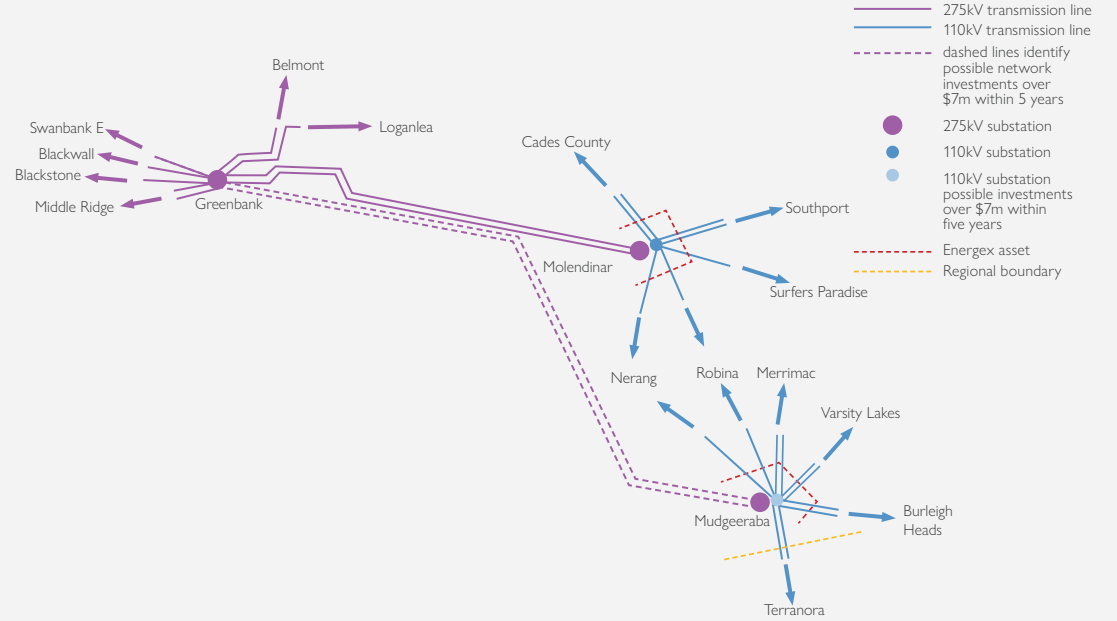
Based on the condition of one of the 110/33kV transformers at Loganlea, it is proposed to retire this transformer at the end of technical service life by June 2026. Powerlink considers that this will not impact on the ability to meet the obligations of Powerlink's reliability criteria. Since publication of the 2023 TAPR, joint planning with Energex has confirmed that based on the most recent load forecast, there is no enduring requirement for the transformer.

6.11.6 Gold Coast zone

Existing network

The Powerlink transmission system in the Gold Coast zone was originally constructed in the 1970s and 1980s. The Molendinar and Mudgeeraba substations are the two major injection points into the area via a double circuit 275kV transmission line between Greenbank and Molendinar substations, and two single circuit 275kV transmission lines between Greenbank and Mudgeeraba substations (refer to Figure 6.19).

Figure 6.19 Gold Coast transmission network



Possible load driven limitations

Based on Powerlink's Central scenario forecast discussed in Chapter 3, there is no additional load driven capacity forecast to be required as a result of load driven network limitations in the Gold Coast zone within the next five years to meet reliability obligations.

Possible network investments within five years

Network investments (which includes reinvestment and augmentations) in the Gold Coast zone are related to addressing the risks arising from the condition of the existing network assets, which without corrective action, would result in Powerlink being exposed to breaching a number of its jurisdictional network, safety, environmental and Rules' obligations.

By addressing the condition of these existing assets, Powerlink is seeking to ensure it can safely deliver an adequate, economic, and reliable supply of electricity to meet the load requirements of customers in the Gold Coast zone into the future. This may result in like-for-like replacement, non-network solutions, network reconfiguration, asset retirement, line refit or replacement with an asset of lower capacity.

