

Executive summary

Planning and development of the transmission network is integral to Powerlink Queensland meeting its obligations under the National Electricity Rules (NER), *Queensland's Electricity Act 1994* and its Transmission Authority.

The Transmission Annual Planning Report (TAPR) is a key part of the planning process. It provides information about the Queensland electricity transmission network to everyone interested or involved in the National Electricity Market (NEM) including the Australian Energy Market Operator (AEMO), Registered Participants and interested parties. The TAPR also provides broader stakeholders with an overview of Powerlink's planning processes and decision making on potential future investments.

The TAPR includes information on electricity energy and demand forecasts, committed generation and network developments. It also provides estimates of transmission grid capability and potential network and non-network developments required in the future to continue to meet electricity demand in a timely manner.

Overview

The 2018 TAPR outlines the key factors impacting Powerlink's transmission network development and operations and discusses how Powerlink is responding to dynamic changes in the external environment.

The forecasts presented in this TAPR indicate low growth for summer and winter maximum demand and a decline in delivered energy for the transmission network over the 10-year outlook period.

The amended planning standard has been in effect from July 2014. It allows the network to be planned and developed with up to 50MW or 600MWh load at risk of being interrupted during a single network contingency. This provides more flexibility in the cost-effective development of network and non-network solutions to meet future demand.

The Queensland transmission network experienced significant growth in the period from the 1960s to the 1980s. The capital expenditure required to manage emerging risks related to assets now reaching the end of technical service life represents the majority of Powerlink's program of work over the outlook period. Considerable emphasis is placed on ensuring that asset reinvestment is not just on a like-for-like basis. Network planning studies have focused on evaluating the enduring need for existing assets in the context of a subdued demand growth outlook and the potential for network reconfiguration, coupled with alternative non-network solutions.

Powerlink's focus on stakeholder engagement has continued over the last year, with a range of engagement activities undertaken to seek stakeholder feedback and input into our network investment decision making. This included the Powerlink Queensland Transmission Network Forum, incorporating related break-out sessions on delivering clean energy hubs in Queensland, how transmission can deliver secure, affordable and sustainable electricity in the future, and transmission network connections under the Transmission Connection and Planning Arrangements Rule change.

Electricity energy and demand forecasts

The energy and demand forecasts presented in this TAPR consider the following factors:

- consumer response to forecast reductions in retail electricity prices
- continued growth of solar photovoltaic (PV) installations, including solar PV farms connecting to the distribution network
- forecast improvement in Queensland economic growth conditions over the outlook period
- the impact of energy efficiency initiatives, battery storage technology and tariff reform.

Powerlink's forecasts are obtained through a reconciliation of top-down econometric forecasts derived from externally provided forecasts of economic indicators, and bottom-up forecasts from Distribution Network Service Providers (DNSPs) and directly connected customers at each transmission connection supply point.

Key economic inputs to Powerlink's econometric model include population growth, employment and the price of electricity. DNSP customer forecasts are reconciled to meet the totals obtained from this model.

