APPENDIX M

Powerlink Forecast Network Capital Projects

1 July 2012 to 30 June 2017

May 2011

Table of Contents

1 Introduction

Powerlink's capital expenditure forecast for the 1 July 2013 to 30 June 2017 regulatory period is provided in Chapter 8 of Powerlink's Revenue Proposal. The chapter also includes a description of the forecasting methodology and key inputs and assumptions used to develop the capital expenditure forecast.

The Submission Guideline pro formas accompanying the Revenue Proposal include a full list of the capital projects included in the capital expenditure forecast. This appendix provides project summaries for uncommitted projects contributing greater than $25m to the capital expenditure forecast for the next regulatory period. The purpose of these project summaries is to provide an overview of the investment need for the projects making up a major part of the capital expenditure forecast.

The project summaries include:

- details of the project requirement including the Rules capital expenditure objectives that the capital project is required to meet;
- the median timing;
- a description of the project scope; and
- alternative options considered to address the limitation.

Committed projects contributing greater than $25m to the capital expenditure over the next regulatory period are listed in Table 1.

Table 1: Committed capital expenditure projects > $25m

Project Description	Category	Period capital expenditure ($m, nominal)	Total project costs ($m, nominal)	Description
CP.01875 Halys to Blackwall 500kV operating at 275kV	Augmentation	$374.6	$401.3	Establish approximately 175km of 500kV DCST transmission line (initially operated at 275kV) between Halys and Blackwall, including associated substation works at Halys and Blackwall.
CP.02031 Columboola to Western Downs Network Augmentation	Augmentation	$137.5	$142.0	Establish a 275kV substation at Columboola East including approximately 60km of 275kV DCST transmission line and associated remote substation works at Western Downs. Establish a 275kV substation at Wandoan South and operate the Wandoan South to Columboola circuits at 275kV.
CP.01705 Calvale to Stanwell 275kV DCST line	Augmentation	$78.7	$117.0	Establish approximately 101km of 275kV DCST transmission line between Calvale and Stanwell, including associated substation works at Calvale and Stanwell.
CP.00882 Ingham South to Cardwell 132kV Line Replacement	Replacement	$52.1	$60.2	Replacement of the entire 132kV transmission line between Ingham South and Cardwell.
CP.02030 Columboola to Wandoan South Network Augmentation	Augmentation	$45.5	$92.5	Establish a 132kV substation at Wandoan South including approximately 70 km of 275kV DCST transmission line (initially operated at 132kV), including associated substation works at Columboola.
CP.01780 Gladstone PS Switchyard Rebuild	Replacement	$37.1	$123.8	Replacement of the 275kV and 132kV primary plant and secondary systems at Gladstone Power Station, including associated remote end works.

A summary of the projects detailed in this appendix is provided in Table 2.

Table 2: Capital expenditure projects > $25m (weighted)

Project Description	Category	Period capital expenditure ($m, nominal)	Total project costs ($m, nominal)	Description
CP.01477.2 Western Downs to Halys 500kV DCST Operating at 275kV	Augmentation	$311.3	$339.3	Establish approximately 135km of 500kV DCST transmission line (initially operated at 275kV) between Western Downs and Halys, including associated substation works at Western Downs and Halys.
CP.01470 Halys to Greenbank 500kV DCST Operating at 275kV	Augmentation	$226.2	$596.4	Establish approximately 218km of 500kV DCST transmission line between Halys and Greenbank, including associated substation works at Halys and Greenbank.
CP.01781 Northern Bowen Basin Augmentation	Augmentation	$82.4	$91.4	Establish approximately 70km of 275kV DCST transmission line (initially operated at 132kV) between Nebo and Moorvale, and approximately 11km of 132kV line between Moorvale and Broadlea, including associated substation works at Nebo and Broadlea.
CP.01195 Larapinta 275/110kV Substation Establishment	Augmentation	$71.1	$71.1	Establish a 275/110kV substation at Larapinta including approximately 6km of 110kV transmission line, including associated substation works at Algester.
CP.01189 Nudgee 275kV Establishment and South Pine to Nudgee DCST	Augmentation	$70.8	$79.4	Establish a 275/110kV substation at Nudgee including approximately 11km of 275kV transmission line and associated line and remote substation works at South Pine.
CP.02222.2 Bergins Hill - Drewvale 275kV Reinforcement Stage 1	Augmentation	$68.0	$76.1	Establish new 275kV transmission line sections, and re-string and reconfigure existing sections between Bergins Hill and Drewvale, including associated substation works at Blackstone.
CP.01710 Gin Gin Substation Plant Replacement	Replacement	$51.2	$51.2	Replacement of the 275kV and 132kV primary plant at Gin Gin Substation.