Transmission lines

Greenbank to Mudgeeraba 275kV transmission lines

Potential consultation	Maintaining reliability of supply to the southern Gold Coast area
Asset details	Constructed in the mid-1970s
Project driver	Emerging condition risks due to structural corrosion
Project timing	June 2029
Proposed network solution	Maintain the existing topography by way of a targeted line refit at an estimated cost of $53 million by June 2029
Possible non-network solutions	The Greenbank to Mudgeeraba 275kV transmission lines provide injection to the southern Gold Coast and northern NSW area. Powerlink is not aware of any non-network proposals in this area that can address this requirement in its entirety. Powerlink would consider proposals from non-network providers that can significantly contribute to reducing the requirement in the Gold Coast region.

The two 275kV single circuit transmission lines between Greenbank and Mudgeeraba substations support the supply to Gold Coast and northern NSW.

Feasible network solutions to address the risks arising from these transmission lines may include:

- Maintaining the existing 275kV transmission line topography and capacity by way of a targeted line refit by June 2029
- Replacement at the end of technical service life of the existing single circuits between Mudgeeraba and Greenbank with a new double circuit line, through staged rebuild.

To ensure reliability of supply to customers, the required renewal works will need to be completed in stages outside of summer peak load and outage co-ordination will be complex due to the significant renewal program in the Gold Coast area within the 10-year outlook period.

Powerlink considers the proposed network solution will not have a material inter-network impact.

Substations

Molendinar 275/110kV Substation

Anticipated consultation	Addressing the secondary systems condition risks at Molendinar
Asset details	Established in 2003
Project driver	Emerging condition risks arising from the condition of the 275kV secondary systems
Project timing	December 2027
Proposed network solution	Selected replacement of secondary systems at an estimated cost of $28 million
Possible non-network solutions	Molendinar Substation provides injection and switching to the southern Gold Coast and northern NSW area. Powerlink would consider proposals from non-network providers that can significantly contribute to reducing the requirement in the Gold Coast region.

Molendinar 275/110kV Substation, located approximately 75km south west of the Brisbane CBD, is one of two major connection points for supply into the Gold Coast area. The 110kV network from Molendinar to Mudgeeraba links the coastal bulk supply points at Southport, Surfers Paradise and Broadbeach via underground cable. An inland overhead 110kV network supplies Robina and Nerang substations.

Possible network solutions

- Selected replacement of 275kV secondary systems by December 2027
- Full replacement of 275kV secondary systems by December 2027.

Powerlink considers the proposed network solution will not have a material inter-network impact.

Possible asset retirements within the 10-year outlook period

Current planning analysis has not identified any potential asset retirements in the Gold Coast zone within the 10-year outlook period.

6.12 Programs of work

6.12.1 Condition based asset renewal programs

To ensure a safe, reliable electricity supply to customers, Powerlink monitors and undertakes a regular program of condition assessments of all network assets, including minor value asset classes or subpopulations across the transmission network e.g. capacitive voltage transformers (CVTs). This ensures the risks arising from asset condition and performance are appropriately managed in a safe, cost effective manner. Taking into consideration the planning options discussed in Table 6.1, where a significant portion of an asset class or subpopulation has been identified as requiring investment across the network in a similar timeframe, programs of work may be undertaken given costs savings derived from economies of scale, efficiencies in resource allocation and as a strategy for proactive replacement.

Table 6.19 identifies potential programs of work over the next five years which will be subject to the RIT-T[37].

Table 6.19 Potential programs of work over the next five years

Program	Consultation	High level scope	Purpose	Earliest possible commissioning date	Indicative cost
Capacitive Voltage Transformers Replacement Program	Managing the risk of Capacitive Voltage Transformer Failure	Staged replacement of 546 Trench capacitive voltage transformers at 42 substations throughout Queensland	Maintain supply reliability to Queensland	December 2030	$60m
Current Transformer Replacement Program	Managing the risk of Current Transformer Failure	Staged replacement of 523 current transformers at 24 substations throughout Queensland	Maintain supply reliability to Queensland	June 2029	$70m

6.12.2 Wide Area Monitoring, Protection and Control platform roll-out

Powerlink is progressing with the development and roll out of the Wide Area Monitoring Protection and Control (WAMPAC) platform to maximise the capability of the network and provide an additional layer of security and resilience to system disturbances and events.