Executive Summary

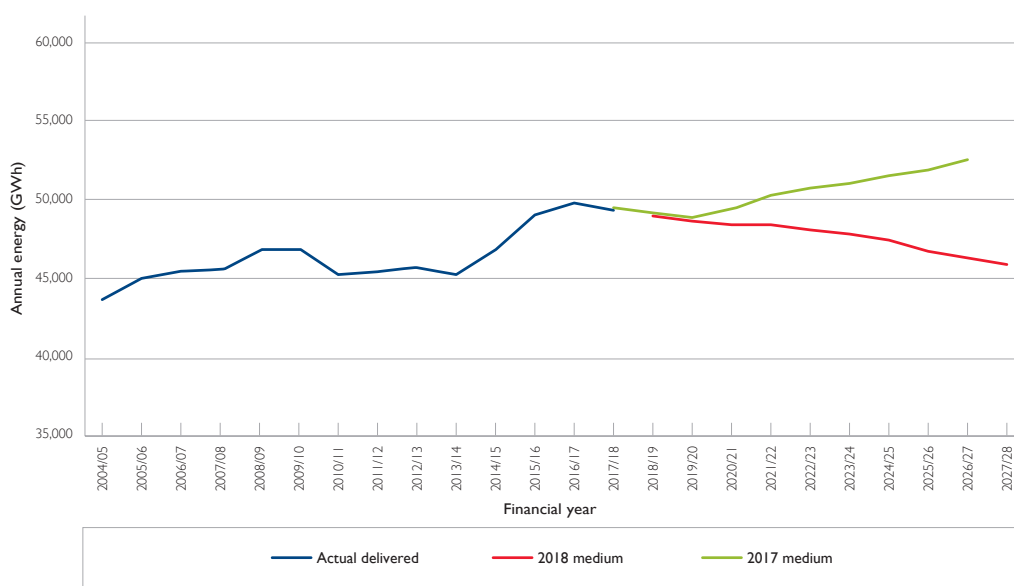
The 2017/18 summer in Queensland set a new record demand at 5:00pm on 14 February, when 8,842MW was delivered from the transmission grid. This corresponded to an operational 'as generated' demand of 9,796MW, passing the previous record of 9,412MW set last summer. After temperature correction, the 2017/18 summer demand exceeded the 2017 TAPR forecast by around 3%.

Electricity energy forecast

Based on the medium economic outlook, Queensland's delivered energy consumption is forecast to decrease at an average of 0.7% per annum over the next 10 years from 49,374GWh in 2017/18 to 45,913GWh in 2027/28. The delivered energy forecast in the 2018 TAPR shows a significant reduction compared to the 2017 TAPR. The reduction is due to forecast increases in the capacity of distribution connected renewable generation. The additional generation capacity is in response to the federal government's large-scale renewable energy target of 33,000GWh per annum by 2020 and the Queensland government's target of 50% renewable energy by 2030.

A comparison of the 2017 and 2018 TAPR forecasts for energy delivered from the transmission network is displayed in Figure 1. Energy delivered from the transmission network for 2017/18 is expected to be within 1% of the 2017 TAPR forecast.

