Powerlink Queensland

Transmission Annual Planning Report

Overview

2016

Message from the Chief Executive

At a time when change is almost a constant in our industry, it is more important than ever to be focused on delivering safe, cost-effective and reliable transmission services to Queensland consumers.

The annual development of Powerlink Queensland's Transmission Annual Planning Report (TAPR) is a key part of planning transmission network development to support future decision-making. Each year, our comprehensive forecasting and subsequent analysis provides valuable information on the outlook for the transmission network in Queensland.

The TAPR includes details on forecast electricity requirements, the transmission network's capabilities, and future investment required to ensure we manage our network safely, efficiently and reliably into the future.

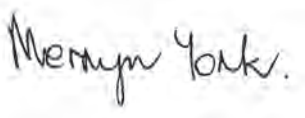
Building on our integrated approach to future network development, the 2016 report contains several components of enhanced or additional information, in particular:

- including a new chapter which discusses renewable energy generation and also identifies locations where capacity for new generation developments exist
- incorporating updated information regarding the future impacts of emerging technologies into Powerlink's forecasting methodology
- detailing the ongoing improvement of information and engagement practices for non-network solution providers
- building on Powerlink's Revenue Proposal which was submitted to the Australian Energy Regulator in January 2016 and its relationship to the proposed capital expenditure discussed within the TAPR outlook period.

This overview document provides a high-level summary of key findings from the 2016 TAPR. It explains Powerlink's role in the National Electricity Market and our response to rising electricity prices, and goes on to explore how and why we forecast demand and energy. The document then examines the results of this year's forecasts, including a discussion on the impact of renewables, and how we are utilising an integrated and strategic approach to future network development.

Over the past year, we have strengthened our focus on sharing effective, timely and transparent information with our stakeholders using a range of engagement methods. Powerlink is continuing to proactively engage with stakeholders to seek their valuable input to our business processes, objectives and direction.

I hope you find our 2016 TAPR a useful resource in understanding Powerlink's commitment to strategic decision-making that effectively responds to challenges and opportunities, and delivers strong and valued outcomes for our stakeholders.



Merryn York
Chief Executive
Powerlink Queensland

About Powerlink

Powerlink Queensland is a Government Owned Corporation that owns, develops, operates and maintains the electricity transmission network in Queensland. Our transmission network runs approximately 1,700km from Cairns down to New South Wales.

With electricity being a key enabler of the economy and supporter of our modern lifestyles, we have an important responsibility to deliver electricity to almost four million Queenslanders.

Powerlink's transmission network transports electricity generated at large power stations to the distribution networks owned by Energex, Ergon Energy and Essential Energy (in northern New South Wales). We also transport electricity to high usage industrial customers such as rail companies, mines and mineral processing facilities, and to New South Wales via the Queensland/NSW Interconnector transmission line.

Electricity prices

Powerlink recognises that the price of electricity continues to be a key issue for Queenslanders.

For the average Queensland residential electricity consumer, use of Powerlink's high voltage grid represents about 9% of the total delivered cost of electricity. Although this is a relatively small component in the supply chain that makes up an electricity bill, we are mindful of our contribution and strive to ensure our transmission services are delivered as cost effectively as possible.

9%

The cost of Powerlink's high voltage electricity grid represents around 9% of the total delivered cost of electricity for the typical Queensland residential electricity consumer.

Electricity supply chain components	Proportion of electricity bill
Power generators and electricity retailers	36%
High voltage transmission	9%
Electricity distribution	42%
Green schemes and solar	13%

Source: AEMC 2015 Residential Electricity Price Trends report Figure 3.2 Pg 49

Powerlink's Revenue Proposal – currently under review by the Australian Energy Regulator – outlines our commitment to delivering better value to consumers and customers through increased efficiency to lower costs, while maintaining reliable transmission services. Under the proposal, consumers will experience a 28% reduction in the indicative transmission price in the first year of the regulatory period. This equates to an annual saving of between $22 and $37[1] for the average Queensland residential household electricity bill.