WAMPAC rapidly detects specific conditions over geographically diverse transmission assets and initiates appropriate action to rapidly respond to changed power system conditions. The platform is capable of operating in sub-second timeframes enabling the system to dynamically respond to changes in the power system and to avoid adverse operating conditions.

WAMPAC has been implemented for system protection services across the Central Queensland to South Queensland (CQ-SQ) grid section to increase the resilience and security of the network under non-credible contingencies. Powerlink is progressing the implementation in other parts of the network to increase transmission capability, improve security and resilience, and more effectively manage and operate the transmission network during outages.

The planned roll out of WAMPAC across the State is outlined within Table 6.20.

[37] Excludes programs of work funded through operational and maintenance expenditure.

Table 6.20 WAMPAC platform roll-out

Status	Zone/Grid Section	Application
Completed	CQ-SQ	Improve security and resilience under non-credible contingencies (tranche 1)
In Progress	Far North and North Queensland	Managing system strength and reduce impacts of network outages
	CQ-SQ	Improve security and resilience under non-credible contingencies (tranche 2)
	Surat	Improve security and resilience under non-credible contingencies
Short to longer term	Various Grid Sections and REZs	Run-back schemes to provide additional network capacity of the shared grid (e.g. Virtual Transmission Lines)
	REZs	Increase hosting capacity of REZs (roll-out aligned within 2024 Queensland REZ Roadmap)
	SuperGrid	Increase capability, security and resilience of SuperGrid backbone transmission (roll-out aligned with QEJP)
	Various locations	Provision of non-firm capacity to urgent load connections (e.g. electrification, hydrogen, etc)
	Various locations	Anti-islanding capability (various timings)

6.13 Supply demand balance

The outlook for the supply demand balance for the Queensland region was published in the AEMO ESOO[38]. Interested parties who require information regarding future supply demand balance should consult this document.

6.14 Existing interconnectors

Powerlink and Transgrid completed a RIT-T in December 2019 on 'Expanding NSW-Queensland transmission transfer capacity'. The recommended QNI Minor Project included uprating the 330kV Liddell to Tamworth 330kV lines and installing SVCs at Tamworth and Dumaresq substations and capacitor banks at Tamworth, Armidale and Dumaresq substations. Transgrid completed commissioning these works by May 2022.

After consultation and in accordance with Clause 5.7.7(p) of the NER, Transgrid, Powerlink and AEMO published a final inter-network test program in May 2022 and commenced monitoring test opportunities from June 2022. The Test Plan requires the flows on the interconnector to reach specific levels (hold points) for a period of approximately three hours to allow switching tests and monitoring of damping levels using the online Oscillatory Stability Monitoring with comparative small signal stability assessment using system snapshots to occur. Normal market dispatch is being relied on to deliver these required transfer levels.

AEMO, Transgrid and Powerlink aimed to achieve full commercial service of the QNI upgrade by mid-2023. However, due to non-availability of favourable market and test conditions, the full QNI transfer capability has not been released. The northerly hold point has now been increased from 600MW to 850MW and the southerly hold point from 1,200MW to 1,400MW. These tests are expected to continue until mid-2025.

[38] Published by AEMO in August 2024.

6.15 Transmission lines approaching end of technical service life beyond the 10-year outlook period

As transmission lines approach their anticipated end of technical service life, detailed planning studies are undertaken to confirm the asset's enduring need taking into consideration asset condition and risk as well as alignment with future investment or possible network optimisation strategies. Options considered may include line refit, targeted and/or staged refit or replacement, upfront replacement or rebuild, network reconfiguration, non-network alternatives, asset de-rating or retirement.

The information contained in Table 6.21 which goes five years beyond the 10-year outlook period of the 2024 TAPR, is provided in good faith[39] as a snapshot, and is the best information available at the time of TAPR publication. Transmission equipment and line ratings information is available on AEMO's website and can also be accessed via the link in the TAPR Portal.