Project Description	Category	Period capital expenditure ($m, nominal)	Total project costs ($m, nominal)	Description
CP.02271.2 Stanwell to Broadsound Series Capacitors (70% and 65% Compensation)	Augmentation	$41.1	$59.0	Establish 3-phase series capacitors on each of the 3 275kV Stanwell to Broadsound transmission circuits.
CP.01423 Western Downs to Halys 500kV Easement Acquisition	Easement	$39.0	$43.3	Acquisition of approximately 135km of double width 500kV transmission line easements between Western Downs and Halys.
CP.02507 Collinsville to Proserpine 132kV Transmission Line Life Extension	Replacement	$38.0	$38.0	Tower painting, member and hardware replacement of the existing 132kV transmission line.
CP.01546 Callide A Switchyard Replacement	Replacement	$36.2	$36.9	Replacement of the existing 110kV switchyard at Callide A.
CP.02477.3 Western Downs to Halys 500kV DCST Operating at 275kV (circuits 5 and 6)	Augmentation	$35.8	$342.9	Establish approximately 135km of 500kV DCST transmission line (initially operated at 275kV) between Western Downs and Halys, including associated substation works at Western Downs and Halys.
CP.01156.2 Stanwell to Broadsound 275kV Stringing 2nd Circuit	Augmentation	$35.5	$54.2	String the second circuit of approximately 127km of 275kV transmission line between Stanwell and Broadsound including associated substation works at Stanwell and Broadsound.
CP.01128 Mackay Substation Replacement	Replacement	$33.5	$33.5	Replacement of the existing 132kV Mackay Substation.
CP.02583 Steel Conductor OHEW Fault Rating Upgrade - Stage 1	Replacement	$30.0	$30.0	Replacement of the OHEW on identified build sections.
CP.01679 Mudgeeraba 110kV Primary and Secondary Replacement	Replacement	$29.4	$33.3	Replacement of the existing 110kV Mudgeeraba Substation.
CP.02364 EMS Replacement	Replacement	$29.4	$29.4	Replace the existing Energy Management System.

Project Description	Category	Period capital expenditure ($m, nominal)	Total project costs ($m, nominal)	Description
CP.01417 Blackwall iPASS Secondary System Replacement	Replacement	$28.5	$28.5	Upgrade the existing iPASS secondary system at Blackwall Substation.
CP.02532 Bergins Hill - Goodna - Belmont Transmission Line Life Extension	Replacement	$27.6	$27.6	Tower painting, member and hardware replacement of the existing 110kV transmission line.
CP.02453 Moranbah to Goonyella Riverside 132kV Transmission Line	Augmentation	$27.3	$29.2	Establish approximately 30km of 132kV double circuit transmission line between Moranbah and Goonyella, including associated substation works at Moranbah and Goonyella Riverside substations.
CP.01957 Calvale to Larcom Creek DCST	Augmentation	$25.3	$127.2	Establish approximately 76km of 275kV DCST transmission line between Calvale and Larcom Creek, including associated substation works at Calvale and Larcom Creek.

2 Western Downs to Halys 500kV DCST Operating at 275kV

Project No: CP.01477.2

Category: Augmentation

Median commissioning date: 2015

Median timing estimated cost: $339.3m ($ nominal)

Contribution to capital expenditure forecast: $311.3m ($ nominal)

2.1 Background

The Bulli zone in South West Queensland is defined as the area south west of Tarong and west of Middle Ridge (Toowoomba) substations. The Bulli zone is a net exporter of electricity to the Queensland Region. Significant generation within the zone is located at the Braemar and Millmerran substations. Surplus generation from the southern states is also exported to the Bulli zone via the Queensland to New South Wales interconnector (QNI).

The vast reserves of gas and coal from the Surat Basin are anticipated to fuel significant generation investment within the Bulli zone during the next regulatory period. As evidenced by the ROAM scenarios these new generation projects are expected to meet the majority of the load growth in the Queensland Region. As a result, the capability of the transmission network connecting the Bulli zone to the rest of the Queensland interconnected main transmission system is critical for delivering mandated reliability supply obligations.

As additional generators connect within the Bulli zone to meet increasing demand across Queensland network limitations emerge between the Bulli and South West Queensland zones. Thermal, voltage and transient stability limitations under contingency conditions limit the power transfer capability out of the Bulli zone. These limitations constrain power from generators within the Bulli zone and northerly flow on QNI. The constraints result in insufficient capability to meet peak power demands in the Queensland region unless action to augment the network is undertaken.

2.2 Recommended Project Overview

This project comprises the construction of a double circuit transmission line between Western Downs and Halys substations. The line is approximately 135km in length and will be built on a newly acquired easement. The line is to be constructed for 500kV but will be initially operated at 275kV.