Figure 1 Comparison of the medium economic outlook energy forecasts

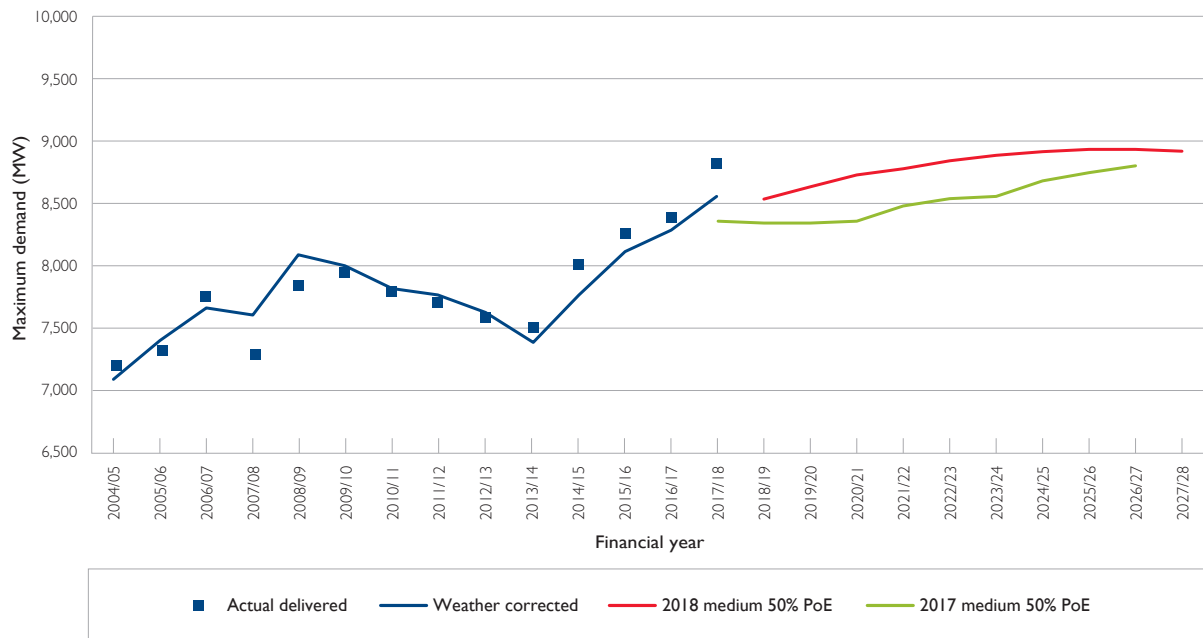


Electricity demand forecast

Based on the medium economic outlook, Queensland's transmission delivered summer maximum demand is forecast to increase at an average rate of 0.4% per annum over the next 10 years, from 8,577MW (weather corrected) in 2017/18 to 8,925 MW in 2027/28.

The transmission delivered maximum demand for summer 2017/18 of 8,842MW was a new record for Queensland.

A comparison of 2017 and 2018 summer maximum demand forecasts for the medium economic outlook, based on a 50% probability of exceedance (PoE) is displayed in Figure 2. As with the energy forecasts, the 2018 demand forecast has been adjusted to take account of actual consumption over the 2017/18 period and updated to reflect the latest economic projections for the State. The increase is largely due to an expectation that electricity prices will reduce and that the Queensland state economy will return to solid growth.

Figure 2 Comparison of the medium economic outlook demand forecasts

Powerlink's asset planning criteria

There is a continued strong focus on delivering the right balance between reliability and cost of transmission services. The amended planning standard (introduced from 1 July 2014) allows for increased flexibility by permitting Powerlink to plan and develop the transmission network on the basis that load may be interrupted during a single network contingency event. The planning standard sets limits of unsupplied demand and energy that may be at risk for the contingency event.

Powerlink is required to implement appropriate network or non-network solutions in circumstances where the limits of 50MW or 600MWh are exceeded, or when the economic cost of load at risk of being unsupplied justifies the cost of the investment. Therefore, the application of the planning standard has the effect of deferring or reducing the extent of investment in network or non-network solutions required in response to demand growth. Powerlink will continue to maintain and operate its transmission network to deliver safe, reliable and cost effective supply to customers.

Future network development

Dynamic changes in the external environment, including the upturn in Variable Renewable Energy (VRE) developments in Queensland, are reshaping the operating environment in which Powerlink delivers its transmission services. In addition, market initiatives such as the Integrated System Plan (ISP) have the potential to influence the future development and network topography of the transmission network in Queensland and the NEM over the 10-year outlook period.

Powerlink is responding to these changes by:

- implementing and adopting the recommendations of the Finkel and other reviews
- adapting to changes in electricity consumer behaviour and economic outlook
- continuing to adapt its approach to investment decisions
- placing considerable emphasis on an integrated and flexible analysis of future reinvestment needs
- supporting diverse generation connection
- continuing to focus on developing options that deliver a secure, safe, reliable and cost effective transmission network.

Executive Summary

Based on the medium economic forecast outlook, the planning standard and committed network solutions, network augmentations to meet load growth are not forecast to occur within the 10-year outlook period of this TAPR.

There are proposals for large mining, metal processing and other industrial loads that have not reached a committed development status. These new large loads are within the resource rich areas of Queensland and associated coastal port facilities. These loads have the potential to significantly impact the performance of the transmission network supplying, and within, these areas. Within this TAPR, Powerlink has outlined the potential network investment required in response to these loads emerging in line with the high economic outlook forecast.

As previously mentioned, the Queensland transmission network experienced significant growth in the period from the 1960s to the 1980s. The capital expenditure needed to manage the emerging risks related to this asset base, which is now reaching end of technical service life, represents Powerlink's program of work within the outlook period. The reinvestment program is particularly focused on transmission lines where condition assessment has identified emerging risks requiring action within the outlook period.