Electricity Prices

28% drop in indicative transmission price in the first year of the 2018-22 regulatory period

Between **$22 and $37** savings for the average Queensland residential household annual electricity bill

[1] Based on the Australian Energy Market Commission's report from 2015 – 'Residential Electricity Price Trends', citing an annual usage of between 2,500kWh and 5,173kWh.

Why we forecast demand and energy

Powerlink's planning processes play an important role in ensuring our network and business priorities continue to meet the needs of participants in the National Electricity Market (NEM) and electricity consumers.

We undertake our annual planning review in accordance with the requirements of the National Electricity Rules, and publish the findings of this review in our TAPR. The TAPR's purpose is to provide information about the Queensland electricity transmission network to everyone interested or involved in the NEM – including the Australian Energy Market Operator (AEMO, who operates the NEM), Registered Participants (entities registered with AEMO who participate in trading activities or provide services for the operation of the market), and interested parties.

The TAPR also provides broader stakeholders with an overview of Powerlink's planning processes and decision-making on future investments – which offers market intelligence to a range of interested groups.

The TAPR includes information on:

electricity demand and energy forecasts

the performance of the existing transmission network

committed generation and network developments

forecast network capability including capacity for generation

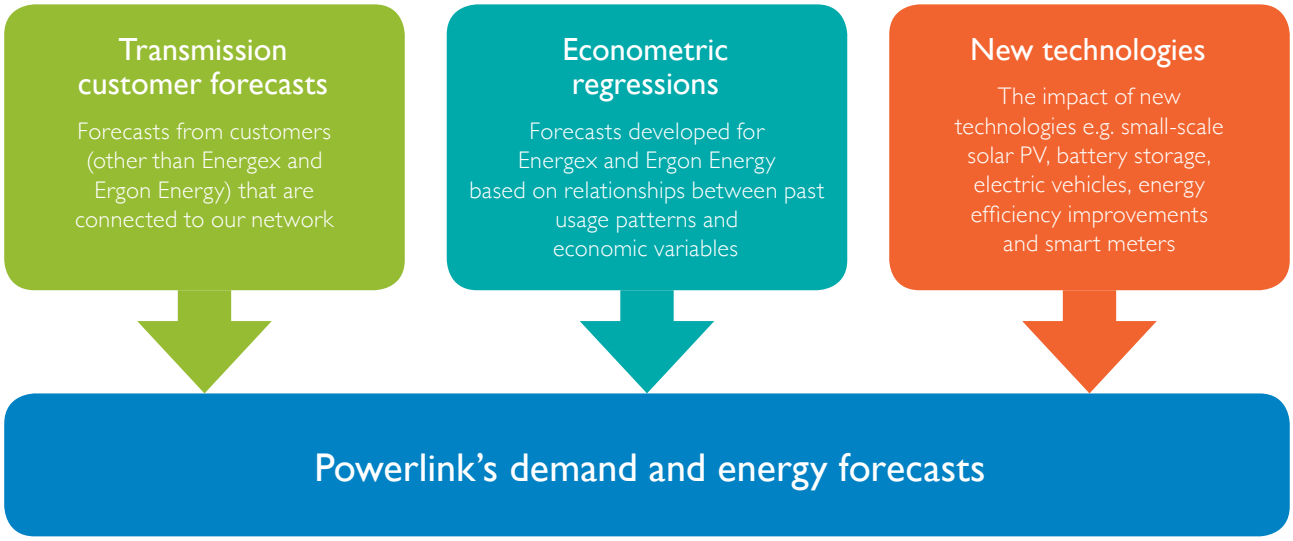
potential future network developments and non-network developments (e.g. demand side management alternatives)

Our forecasting methodology

Powerlink takes a comprehensive and consultative approach to developing and applying a robust forecasting methodology to produce the TAPR.