2.3 Investment Need

This project is required to achieve the following capital expenditure objectives identified in clause 6A.6.7(a) of the Rules:

- meet the expected demand for prescribed transmission services over that period;
- comply with all applicable regulatory obligations or requirements associated with the provision of prescribed transmission services; and
- maintain the reliability, safety and security of the transmission system through the supply of prescribed transmission services.

The key investment driver for this project is to provide adequate transmission capacity out of the Bulli zone to meet demand in the Queensland Region (excluding the load in the Bulli zone).

2.4 Investment Timing

The timing of this project is dependent on the load economic growth rate and generation scenario. Under the medium economic growth rate scenarios the timing varies from 2014 to 2017. For the high economic growth scenarios the timing varies between 2013 and 2014.

2.5 Investment Options

Alternative options considered were:

- upgrade of the Middle Ridge 330/275kV 1300MVA transformer to a 1500MVA transformer;
- establish Ebenezer 330/275kV Substation west of Brisbane and upgrade the transmission line between Middle Ridge and Ebenezer to 330kV operation;
- establish third 330/275kV transformer connected to the Braemar West 275kV switchyard;
- establish third 330/275kV transformer connected to the Braemar West 275kV switchyard and connect a 330kV series reactor at Braemar;
- construction of a new 275kV transmission line between Western Downs and Halys substations;
- construction of a new 500kV transmission line between Western Downs and Halys substations with one side strung, operating at 275kV; and
- construction of a new 500kV transmission line between Western Downs and Halys substations, operating at 500kV.

Economic assessment was performed for these options across the 20 scenarios.

3 Halys to Greenbank 500kV DCST Operating at 275kV

Project No: CP.01470

Category: Augmentation

Median commissioning date: 2018

Median timing estimated cost: $596.4m ($ nominal)

Contribution to capital expenditure forecast: $226.2m ($ nominal)

3.1 Background

South East Queensland (SEQ) comprises the areas of Brisbane, Ipswich and the Gold and Sunshine Coasts. Electricity use is expected to continue to grow strongly over the next ten years, due to inter alia economic and population growth and the on-going uptake of domestic air-conditioning.

SEQ is a net importer of electricity. Large amounts of electricity must be transferred into South East Queensland from power stations in Central Queensland, Bulli and South West zones via Powerlink's 275kV transmission network in order to meet peak demand.

As load increases in SEQ power transfer across the South West to South East Queensland grid section will be limited thermally or by the occurrence of unstable voltages, following critical contingencies. These limitations constrain power flows and result in insufficient capability to meet peak power demands in the SEQ unless action to augment the network is undertaken.

3.2 Recommended Project Overview

This project comprises the construction of a double circuit transmission line between Halys and Greenbank substations. The line is approximately 218km in length. The line is to be constructed for 500kV but will be operated initially at 275kV.

3.3 Investment Need

This project is required to achieve the following capital expenditure objectives identified in clause 6A.6.7(a) of the Rules:

- meet the expected demand for prescribed transmission services over that period;
- comply with all applicable regulatory obligations or requirements associated with the provision of prescribed transmission services; and
- maintain the reliability, safety and security of the transmission system through the supply of prescribed transmission services.

The key investment driver for this project is to provide adequate transmission capacity into SEQ such that mandated reliability of supply obligations can be met.

3.4 Investment Timing

The project timing depends on the required power transfer across the Tarong grid section. As a result, timings are earlier in the high economic growth scenarios (completed by 2016) compared to the medium economic growth scenarios (typically to be completed by 2018, but can range from 2017 to 2020).

3.5 Investment Options

Alternative options considered were:

- installing series compensation on the five 275kV circuits between Tarong and SEQ;

- construction of a new 500kV transmission line between Halys and Greenbank substations, operating at 275kV with one side strung;
- establish 500kV substations at Blackwall and Western Downs and operate the Halys to Blackwall line at 500kV; and
- construct a new 500kV transmission line between Springdale and Greenbank (operating at 275kV) and reconfigure the Halys to Blackwall double circuit line at Springdale to establish single circuit connections between Halys and Blackwall and Halys and Greenbank substations.

Economic assessment was performed for these options across the 20 scenarios.

4 Northern Bowen Basin Augmentation

Project No: CP.01781

Category: Augmentation

Median commissioning date: 2014

Median timing estimated cost: $91.4m ($ nominal)

Contribution to capital expenditure forecast: $82.4m ($ nominal)

4.1 Background

The load in the Northern Bowen Basin area relates to the mining and transportation of coal. The load is concentrated in a band between Newlands and Dysart, which corresponds to a particularly productive coal seam that supplies around half the world's high quality metallurgical coal. Given the importance of metallurgical coal exports to Queensland's and Australia's economies, it is particularly important that a reliable electricity supply is maintained to the region.

