



# NETWORK STRATEGY AND OPERATIONS



*Transmission Barehand  
Live Linesperson,  
Andre Leebod.*

NETWORK STRATEGY AND OPERATIONS

## ACHIEVING

- recognition as a top performer in terms of cost efficiency and network reliability through international benchmarking
- implemented new methods of replacing and extending the life of parts of our network
- developed new strategies to monitor and respond to weather events that may impact our network
- finalised approvals to acquire easements and sites for 13 future transmission projects
- implemented new substation technology to improve performance.

### Power system security

Powerlink oversees the operation of the electricity transmission network 24/7. Working in conjunction with the Australian Energy Market Operator (AEMO), Powerlink ensures the network is operated in a safe, secure and reliable manner.

Our Energy Management System (EMS) was upgraded last year to better meet our emerging business needs. In its first full year of operation, the EMS operated with 100 per cent availability, enabling real-time monitoring and control of the transmission network, as well as data analysis and assessment of the impact of unplanned outages.

Our upgraded dedicated network operator training facility has improved the availability of training in procedures and systems for our network operators. Ongoing training ensures our operators maintain and enhance their capabilities in managing conditions and contingency events on the transmission network, contributing to Powerlink's ability to operate the network in safe, reliable and secure manner.

## CASESTUDY

## EFFICIENCY GAINS THROUGH SMART SUBSTATION DESIGN

Powerlink has adopted the International Electro-technical Commission (IEC) standard IEC 61850 Communication and Systems for Power Utility Automation, which will enable us to increase the efficiency of control, monitoring and protection systems in our substations.

The new standard provides a platform for Powerlink to adopt new technologies that improve communication between electronic devices used within and outside of our substations, and will deliver higher levels of security and reliability.

Pascal Schaub, Principal Consultant for Digital Technology Infrastructure, said the new solution delivered significant benefits.

"The design, testing and construction are less labour intensive and deliver significant efficiencies and safety improvements," Pascal said. "There are also far fewer connections between electronic devices in the substation and those connections are fibre optic, rather than the copper wiring previously used."

He said Powerlink was implementing the new standard through a phased approach.

"In the first phase, we are developing and implementing a design solution for substation control and protection devices within the substation control building. This is referred to as an IEC 61850 station bus solution. Pilot projects to implement this phase are under way at our Redbank Plains and Blackstone substations.

"The second phase involves implementing new and emerging technology with electronic interfaces between the substation control room and the primary plant equipment located within the substation yard. This is referred to as an IEC 61850 process bus solution, with the process bus being the interface between the control building and the switchyard.

"In 2011/12 we completed the first application of IEC 61850 process bus at a pilot project at our Loganlea Substation, which services metropolitan Brisbane. It was the world's first commercial installation of a substation protection system outside of China that is based entirely upon IEC 61850 process bus.

"Following the success of the project, we are undertaking four more substation refurbishments using the same methodology.

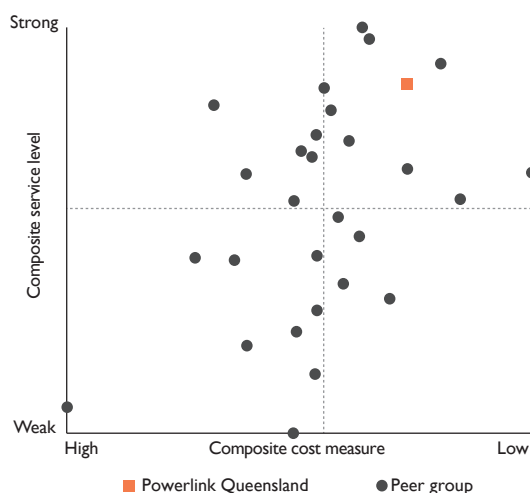
"The learnings from Loganlea Substation have been important and will continue to be realised as Powerlink works towards a full implementation of the new international design standards."

## International benchmarking

Powerlink participated in the International Transmission Operations and Maintenance Study (ITOMS) 2011, a biennial benchmarking study of network performance and practices.

Among the 27 international transmission businesses participating in ITOMS 2011, Powerlink was identified as a top quartile performer in terms of cost efficiency and network reliability in both transmission line and high voltage substation categories. Powerlink has participated in ITOMS since 1995, and during the past decade has consistently achieved top quartile performance.

ITOMS also examines the maintenance policies and work practices adopted by participating businesses and offers a forum for international collaboration and information sharing.

ITOMS overall composite benchmark  
non-weighted average

## Electricity demand forecasts

Consistent with the National Electricity Rules (NER), Powerlink publishes an Annual Planning Report (APR) in June each year, which is issued to National Electricity Market (NEM) participants and other interested parties and is available on our website. The APR provides information about the outlook for the electricity transmission network in Queensland and includes information on forecast electricity requirements, the transmission grid's capability and potential network developments required in the future years, to ensure an efficient, safe and reliable network.