Transmission network planning is a complex task and requires detailed analysis performed by our specialist planning engineers. We recognise the external pressures shaping the future of our business and strive to identify and respond to these trends in a timely manner.

We look at two major components when developing our forecasts – demand (instantaneous electricity usage) and energy (electricity usage over a full year). To prepare these forecasts, Powerlink uses a 'building block' approach of seeking input from a range of external sources including AEMO, network customers and broader market research.



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

- recent high levels of investment in Liquefied Natural Gas (LNG) development in South West Queensland
- continued growth of solar PV installations
- sustained consumer response to high electricity prices
- ongoing subdued economic growth in Queensland
- impact of energy efficiency initiatives, battery storage technology, tariff reform and demand side management.

Of particular interest in recent years has been the growing influence of new technologies on our forecasts. Driven by our commitment to engage with stakeholders, Powerlink again conducted a forum of industry experts in early 2016 to share insights and build on our knowledge relating to emerging technologies. As a result, our methodology relating to new technologies was strengthened within this TAPR to inform the development of more robust and useful forecasts. For more information on our forecasting model, please visit our website www.powerlink.com.au (via the 'About Powerlink' > 'Publications' > 'Transmission Annual Planning Reports' > 'Transmission Annual Planning Report 2016' page).

Our demand and energy forecast

The forecasts presented in the 2016 TAPR are similar to last years and indicate there will be relatively flat growth for energy, summer maximum demand and winter maximum demand after the LNG industry is at full output.

While there has been significant investment in the resources sector, further developments in the short-term are unlikely due to low global coal and gas prices. Queensland on the whole is still experiencing slow economic growth.

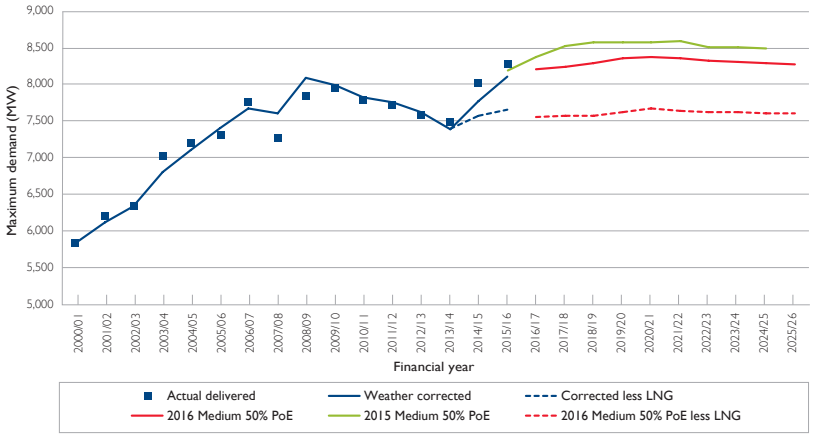
The consumer response to high electricity prices continues to have a dampening effect on electricity usage. Future developments in battery storage technology coupled with the popularity of small-scale solar PV may induce significant changes to future electricity usage patterns. We remain committed to understanding the future impacts of emerging technologies so that our transmission network services are developed in a way most valued by customers.

It is worth noting the 2016 TAPR forecasts for both energy and demand are lower than what was forecast in the 2015 TAPR. The energy reduction is almost entirely due to slower than expected energy usage growth within the LNG sector. The demand reduction is due to similar lowering demand for both regional Queensland and the LNG sector.

Demand forecast

The information presented in the TAPR indicates that summer maximum demand is forecast to increase at an average rate of 0.2% per annum over the next 10 years. The LNG industry continues to be a strong contributor to forecast growth. Without the impact of LNG, forecast growth would fall at an average of 0.1% per annum.