Given the rapid speed of the energy transformation, proponents who wish to connect to Powerlink's transmission network are strongly encouraged to contact BusinessDevelopment@powerlink.com.au in the first instance.

[39] For completeness, please refer to Powerlink's Disclaimer on page 2.

Table 6.21 Transmission lines approaching end of technical service: 10-15 years (July 2035 – June 2040)

Region	Zone	Feeder	Voltage	General location
Northern	Far North	7165,7166	132kV	Between Chalumbin and Turkinje substations
Northern	Far North	7227	132kV	Between Cairns and Woree substations
Northern	Far North	7191,7192	132kV	Kareeya to Chalumbin substations
Northern	Ross	879,8911	275kV	Between Strathmore and Ross Substation
Northern	Ross	7130,7131	132kV	Between Clare South and Townsville South substations
Northern	North	7120,7304,7305	132kV	Between Nebo and Pioneer Valley substations
Northern	North	7152	132kV	Between Pioneer Valley and Alligator Creek substation
Northern	North	7119	132kV	Between Nebo and Alligator Creek substations
Northern	North	7238	132kV	Between Pioneer Valley and Mackay substations
Northern	Central West	820	275kV	Between Bouldercombe and Broadsound substations
Central	Central West	833	275kV	Between Broadsound and Lilyvale substations
Central	Central West	7150	132kV	Between Lilyvale and Dysart substations
Central	Central West	7109	132kV	Between Baralaba and Calvale substations
Central	Central West	7110	132kV	Between Calvale and Moura substations
Central	Central West	7112	132kV	Between Baralaba and Moura substations
Central	Central West	7124	132kV	Between Moranbah and Dysart substations
Central	Gladstone	848,849	275kV	Between Stanwell and Bouldercombe substations
Central	Gladstone	7145,7146	132kV	Between Calliope River and Boyne Island substations
Central	Gladstone	7221	132kV	Between Bouldercombe and Egans Hill substations
Central	Gladstone	871	275kV	Between Calvale and Wurdong substations
Central	Gladstone	848,849	275kV	Between Stanwell and Bouldercombe substations
Southern	Wide Bay	8850	275kV	Between Woolooga and Teebar Creek substations
Southern	Wide Bay	813,814	275kV	Between Woolooga, Gin Gin and Calliope River substations
Southern	Wide Bay	819	275kV	Between Teebar Creek and Wurdong substations
Southern	Wide Bay	807	275kV	Between South Pine and Woolooga substations
Southern	Wide Bay	810	275kV	Between Woolooga and Palmwoods substations
Southern	Wide Bay	808	275kV	Between South Pine and Palmwoods substations
Southern	South West	831	275kV	Between Tarong and Middle Ridge substations
Southern	Moreton	827	275kV	Between Tarong and Blackwall substations
Southern	Moreton	832	275kV	Between Tarong and South Pine substations
Southern	Moreton	825	275kV	Between Mt England and South Pine substations
Southern	Moreton	8819	275kV	Between Blackwall and Goodna substations
Southern	Moreton	829	275kV	Between Loganlea and Belmont substations
Southern	Moreton	8822	275kV	Between Greenbank and Belmont substations

6.16 Queensland SuperGrid Infrastructure Blueprint - proposed investments

In July 2024, Powerlink commenced consultation on the Gladstone Project as a candidate PTI under the ERTJ Act. This consultation is being undertaken to ensure that on-going reliability and security of supply is available to meet forecast electrical load in the Gladstone area and support the decarbonisation of major industries in anticipation of the closure of the Gladstone Power Station (refer to sections 8.2.5 and 6.6 and Powerlink's website[40]).

Feasible network solutions to deliver reliability of supply obligations in the Gladstone zone and facilitate efficient market operation may include:

- new 275kV high capacity double circuit line between Calvale and Calliope River
- rebuild Calliope River to Larcom Creek 275kV high capacity double circuit line
- rebuild Larcom Creek to Bouldercombe 275kV high capacity double circuit line
- a new (third) 275/132kV transformer at Calliope River.

