

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 2017 TAPR outlines the key factors impacting Powerlink's transmission network development and operations. The forecasts presented in this TAPR indicate relatively flat growth for energy, summer maximum demand and winter maximum demand in the first half of the 10-year outlook period, with moderate growth in the latter half of the 10-year outlook period.

An amended planning standard for the transmission network also came into effect from July 2014 which allows the network to be planned and developed with up to 50MW or 600MWh 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 or economic 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, encompassing large-scale variable renewable electricity (VRE) generation in Queensland and improving stakeholder engagement when developing non-network solutions.

Electricity energy and demand forecasts

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

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

In preparing its demand and energy forecasts, Powerlink conducted a forum for industry experts to share insights and build on our knowledge relating to emerging technologies. As a result several enhancements were made to how these emerging technologies are forecast within this TAPR. These forecasts are obtained through a reconciliation of two separate processes, namely 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.

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

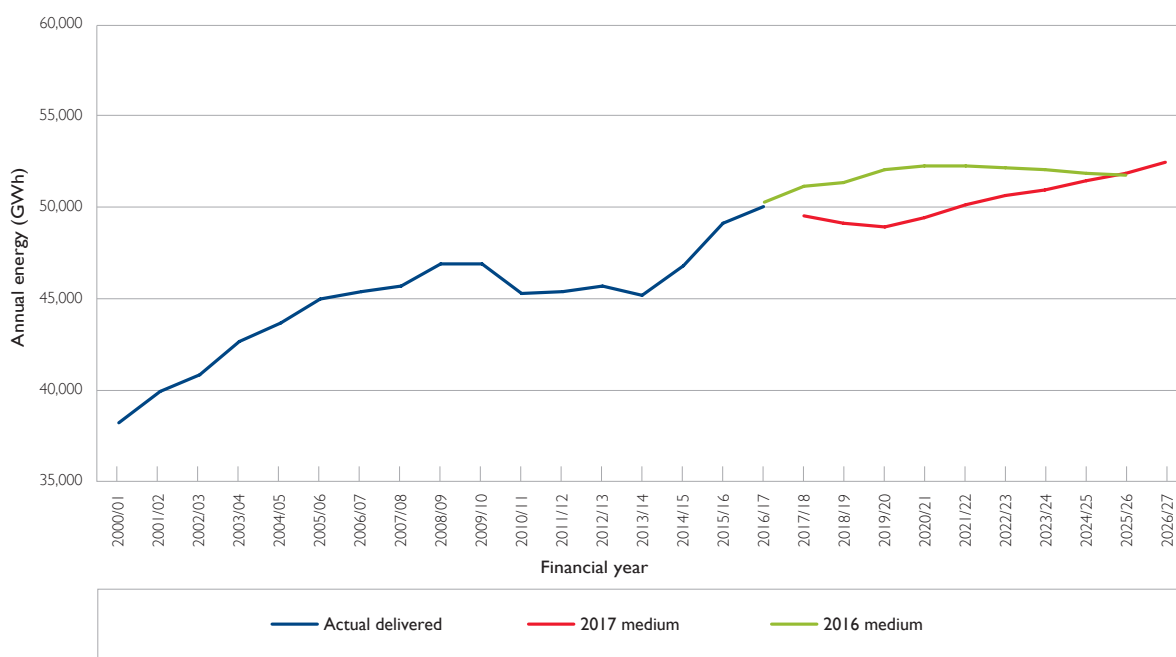
The 2016/17 summer in Queensland was hot and long lasting with particularly high electricity demand on the transmission network on 18 January and 12 February. A new record demand was recorded at 6:00pm on 18 January, when 8,401MW was delivered from the transmission grid. Scheduled as generated and native demand records were recorded at 5:30pm on 12 February, with scheduled as generated reaching 9,369MW and native demand reaching 8,756MW. The corresponding delivered demand on 12 February was 8,392MW, slightly lower than 18 January record. The scheduled as generated record of 9,369MW exceeded the previous record of 9,097MW from February 2016. After temperature correction, the 2016/17 summer demand exceeded the 2016 Transmission Annual Planning Report forecast by around 2%.

Electricity energy forecast

Based on the medium economic outlook, Queensland's delivered energy consumption is forecast to increase at an average of 0.4% per annum over the next 10 years from 50,190GWh in 2016/17 to 52,459GWh in 2026/27. The delivered energy forecast in the 2017 TAPR shows a reduction compared to the 2016 TAPR. The reduction to 2020 is largely due to forecast increases in the capacity of distribution connected solar PV farms and a forecast reduction in energy usage by a major transmission connected customer.