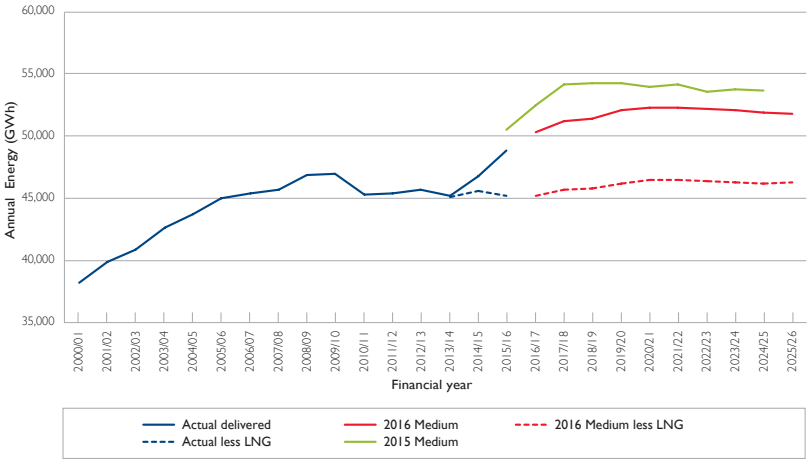
Comparison of summer demand forecasts for the medium economic outlook



Energy forecast

Energy consumption is forecast to increase by an average of 0.6% per annum over the next 10 years. Without the impact of LNG, forecast consumption would increase at an average of 0.2% per annum.

Comparison of energy forecasts for the medium economic outlook



What we do with our planning information

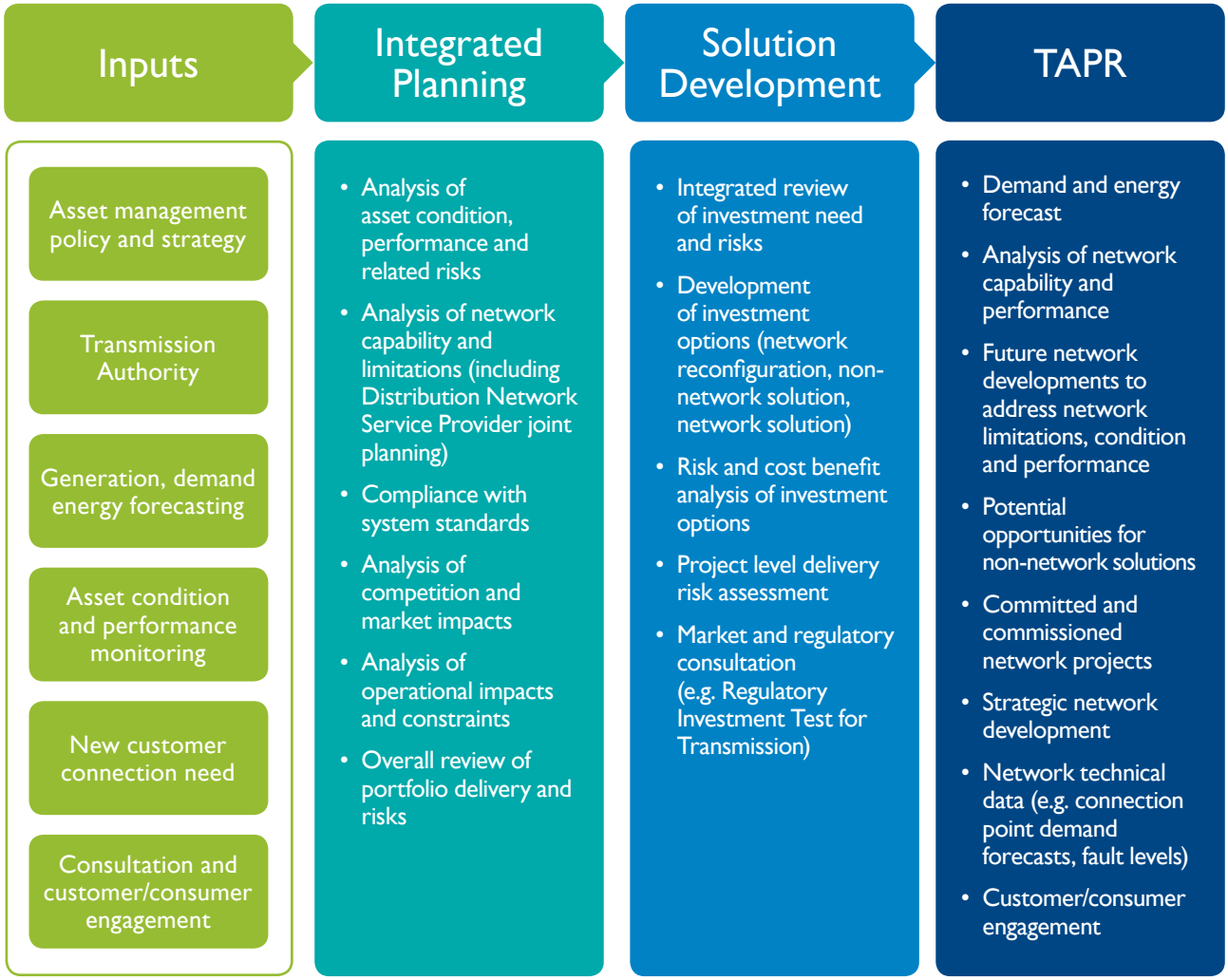
Powerlink's comprehensive planning approach identified a number of opportunities for us to respond to external changes and deliver effective solutions.