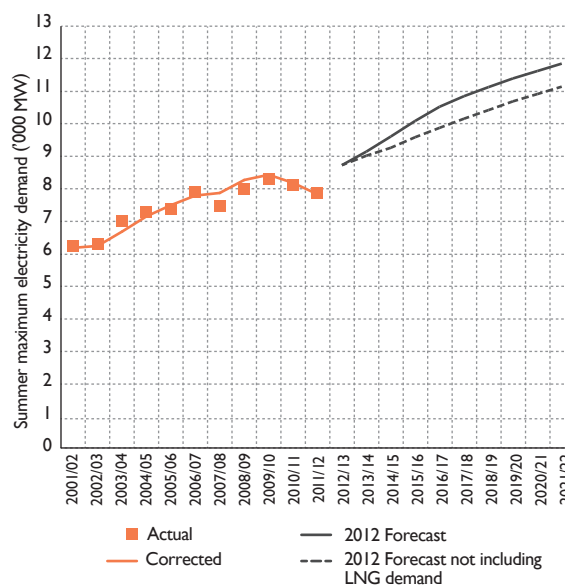
In December 2011, Powerlink undertook a review of demand forecasts from its 2011 APR and published the results in an Annual Planning Report 2011 Update. We undertook the review to support our Revised Revenue Proposal to the Australian Energy Regulator (AER) and to ensure the AER was working with the most recent information. The APR takes a long-term view of electricity demand and energy forecasts and is very dependent on changeable external factors. The update showed there had been some adjustment of figures over the six month period.

The 2012 APR, which was issued on 30 June, indicates that peak electricity demand has steadied in recent years, and was in fact lower in 2012 than in previous years. However peak demand is forecast to increase by an average of 3.5 per cent per year over the next 10 years, which reflects the predicted trends in Queensland's economy – a return to growth following the recent period of economic slowdown. This growth is driven primarily by emerging electricity requirements in the Surat Basin due to proposed upstream processing facilities for multiple liquefied natural gas (LNG) projects and the related growth in the service towns in this region. Without including the LNG industry, forecast demand growth would be 2.8 per cent per year over the next 10 years.

The long-term statewide electricity demand forecast has been revised down when compared to past forecasts due to the slower than anticipated recovery of the State's economy, continued uptake of household solar initiatives, general consumer response to rising electricity prices and the fact that households used less air-conditioning in the mild summer of 2011/12.

This electricity demand forecast for the next 10 years is used by Powerlink to determine timely, safe and efficient transmission arrangements to meet customer needs at the lowest long-run cost.

*Queensland maximum electricity demand forecast*



\* The starting value for the forecast demand (the 2012/13 summer demand) takes account of economic growth forecast to occur from the 2011/12 to 2012/13 summer period. This starting value also takes account of the fact that the peak temperature day during the 2011/12 summer occurred in the January holiday period and therefore was lower than it would have been had similar weather conditions occurred several weeks later.

## Capital works program

In 2011/12, Powerlink invested \$752.9 million in capital works projects throughout Queensland to ensure our transmission network continues to meet reliability standards and electricity demand for more than two million customers and to underpin Queensland's economic development, including resource sector projects. We develop our regulated (prescribed) network to meet the needs of electricity consumers and also develop non-regulated transmission assets on a user-pays basis in response to requests by large business customers for example, coal mines and liquefied natural gas developments.

During the next five-year period to 30 June 2017, Powerlink is planning to invest more than \$3.5 billion in capital works to: connect customers, augment the network to meet electricity demand, extend the life of existing assets to maintain reliability of electricity supply, and replace existing assets which have reached the end of life to maintain reliability of electricity supply. Regulated (prescribed) investments make up about 85 per cent of this work. Our investment in regulated (prescribed) projects is expected to decrease in real terms when compared to the five years to 30 June 2012.

Investments are subject to continuous review regarding scope and timing to ensure electricity services are delivered at the time required and at the lowest long-run cost to customers.

## Replacement and life extension works

About 36 per cent of our 2011/12 capital works budget was invested in replacement and life extension projects to ensure we continue to maintain a reliable electricity transmission supply. Approximately 50 per cent of the proposed regulated (prescribed) capital allowance for the next five-year period will be invested in replacement works.

As with all activities on our network, we endeavour to minimise the impacts of these works on the NEM and electricity customers through the use of innovative and cost effective techniques.

We used a micropile technique to replace ageing transmission tower footings on our Woree to Kamerunga transmission line in Far North Queensland. This technique, which enables foundations to be drilled in areas where space is restricted, was an innovative solution to minimising ground disturbance in our work locations. Other life-extension projects on our transmission lines include tower painting and replacing components of transmission towers.