As discussed in sections 2.4 and 8.3, subject to shareholding Minister approval, the Queensland SuperGrid Infrastructure Blueprint detailed a new high capacity transmission backbone to be developed in four stages which will enable renewable energy and storage across Queensland.

Stage 1 involves the delivery of a high capacity transmission line connection between Halys and Woolooga which will also connect the Borumba Pumped Hydro Energy Storage (PHES) project into the transmission network. The second stage of the SuperGrid provides a high capacity transmission line between Southern Queensland (SQ) and Central Queensland (CQ).

In July 2024 an update was made to the SuperGrid strategy for stages 1 and 2. The change to Stage 2 is to shift the original location to a more inland route. This alignment change is driven by the significant interest from renewable energy companies to develop wind farms to the west. This strategy also allows the western CQ-SQ transmission development to be built in stages and paced to align with interest for renewable connections.

The establishment of a transmission line of up to 500kV along an inland corridor between South Queensland and Central Queensland enables the first stage of the SuperGrid transmission backbone from Halys to Woolooga to be constructed at 275kV rather than 500kV.

Powerlink will commence a consultation on the Queensland SuperGrid South project as a candidate PTI under the ERTJ Act. This consultation will be undertaken to:

- ensure efficient levels to power transfer capacity between Halys and Woolooga substations and that the connection allows full operation and capacity from the Borumba PHES
- ensure the western South Queensland and Central Queensland transmission delivers efficient levels to power transfer capacity and efficiently integrates renewable energy developments to the west consistent with Powerlink meeting Queensland's renewable energy targets.

The third stage of the SuperGrid transmission backbone involves transmission connections from Townsville through to Central Queensland, enabling connection of the proposed PHES to load within the Gladstone area as well as harnessing the diverse and high quality wind resource in northern and western Queensland.

The fourth stage of the SuperGrid is the Townsville to Hughenden transmission development.

6.17 AEMO's 2024 Integrated System Plan

Powerlink, through the QEJP and associated modelling continues to investigate the impact of investment in large-scale VRE generation and firming generation in the Queensland region on the utilisation and economic performance of the Powerlink network. Powerlink also considers the emerging condition-based drivers and market facing proponent interest as part of the integrated planning process to ensure that overall, the most cost effective solutions are delivered for customers. Through joint planning processes with AEMO the outcomes from this work are taken as inputs into the analysis for the ISP.

[40] Refer to PTI Gladstone project.

The 2024 ISP published by AEMO in June 2024 provides a strategic view of the efficient development of the NEM transmission network to 2050. It reinforced that to deliver low-cost, secure and reliable energy, investments in transmission are needed. It identified three projects in Queensland as requiring action prior to the release of the 2026 ISP. These projects include:

- Gladstone Grid Reinforcement (now referred to as the Gladstone Project)
- Queensland SuperGrid South
- QNI Connect.

As identified in sections 2.4 and 6.16, Powerlink had already identified the need for the first two projects. These projects will progress under the candidate PTI framework (refer to Section 6.16).

QNI Connect requires the publication of a PADR by 25 June 2026.

Powerlink will continue to work closely with AEMO to inform the development of future ISPs and ensure continuing alignment of development pathways as updates to the Blueprint are released and renewable energy development continues in Queensland.

6.17.1 Gladstone grid section reinforcement

The 2024 ISP also identified that the transmission network which supplies the Gladstone area will not be adequate to maintain the required reliability of supply to customers in the Gladstone zone as the generation mix transitions away from coal. If major industrial loads are electrified, or if large hydrogen projects progress, there will be a further material shift in the supply demand balance in the Gladstone area requiring further investment.

Specifically, under the Step Change scenario forecast, the 2024 ISP identified a need to upgrade the transmission capacity from Calvale and Bouldercombe substations into the Gladstone zone and also increase the 275/132kV transformation capacity in the Gladstone zone by 2030-31.