A comparison of the 2016 and 2017 TAPR forecasts for energy delivered from the transmission network is displayed in Figure 1. Energy delivered from the transmission network for 2016/17 is expected to be within 1% of the 2016 TAPR forecast.

Figure 1 Comparison of the medium economic outlook energy forecasts



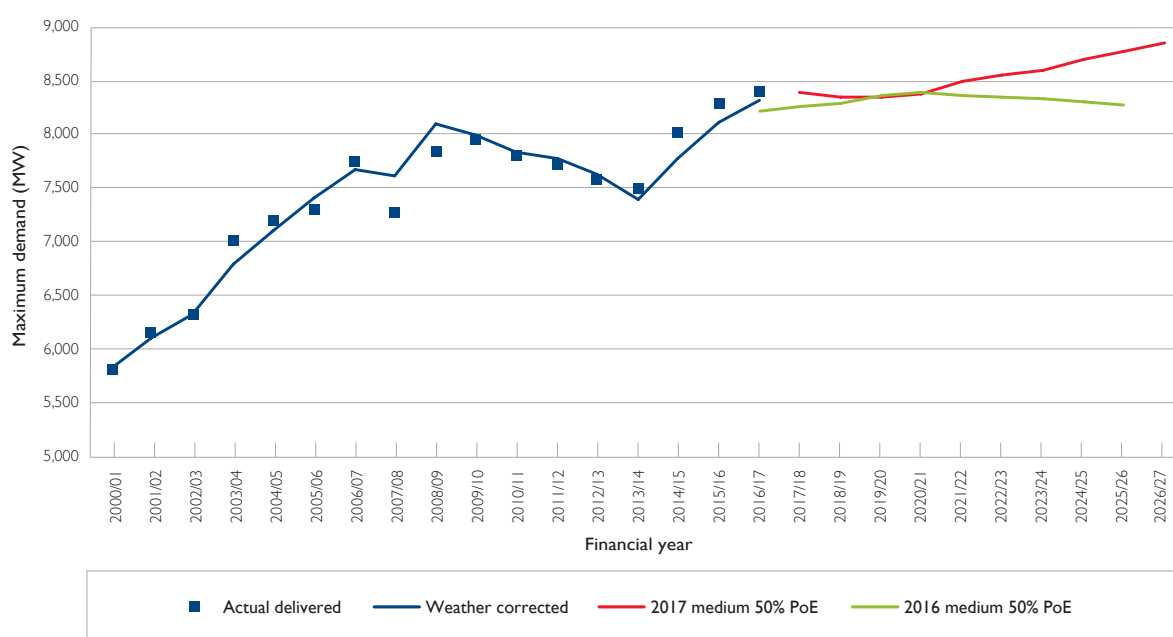
Electricity demand forecast

Based on the medium economic outlook, Queensland's transmission delivered summer maximum demand is forecast to increase at an average rate of 0.6% per annum over the next 10 years, from 8,302MW (weather corrected) in 2016/17 to 8,790MW in 2026/27.

The transmission delivered maximum demand for summer 2016/17 of 8,401MW was a new record for Queensland.

A comparison of 2016 and 2017 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 2017 demand forecast has been adjusted to take account of actual consumption over the 2016/17 period and updated to reflect the latest economic projections for the State. The increase from 2020 is largely due to an expectation that electricity prices will remain flat and then fall 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 significant focus on striking the right balance between reliability and cost of transmission services. In response to these drivers, the Queensland Government amended Powerlink's N-I criterion to allow for increased flexibility from July 2014. 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, within 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 which is 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 maximise reliability to consumers.

Future network development

The energy industry is going through a period of transformation driven by changes in economic outlook, electricity consumer behaviour, government policy and regulation and emerging technologies. These fundamental shifts, including the upturn in VRE developments in Queensland, are reshaping the operating environment in which Powerlink delivers its transmission services.

Powerlink is responding to these fundamental shifts by:

- adapting its approach to investment decisions
- placing considerable emphasis on an integrated and flexible analysis of future reinvestment needs
- supporting diverse generation connection

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- continuing to focus on developing options that deliver a secure, reliable and cost effective transmission network.

Based on the medium economic forecast outlook, the planning standard and committed network and non-network solutions, network augmentations are not forecast to occur as a result of network limitations within the five-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 or economic life, represents the majority of 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 or economic life and considered a broad range of options including network reconfiguration, asset retirement, non-network solutions or replacement with an asset of lower capacity. An example of this is the strategy to undertake minor works from Central Queensland to Southern Queensland to align the technical and economic end of life of the 275kV transmission lines. This incremental development approach defers large capital investment and has the benefit of maintaining the existing topology, transfer capability and operability of the transmission network.