Within some of our substations we have undertaken refurbishment projects, including replacing electronic protection and control equipment. We are applying the new International Electro-technical Commission (IEC) standard IEC 61850 Communication and Systems for Power Utility Automation discussed on page 20 to our substation refurbishment program.

## Strategies to deliver the capital works program

By avoiding the need to take transmission equipment out of service for maintenance or construction works, we further enhance the reliability of electricity supply and meet the network performance targets set by the AER.

Our live substation and live line procedures have been developed, trialled and approved to ensure the safety and efficiency of our highly trained and skilled technicians. During 2011/12, a new live line procedure was approved for helicopter stringing of new conductor (powerline wire) onto one side of a transmission tower; next to a live conductor suspended on the other side of the transmission tower. A new live substation work method was also approved to upgrade the busbar at Tarong Substation.

As the footprint of our network moves into South West Queensland, we are preparing to establish a local presence to ensure our skilled personnel are readily available to maintain the network and to avoid excessive travel. A new depot near the Surat Basin is planned for establishment by 2016. We currently operate a construction office in Dalby and our people travel regularly to areas within South West Queensland.

## Continuous improvement and innovation

During 2011/12, Powerlink undertook a trial to evaluate the effectiveness of a construction contractor acting as a 'Recipient' – ensuring they are trained in and responsible for maintaining safety at a work site. A Recipient role is defined by the *Queensland Electricity Entity Procedures for Safe Access to High Voltage Electrical Apparatus* as a suitably qualified person (that is, meeting national competency requirements) approved by Powerlink who is issued with an Access/Test Permit to work on or near isolated high voltage equipment, and is responsible for the electrical safety within a defined work area. To date, this role has been filled by a Powerlink or Distribution Network Service Provider (DNSP) employee.

The objective of this trial is to improve efficiency. A schedule of monitoring, on-site safety auditing and consultation was undertaken within the trial program including an on-site audit by the Electrical Safety Office, which found the work to be compliant with legislative requirements.

The outcomes of the trial support a risk-based approach in transferring the role of Recipient to contractors with appropriate training and qualifications.

## Initiatives to improve network performance

Powerlink is committed to further improving its high standard of network performance. In 2011/12 we undertook initiatives including:

- adopting improved weather monitoring and early warning system for extreme weather events such as floods, fires and cyclones by using near-real time weather data and weather measurements to monitor, predict and assess the potential impact on our transmission network assets
- improving extreme weather event management by more closely collaborating with Emergency Services Queensland to improve access to resources, equipment and capabilities
- testing and approving additional procedures to safely undertake live line and live substation works for planned outages on our network
- implementing new condition monitoring systems to maximise reliability performance of the network, including circuit breaker SF<sub>6</sub> gas density monitoring.

## Acquiring easements and substation sites

To secure easements and sites for planned future transmission infrastructure, we comply with the *Acquisition of Land Act 1967* and a planning process approved under the *Sustainable Planning Act 2009* (SPA).

This year we undertook a significant number of easement and site acquisition projects, mirroring the activity and growth in the resources and energy sectors in Queensland, particularly in the Surat Basin and Gladstone areas.

In 2011/12 we began work to refine our process for estimating the timeframe for easement and site acquisition, taking into account the many external factors and stakeholders that may be involved in our process. The outcome of these refinements is expected to deliver efficiencies in terms of resource planning, and customer and stakeholder relationships.

Under the SPA Powerlink must obtain planning approval for new electricity infrastructure. Powerlink does this by requesting Ministerial designation of a transmission line route for community infrastructure before a new line is built. Easement and site acquisition projects which reached the stage of Ministerial designation in 2011/12 are detailed in the table below.

## Climate change adaptation strategies

Our network assets are designed to a standard which allows them to operate in a range of environmental conditions. Through a risk assessment process we have identified six key aspects of climate change which may have the potential to impact the resilience of our transmission network:

- dust
- flood
- bushfire
- lightning strikes
- extreme winds
- increasing ambient temperatures.

We have established investigatory projects to further our understanding and develop an adaptation plan for each of these key aspects. The projects will identify the current resilience of transmission and substation equipment and assist in improving that resilience.