Amended planning standard drives focus on cost-effectiveness

Powerlink continues to aim for striking the right balance between reliability and cost of transmission services, following the introduction of the amended reliability planning standard in July 2014.

Reliability standards set the trigger level for investment to cater for peak electricity demand growth. The introduction of a slightly lower reliability standard now permits the network to be planned and developed on the basis that electricity load may be interrupted during a single network contingency event.

The amended reliability planning standard and heightened emphasis on cost-effectiveness has allowed for increased flexibility in network planning. It has also had the effect of deferring or reducing the extent of investment in network or non-network solutions required in response to demand growth. We will continue to design, operate and maintain our network to reduce costs and maintain reliability to consumers in accordance with the amended standard.



Impact of renewable energy sources

There is significant potential for energy supply from renewable resources in Queensland.

Powerlink is committed to responding to the impacts and opportunities associated with the growing developments in renewable energy generation. For the first time, this year's TAPR has included a new chapter to explore how renewables can be readily incorporated into the supply side.

While Queensland is rich in a diverse range of renewable energy resources – geothermal, biomass, wind and hydro – the focus to date has primarily been on solar, with Queensland having one of the highest levels of solar concentration in the world. This makes Queensland a logical choice for solar energy developers keen to take advantage of this rapidly growing market sector.

Network capacity for renewable generation

To ensure our business is agile and responding appropriately to changes in how electricity is generated, Powerlink has assessed the ability of the existing transmission network to connect additional renewable generation capacity. The results of these assessments are encouraging – our network has the capability to provide an effective and efficient means of transporting large amounts of renewable energy to load centres within Queensland.

Additionally, due to the high level of growth in renewable energy systems in Queensland, Powerlink recently undertook a joint study with Ergon Energy to assess the potential impact of large-scale renewable energy penetration on grid stability. In general, the study confirmed that our transmission network was sufficiently strong, possessing capability to support additional renewable energy connections without compromising the performance and reliability of our infrastructure.

Adapting to future opportunities

Powerlink will continue to widely engage with market participants and interested parties across the renewables sector to better understand the potential for renewable energy, and to identify opportunities and emerging limitations as they occur.

We are determined to effectively adapt our business to align with the ever-changing operating environment, and have a strong commitment to further exploring efficient connection arrangements for renewable energy developments across Queensland.