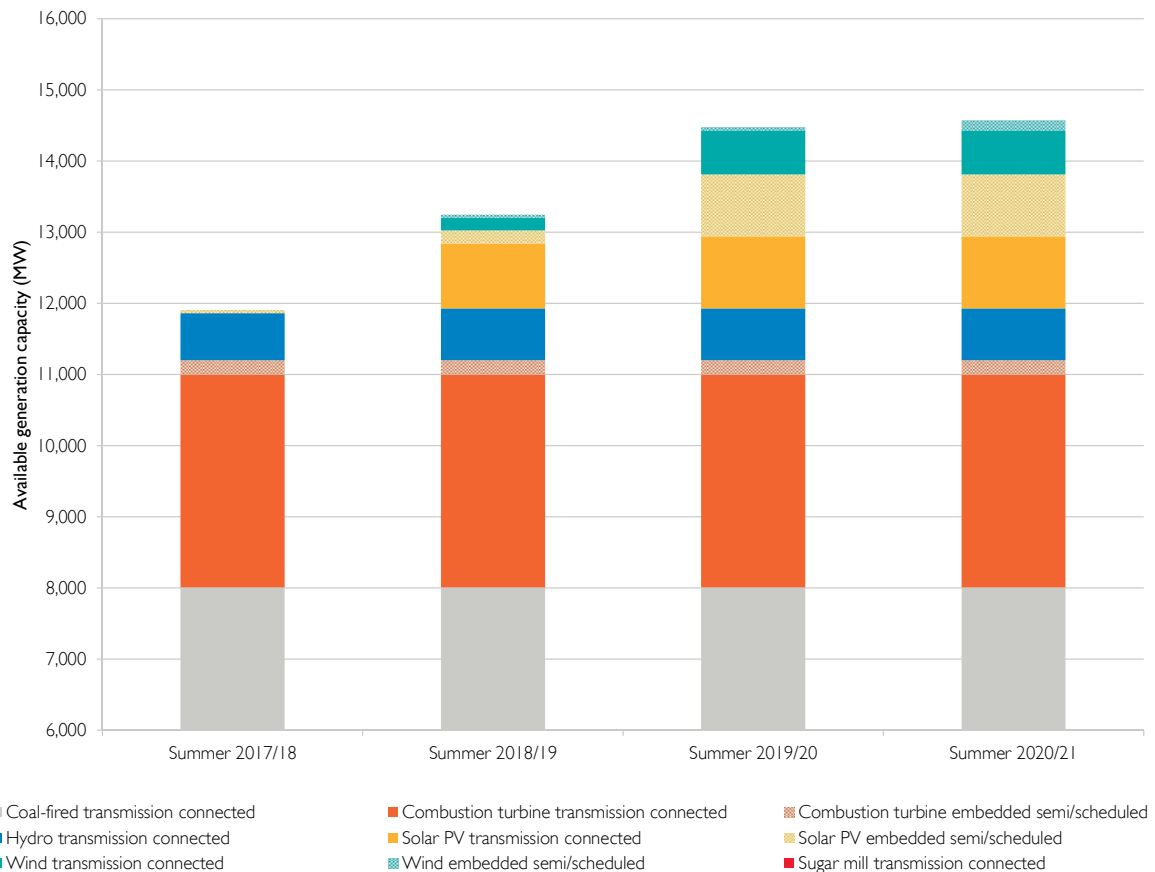
Considerable emphasis has been given to an integrated approach to the analysis of future reinvestment needs and options. Powerlink has systematically assessed the enduring need for assets at the end of their technical service life and considered a broad range of options including network reconfiguration, asset retirement, non-network solutions or replacement with an asset of lower capacity. This strategy was used to undertake minor works from Central Queensland to Southern Queensland to align the end of technical service life of the 275kV transmission lines. This incremental development approach potentially defers large capital investment and has the benefit of maintaining the existing topography, transfer capability and operability of the transmission network.

The integrated planning approach has identified a number of potential reconfiguration opportunities in the Ross, Central West, Gladstone and Moreton zones within the outlook period. Powerlink has also included additional information in this TAPR relating to long-term network reconfiguration strategies that in future years will include further stakeholder engagement and consultation.