AEMO has declared this as an actionable Queensland project. AEMO's assessment is fully aligned with the need identified by Powerlink. The required timing for these transmission reinforcements is however subject to when the supply and demand balance changes in the Gladstone zone.

6.17.2 CQ-SQ grid section reinforcement

The Borumba Pumped Hydro Energy Storage (PHES) scheme was classified as an anticipated project for the 2024 ISP. The subsequent modelling confirmed the Borumba PHES and connecting network in the optimal development path (ODP). The 2024 ISP connected the Borumba PHES into the transmission system via a 500kV double circuit line from Halys Substation, through Borumba to Woolooga Substation and then to a new substation west of Gladstone. This 500kV transmission was consistent with Stage 1 and Stage 2 of the 2022 Queensland Energy and Jobs Plan (QEJP) and Infrastructure Blueprint (refer to Figure 2.4). AEMO referred to this connection of Borumba PHES and connection to the Gladstone area as the Queensland SuperGrid South (QEJP Stage 2) project.

As with the SuperGrid Blueprint, AEMO also identified that the Queensland SuperGrid South project was required to increase power transfer capability of the transmission network to:

- support the expected increase in renewable generation in Central and Northern Queensland to support growing demand in Southern Queensland
- supply the large industrial loads in Central Queensland with renewable energy especially after significant amounts of coal generation in Central Queensland are decommitted or withdrawn, and
- provide the necessary infrastructure required to adequately host the large Borumba pumped hydro project.

Under AEMO's Step Change scenario the optimal timing of this project was 2031-32. AEMO has declared the Queensland SuperGrid South project this as an actionable Queensland project.

As outlined in Section 6.16 Powerlink's alignment for the SuperGrid South project will be further west to capture synergies with proponent interest to develop large-scale wind farms, together with delivering increased power transfer capacity. The change in alignment also avails a lower cost connection for the Borumba PHES at 275kV. Together this delivers greater value to customers.

These changes in detail will be captured in the 2026 ISP.

6.17.3 Expanding NSW-Queensland transmission transfer capacity

Increasing the capacity of interconnection between NEM regions is essential to support efficient sharing of new renewable generation, enable integration of REZs into existing networks by providing alternative flow paths for REZ generation and firming support between NEM regions. Appropriate intra-regional transmission capacity is required to support these objectives.

The 2024 ISP identified that further upgrade of the transmission capacity between Queensland and NSW (coined 'QNI Connect') is an integral part of the optimal development plan with a timing of 2034-35 across all three scenario forecasts.

Given the complexity in engagement and delivery of this project AEMO has declared this as an actionable ISP project. Powerlink and Transgrid are the proponents for this RIT-T. The PADR must be published by 25 June 2026.

Consistent with this recommendation the 2024 ISP has called for submissions on non-network options for this project with the potential to satisfy, or contribute to satisfying, the identified need. The process is that AEMO will provide all submissions to the Powerlink and Transgrid for consideration in the PADR.

The PADR will consider the following possible network solutions:

- Construct a 330kV single circuit between Powerlink's Bulli Creek Substation and follow the existing 330kV line except traversing to the west and then south-west of Armidale to connect to the New South Wales (NSW) planned New England Central Hub Substation. The single circuit line would be switched at Transgrid's Dumaresq and the New England Central Hub Substation connecting to Transgrid's existing Armidale and Tamworth substations. The proposed route traverses the New England REZ (within AEMO's North West NSW) and Darling Downs REZs.
- A variation to the option above is to connect the 330kV single circuit line from Powerlink's Braemar Substation and then to the NSW border (via Bulli Creek Substation) and beyond as per the option above.
- Construct a 330kV double circuit between Powerlink's Bulli Creek Substation and follow the existing 330kV line except traversing to the west and then south-west of Armidale to connect to the New England Central Hub Substation, as per the single circuit options above.
- Construct a double circuit 500kV line between Powerlink's Halys Substation and Transgrid's New England Hub Substation and connecting at 330kV to Transgrid's Dumaresq Substation with associated supporting plant.