### Easement and site acquisition projects which reached the stage of Ministerial designation in 2011/12

| Non-regulated project description   | Regulated (prescribed) project description  |
|---|---|
| <b>Designated during 2011/12</b>  |   |
| <b>South Queensland</b> <ul style="list-style-type: none"> <li>■ APLNG Condabri Substation sites</li> <li>■ Braemar to Kumbarella transmission line</li> <li>■ Wandoan South to Woleebee transmission line</li> </ul> <b>Central Queensland</b> <ul style="list-style-type: none"> <li>■ Eagle Downs Substation site</li> <li>■ Goonyella Riverside Mine Switching Station site</li> <li>■ QRN Bluff Transmission line</li> <li>■ QRN Duaringa transmission line</li> <li>■ QRN Wycarbah transmission line</li> </ul> | <b>South Queensland</b> <ul style="list-style-type: none"> <li>■ Columboola to Wandoan South transmission line</li> <li>■ Western Downs to Halys transmission line</li> </ul> <b>Central Queensland</b> <ul style="list-style-type: none"> <li>■ Calvale to Stanwell transmission line</li> </ul> <b>Far North Queensland</b> <ul style="list-style-type: none"> <li>■ Ingham to Tully transmission line</li> </ul> |
| <b>Submitted for designation during 2011/12</b>   |   |
| <b>South Queensland</b> <ul style="list-style-type: none"> <li>■ APLNG Condabri transmission line</li> </ul> <b>Central Queensland</b> <ul style="list-style-type: none"> <li>■ Lilyvale to Surbiton (Galilee Basin – Stage 1) transmission line</li> </ul>   | <b>South Queensland</b> <ul style="list-style-type: none"> <li>■ Springdale to Blackwall transmission line</li> <li>■ Western Downs to Columboola transmission line</li> </ul> <b>North Queensland</b> <ul style="list-style-type: none"> <li>■ Nebo to Broadlea (Northern Bowen Basin – Stage 1) transmission line</li> </ul>  |

## Maintaining our efficient network

In 2011/12 we invested \$94.3 million in maintaining the network to ensure the continued high level of reliability and efficiency expected by electricity customers and our regulator, the AER.

When undertaking maintenance on Powerlink's network, we manage our work programs to minimise the planned outages on our network, and consequently the impact on electricity customers and the NEM. Our 2011/12 planned maintenance program was delivered with emphasis on work bundling and programming, and using non-invasive and live work techniques where possible to minimise the frequency and duration of network outages.

### Network maintenance activities 2011/12

| Target  | Performance     | % of target achieved |
|---|-----------------|----------------------|
| <b>Planned transmission lines maintenance works (number of work units*)</b>                       |                 |                      |
| 1,798.1   | 1,761.6         | 98%                  |
| <b>Planned substation (including secondary systems) maintenance works (number of work units*)</b> |                 |                      |
| 8,378.6   | 8,122.7         | 97%                  |
| <b>Communication site maintenance works (number of work units*)</b>                               |                 |                      |
| 893.7   | 887.4           | 99%                  |
| <b>Total maintenance activities (number of work units*)</b>                                       |                 |                      |
| <b>11,070.4</b>   | <b>10,771.7</b> | <b>97%</b>           |

\* Work units are used to manage routine maintenance. A work unit represents the comparative effort of work that is required to perform a particular routine maintenance task.

## Telecommunications

Powerlink operates a telecommunications network to facilitate the protection, control and monitoring of our transmission network. Limited spare capacity on our telecommunication network is contracted to major customers.

During 2011/12, we installed 232 kilometres of Optical Fibre Ground Wire (OPGW) in North Queensland. The most significant installations were between Yabulu South and Ingham South Substations, and Kareeya, Chalumbin and Turkinje substations.

We also replaced a range of ageing telecommunications equipment in North and Central Queensland. As a result of installing next generation telecommunication equipment, we have significantly improved the reliability and capacity of communications between substation sites and our network control centre.

## Infrastructure security

Powerlink's security policy and initiatives target the safety of our people and the public, protection of our network as critical infrastructure, and the need to ensure business continuity.

We continue as a participating member of the International Electricity Infrastructure Assurance (IEIA) Forum to ensure we remain abreast of developments in infrastructure security, and the Energy Sector Group under the Commonwealth Government's Trusted Information Sharing Network (TISN). This year Powerlink also became a member of the State Interdepartmental Committee for Bushfires.

## Contingency planning and corporate emergency response

Powerlink's suite of corporate emergency management response plans are regularly reviewed and tested to ensure we have the capability to quickly respond to any network or corporate emergency while maintaining a secure and reliable transmission service.

Applying what we learnt from the South East Queensland floods in early 2011, we have improved our response plans for flood events that impact, or have the potential to impact, our infrastructure.

To refine and ensure our people are familiar with the emergency management response plans, we participated in a number of internal exercises and an annual desktop exercise in conjunction with AEMO.

## LOOKING FORWARD

In 2012/13 and beyond, we will:

- continue to evaluate and improve our capability to efficiently deliver our capital works program throughout Queensland
- investigate new methods to facilitate the implementation of new technology and work techniques
- undertake substation refurbishments using substation protection systems based on IEC standard 61850 and work towards full implementation of the design standard
- continue to refine our processes for estimating timeframes for easement and site acquisition.