Renewable energy and generation capacity

Over the past year, Powerlink has supported a high level of connection activity, responding to more than 120 connection enquiries comprising over 25,000MW of potential VRE generation. In 2017/18, Powerlink finalised seven VRE generator Connection and Access Agreements (CAAs) totalling 1,012MW.

The aggregate of executed CAAs across Network Service Providers (NSP) in Queensland during 2017/18 has added 1,912MW of capacity, taking Queensland's semi-scheduled VRE generation capacity to 2,645MW. Figure 3 illustrates the expected changes to available generation capacity in Queensland from summer 2017/18 to summer 2020/21.

Figure 3 Summer available generation capacity by energy source

Powerlink is also working with the Queensland Government on two initiatives:

- Economic Development Queensland on the Aldoga Renewable Energy Zone project and
- the Powering North Queensland Plan.

Powerlink will continue to engage with market participants and interested parties across the renewables sector to better understand the potential for VRE generation in Queensland.

Committed and commissioned projects

During 2017/18, major committed projects providing for reinvestment in substations and transmission lines across Powerlink's network include:

- Callide A/Calvale 132kV transmission reinvestment
- Garbutt 132/66kV transformers replacement
- Dysart 132kV primary plant and transformers replacement
- Calvale and Callide B 275/132k secondary systems replacement
- Gin Gin Substation replacement
- Ashgrove West Substation replacement
- line refit works on the 132kV transmission line between Eton tee and Alligator Creek Substation
- line refit works on the 275kV transmission line between Woolooga and Palmwoods substations.

Executive Summary

Reinvestment projects completed in 2017/18 include replacement works at:

- Proserpine Substation
- Blackwater Substation
- Mudgeeraba Substation
- 132kV transmission line between Garbutt and Alan Sherriff substations.

Powerlink also finalised the last of its minor transmission augmentation projects to manage localised voltage limitations in the Northern Bowen Basin, with the installation of a 132kV capacitor bank at Moranbah Substation.

Grid section and zone performance

During 2017/18, the Powerlink transmission network supported the delivery of a record summer maximum demand of 8,842MW, 441MW higher than that recorded in summer 2016/17. Record transmission delivered demand was recorded for Wide Bay, Surat and Moreton zones.

The Central Queensland to Southern Queensland grid section showed greater levels of utilisation during 2017/18, mainly due to lower gas fired generation in the Bulli Zone and higher interconnector transfers sourced predominantly by generation in central and north Queensland.

The transmission network in the Queensland region performed reliably during the 2017/18 year, including during the record summer maximum demand. Queensland grid sections were largely unconstrained due in part to the absence of high impact events on the transmission network, effective emergency response, and prudent scheduling of planned transmission outages. Towers damaged by Tropical Cyclone Debbie were rectified in 2017.

Consultation on network reinvestments

Powerlink is committed to regularly reviewing and developing its transmission network in a timely manner to meet the required levels of reliability and manage the risks arising from aged assets remaining in-service.

Following the Replacement Expenditure Planning Arrangements Rule, which commenced in September 2017, Powerlink anticipates a significant Regulatory Investment Test for Transmission (RIT-T) program in relation to the replacement of network assets, particularly over the next two years.

During 2017/18, Powerlink commenced regulatory processes associated with proposed future network reinvestments, in particular, where technically and economically feasible, to consider opportunities for non-network solutions to resolve the following network requirements:

- addressing the secondary systems condition risks at Baralaba Substation
- addressing the secondary systems condition risks at Dan Gleeson Substation
- maintaining reliability of supply to Ingham.

The TAPR also highlights anticipated upcoming RIT-Ts for which Powerlink intends to seek solutions and/or initiate consultation with AEMO, Registered Participants and interested parties in the near future.