Supporting renewable energy infrastructure development

Powerlink recognises the importance of supporting the development of renewable energy projects in Queensland. As such, where economies of scale can be achieved through 'project clusters', we will consider the development of 'Renewable Energy Zones', subject to regulatory approvals and the conditions of our Transmission Licence.

These zones may be viewed as an augmentation to the existing network – for example a high capacity transmission line or a connection hub – either of which would support clusters of renewable energy projects. This type of future potential network configuration presents strong opportunities for cost-savings, as infrastructure sharing reduces asset duplication.

The implementation of a 'Renewable Energy Zone' would be based on a range of criteria, including:

- economic benefit to customers
- energy resource potential
- infrastructure availability and access
- stakeholder and local authority support
- environmental suitability
- potential opportunity for deferral or replacement of network investment projects

Proposed renewable energy development projects in Queensland

Source: Queensland Department of Energy and Water Supply

An integrated approach to drive future investment

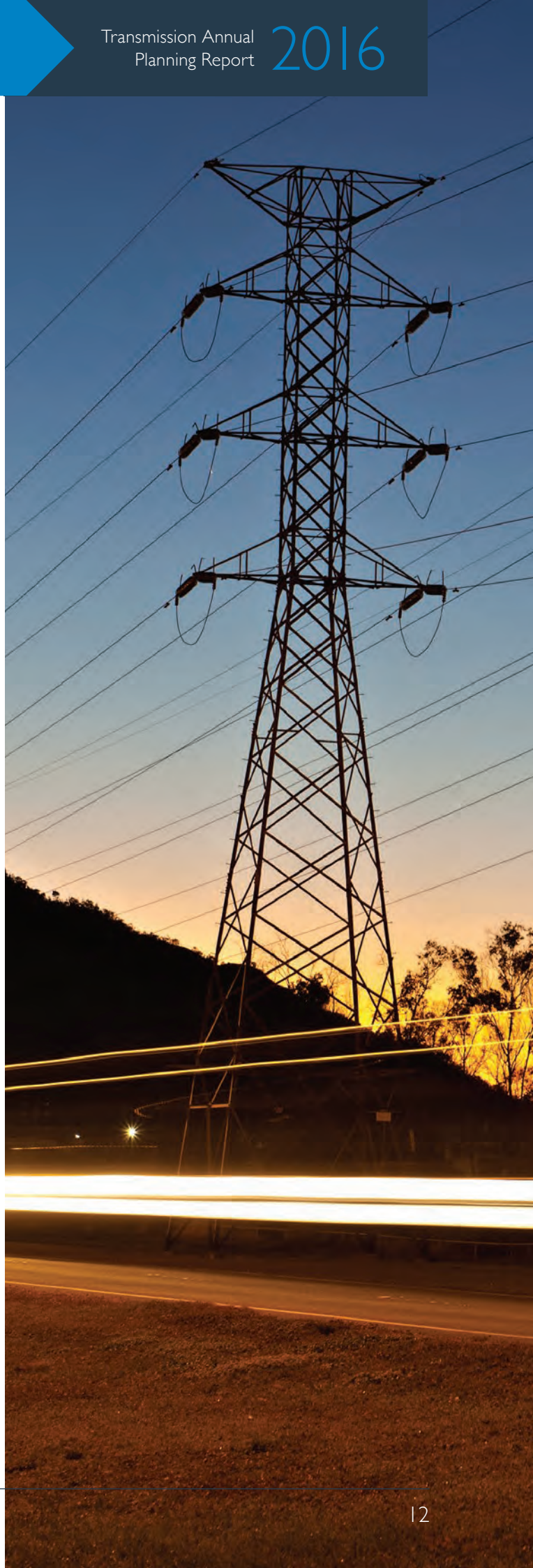
Ultimately, our annual planning review processes provide Powerlink with the ability to holistically analyse, prioritise and validate network investment.