The integrated planning approach has revealed 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 are likely to require further stakeholder engagement and consultation.

Renewable energy

Over the past year, Powerlink has supported a high level of connection activity, responding to more than 80 connection enquiries comprising over 15,000MW of potential VRE generation. In 2016/17, Powerlink finalised seven VRE generator Connection and Access Agreements totalling 718MW.

Powerlink is also working with the Queensland Government to progress 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 2016/17, the majority of committed projects provided for reinvestment in transmission lines and substations across Powerlink's network.

Reinvestment projects completed in 2016/17 include major replacement works at Rockhampton Substation and line refit works on 110kV transmission lines in Brisbane between Belmont, Runcorn and Algester substations.

Powerlink is currently finalising 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 2016/17, the Powerlink transmission network supported the delivery of a record summer maximum demand of 8,401MW, 130MW higher than that recorded in summer 2015/16. Record transmission delivered demands were recorded for Ross, Surat, Bulli and Moreton zones.

The Central Queensland to Southern Queensland grid section showed greater levels of utilisation during 2016/17, predominantly due to lower gas fired generation in the Bulli Zone and greater output from central and north Queensland generators.

The transmission network in the Queensland region performed reliably during the 2016/17 year, including during the 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. Central Queensland to North Queensland grid section experienced 3.58 hours of constrained operation associated with the reclassification of double circuit events due to increased risk during the Tropical Cyclone Debbie weather event. Subsequent flooding damaged 19 towers between Broadsound and Nebo substations which are scheduled for rectification during 2017.

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.

In August 2016, Powerlink concluded the first Non-network Solution Feasibility Study to further improve communication with non-network providers. Such studies are intended to seek potential alternate solutions for future network developments resulting from augmentation and reinvestments needs which currently fall outside of NER consultation requirements. Powerlink will continue to request non-network solutions from market participants as part of the Regulatory Investment Test for Transmission (RIT-T) process.

In May 2017, Powerlink held a Future Transmission Network webinar, the first in a series of webinars which are intended to inform non-network providers, and other stakeholders unfamiliar with Powerlink's transmission network, with an overview of the history, characteristics, most recent understanding of asset condition and ongoing requirements of the transmission network. Each webinar will focus on transmission assets in specific geographic regions within Queensland which are approaching their anticipated end of technical or economic life in the medium to longer term, sharing our most recent information well in advance of the commencement of any NER consultation process.

The Future Transmission Network webinar series in conjunction with the Non-network Feasibility Study process will assist in achieving the right balance between reliability and cost by providing opportunities to exchange early information on the viability and potential of non-network solutions and how they may integrate with the transmission network.

Customer and consumer engagement

Powerlink continues to implement its Stakeholder Engagement Framework, supporting the considerable work already being undertaken to engage with stakeholders and seek their input into Powerlink's business focus and objectives.

The framework aims to build greater stakeholder engagement and contribution, inform consumers and encourage feedback, and appropriately incorporate that input into Powerlink's business decision making to improve planning and operational activities. A primary aim is to ensure Powerlink's services better reflect consumer values, priorities and expectations.

Powerlink undertakes a biannual survey across its stakeholder groups, including customers, consumer advocates, government, regulators and industry, to gain a stronger understanding of stakeholder perceptions of performance. The survey completed in 2016 sought views from over 100 key stakeholders and highlighted improvements in reputation and social licence to operate for Powerlink.

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Powerlink's Customer and Consumer Panel also continued to meet throughout the year, providing input and feedback on Powerlink's decision making processes and methodologies. Comprised of members from a range of sectors including energy industry, resources, community advocacy groups, consumers and research organisations, the panel provides an important avenue to keep our stakeholders better informed about operational and strategic topics of relevance.

Since 2016, Powerlink has engaged with key stakeholders in a number of ways, including its Transmission Network Forum, Demand and Energy Forecasting Forum, North Queensland Area Forum and Future Transmission Network webinar – all proving to be valuable avenues to exchange information and gather feedback on a range of investment and forecasting considerations.

Focus on continuous improvement in the TAPR

As part of Powerlink's commitment to continuous improvement, the 2017 TAPR focuses on an integrated approach to future network development and contains detailed discussion on key areas of future expenditure.

The 2017 TAPR:

- continues the discussion on the potential for generation developments (in particular VRE generation) first introduced in 2016 (refer to Chapter 7)
- 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 and provision of information (refer to Section 1.8.1 and Section 4.2).