Queensland/New South Wales Interconnector (QNI) transmission line

Preliminary market modelling studies undertaken in 2017 by TransGrid and Powerlink indicate that there may be net market benefits arising from upgrading the interconnector capability on QNI. These preliminary findings are consistent with the 2016 NTNDP. In accordance with the requirements of the RIT-T, TransGrid and Powerlink aim to publish a joint Project Specification Consultation Report (PSCR) in the third quarter of 2018 relating to the potential upgrade of the interconnection between Queensland and New South Wales.

Additional stakeholder consultation for non-network solutions

Powerlink is continuing to build its engagement processes with non-network providers and expand the use of non-network solutions to address the future needs of the transmission network, as an alternative option to like-for-like replacements or to complement an overall network reconfiguration strategy, where technically and economically feasible.

As the opportunity arises, Non-network Solution Feasibility Studies will be undertaken to seek potential alternate solutions for future network developments resulting from augmentation and reinvestments needs which fall outside of NER consultation requirements. Powerlink will continue to request non-network solutions from market participants as part of the RIT-T process.

In March and May 2018, Powerlink held Future Transmission Network webinars, to inform and discuss with non-network providers and other stakeholders relevant and topical matters impacting potential future non-network opportunities and more broadly, the future regulated development of the transmission network in Queensland. The webinars included discussion on recent regulatory changes in relation to transmission network planning and an informative session on Powerlink's approach to assessing risk on an ageing transmission network.

Sharing information and building relationships through activities such as the Transmission Network Forum and Future Transmission Network webinar series will assist in broadening communication channels and provide additional opportunities to exchange information on the viability and potential of non-network solutions.

Customer and consumer engagement

Powerlink has embedded its Stakeholder Engagement Framework, which focuses on engaging with stakeholders and seeking their input into Powerlink's business focus and objectives.

The framework aims to promote more effective stakeholder engagement, better inform customers and encourage feedback, and appropriately incorporate that input into Powerlink's business decision making to improve our planning. A primary aim is to ensure Powerlink's services better reflect customer values, priorities and expectations.

Powerlink surveys its key stakeholder groups, including customers, consumer advocates, government, regulators and industry, to gain a stronger understanding of stakeholder perceptions of performance. The survey completed in 2017 sought views from over 100 key stakeholders and highlighted year-on-year improvements in reputation and social licence to operate for Powerlink.

Powerlink's Customer Panel met throughout the year, with panel members providing input and feedback on Powerlink's decision making processes and methodologies. Composed of members from a range of sectors including energy industry, resources, community advocacy groups, consumers and research organisations, the panel provides an important channel to keep our stakeholders better informed about operational activities and strategic topics of interest to them.

Since 2017, Powerlink has engaged with key stakeholders in a number of ways, including its Transmission Network Forum, and Future Transmission Network webinars – all proving to be valuable avenues to exchange information and receive stakeholder input on a range of investment and forecasting considerations.

Executive Summary

Focus on continuous improvement in the TAPR

As part of Powerlink's commitment to continuous improvement, the 2018 TAPR continues to focus on an integrated approach to future network development and contains detailed discussion on key areas of future expenditure.

The 2018 TAPR:

- provides additional information in relation to joint planning and Powerlink's approach to asset management (refer to Chapters 3 and 4)
- includes additional information for the proposed replacement of network assets and potential non-network solutions which are anticipated to be subject to the RIT-T in the next five years (refer to Chapter 5)
- summarises possible network reinvestments in the next six to 10 years (refer to Chapter 5)
- discusses possible future network asset retirements for the 10-year outlook period (refer to Chapter 5)
- includes information on network control facilities and the outcome of the inaugural Power System Frequency Risk Review (refer to Chapter 6)
- continues the discussion on the potential for generation developments (in particular VRE generation) first introduced in 2016 (refer to Chapter 8)
- includes enhanced information with respect to forecasting data, sources of input and assumptions (refer to Appendices A and B)
- to assist non-network providers, includes a compendium on where to locate information within the TAPR on potential non-network opportunities, grouped by investment type (Appendix F)
- includes updated information on Powerlink's approach to assisting the development of non-network solutions – specifically through the ongoing improvement of engagement practices for non-network solution providers (refer to Section 1.8.1).