Our planning for future network development focuses on optimising the network topology based on several considerations:

- forecast demand
- new customer supply requirements
- existing network configuration
- condition-based risks related to existing assets.

Based on the economic forecast outlook, the amended planning standard and committed network and non-network solutions already under way, no network augmentations are planned to occur as a result of network limitations within the five-year outlook period of this TAPR.

Rather, managing ageing assets that are reaching the end of their technical or economic life continues to be the largest component of Powerlink's capital expenditure. This is in response to the significant growth experienced in Queensland's transmission network from the 1960s to the 1980s. Network reinvestment works can include line refits, network reconfigurations, asset retirements, non network solutions, or replacements with lower-capacity assets.



Our committed projects

Network reinvestment projects that are committed and under way as at June 2016 include:

Project	Purpose	Zone location	Proposed commissioning date
Turkinje secondary systems replacement	Maintain supply reliability in the Far North zone	Far North	Summer 2018/19
Garbutt to Alan Sherriff 132kV line replacement	Maintain supply reliability in the Ross zone	Ross	June 2018
Nebo 275/132kV transformer replacements	Maintain supply reliability in the North zone[2]	North	Progressively from summer 2013/14 to summer 2017/18
Line refit works on the 132kV transmission line between Collinsville North and Proserpine substations	Maintain supply reliability to Proserpine	North	Summer 2018/19
Proserpine Substation replacement	Maintain supply reliability in the North zone	North	Winter 2016
Moranbah 132/66kV transformer replacement	Maintain supply reliability in the North zone	North	Summer 2016/17
Mackay Substation replacement	Maintain supply reliability in the North zone	North	Summer 2017/18
Nebo primary plant and secondary systems replacement	Maintain supply reliability in the North zone	North	Summer 2019/20
Rockhampton Substation replacement	Maintain supply reliability in the Central West zone	Central West	Winter 2016
Blackwater Substation replacement	Maintain supply reliability in the Central West zone	Central West	Summer 2016/17
Baralaba secondary systems replacement	Maintain supply reliability in the Central West zone	Central West	Summer 2016/17
Moura Substation replacement	Maintain supply reliability in the Central West zone	Central West	Summer 2017/18

[2] The first transformer was commissioned in August 2013.

Project	Purpose	Zone location	Proposed commissioning date
Stanwell secondary systems replacement	Maintain supply reliability in the Central West zone	Central West	Summer 2018/19
Calvale and Callide B secondary systems replacement	Maintain supply reliability in the Central West zone[3]	Central West	Winter 2021
Line refit works on 132kV transmission lines between Calliope River to Boyne Island	Maintain supply reliability in the Central West zone	Central West	Summer 2017/18
Tennyson secondary systems replacement	Maintain supply reliability in the Moreton zone	Moreton	Summer 2017
Upper Kedron secondary systems replacement	Maintain supply reliability in the Moreton zone	Moreton	Summer 2016
Rocklea secondary systems replacement	Maintain supply reliability in the Moreton zone	Moreton	Summer 2017
Blackwall IPASS secondary systems Replacement	Maintain supply reliability in the Moreton zone	Moreton	Winter 2017
Line refit works on 110kV transmission lines between Runcorn to Algester	Maintain supply reliability in the Moreton zone	Moreton	Summer 2016/17
Line refit works on 110kV transmission lines between Belmont to Runcorn	Maintain supply reliability in the Moreton zone	Moreton	Winter 2017
Mudgeeraba 110kV Substation primary plant and secondary systems replacement	Maintain supply reliability in the Gold Coast zone	Gold Coast	Summer 2017/18
Mudgeeraba 275/110kV transformer replacement	Maintain supply reliability in the Gold Coast zone	Gold Coast	Summer 2017/18

[3] The majority of Powerlink's staged works are anticipated for completion by summer 2018/19. Remaining works associated with generation connection will be coordinated with the customer.

Contact us

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