The Northern Bowen Basin transmission network comprises the 132kV network south from Strathmore 275kV Substation (excluding the 132kV circuits to Proserpine), west from Nebo 275kV Substation and north from Lilyvale 275kV Substation. Moranbah is the point at which the 132kV circuits from Strathmore, Nebo and Lilyvale intersect, and presently supplies the largest load in the area. A number of 66kV circuits (owned by the DNSP Ergon Energy and privately by mining companies) radiate away from Powerlink's 132kV substations to the individual mines located throughout the region.

This project is required to address thermal and voltage limitations in the Northern Bowen Basin area for outages of critical 132kV circuits, including 7150 Lilyvale – Dysart and 7118 Nebo – Coppabella – Dysart.

4.2 Recommended Project Overview

This project comprises the construction of a double circuit transmission line between Nebo and Broadlea substations. The line between Nebo and Moorvale South is to be constructed for 275kV but will be initially operated at 132kV, while the section from Moorvale South to Broadlea is to be constructed and operated at 132kV.

4.3 Investment Need

This project is required to achieve the following capital expenditure objectives identified in clause 6A.6.7(a) of the Rules:

- meet the expected demand for prescribed transmission services over that period;
- comply with all applicable regulatory obligations or requirements associated with the provision of prescribed transmission services; and
- maintain the reliability, safety and security of the transmission system through the supply of prescribed transmission services.

The key investment drivers for this project are to provide adequate capacity to meet the demand in the Northern Bowen Basin area.

4.4 Investment Timing

This project is scheduled to be completed by 2014 (scenario 5).

4.5 Investment Options

Alternative options considered were:

- establishing a new transmission line from Strathmore to Goonyella Riverside, to be constructed at 275kV but initially operated at 132kV. It would also be necessary to connect 132kV feeder 7128 Collinsville-Clare South to Strathmore 132kV bus and to install a 2nd 275/132kV transformer at Strathmore; and
- establishing a new transmission line from Lilyvale to Dysart, to be constructed at 275kV but initially operated at 132kV. It would also be necessary to establish a new transmission line, also constructed at 275kV but operated at 132kV, between Dysart and Moranbah.

Economic assessment was performed for these options across the 20 scenarios.

5 Larapinta 275/110kV Substation Establishment

Project No: CP.01195

Category: Augmentation

Median commissioning date: 2014

Median timing estimated cost: $71.1m ($ nominal)

Contribution to capital expenditure forecast: $71.1m ($ nominal)

5.1 Background

The 110kV network between Rocklea and Belmont supplies the Richlands, Algester, Runcorn and Sumner substations. Demand in these areas is forecast to increase steadily as a result of new residential, commercial and industrial loads, as well as increasing intensity in established areas.

This increased demand will result in an N-1 thermal overload of the Rocklea 275/110kV transformer and whilst operational measures are available to address this limitation, the operational measures result in system normal overloads, as well as significant overloads under N-1 conditions, of other parts of the 110kV network.

5.2 Recommended Project Overview

This project comprises the construction of a new 275/110kV substation at Larapinta, with 275kV bus to be cut into 817 Blackwall to Belmont, one 275/110kV transformer and 132kV bus, and the construction of a 110kV transmission line between Larapinta and Algester substations.

5.3 Investment Need

This project is required to achieve the following capital expenditure objectives identified in clause 6A.6.7(a) of the Rules:

- meet the expected demand for prescribed transmission services over that period;
- comply with all applicable regulatory obligations or requirements associated with the provision of prescribed transmission services; and
- maintain the reliability, safety and security of the transmission system through the supply of prescribed transmission services.

The key investment drivers for this project are to provide adequate capacity to meet the demand on the 110kV network between Rocklea and Belmont. It has been co-ordinated with other network developments for the greater Brisbane area through joint planning activities with ENERGEX.

5.4 Investment Timing

This project is scheduled to be completed by 2014 (scenario 5).

5.5 Investment Options

Alternative options considered were:

- establishing a 275kV bus at Rocklea and installing a third 275/110kV transformer;
- extending Algester Substation, with 275kV bus and 275/110kV transformer, and double circuit 275kV from Algester to cut into 817 Blackwall – Belmont; and

- installing a second 275/110kV transformer at Goodna Substation, cutting in 817 Blackwall – Belmont into Goodna, and establishing a 110kV transmission line between Goodna and Algester substations.

Economic assessment was performed for these options across the 20 scenarios.

6 Nudgee 275kV Establishment and South Pine to Nudgee DCST

Project No: CP.01189

Category: Augmentation

Median commissioning date: 2016

Median timing estimated cost: $79.4m ($ nominal)

Contribution to capital expenditure forecast: $70.8m ($ nominal)

6.1 Background

South Pine Substation, in Brisbane's North, provides supply to ENERGEX's Nudgee 110/33kV Substation, as well as through to their Meeandah and Myrtletown 110/33kV substations. These substations provide supply to the residential, industrial and commercial areas from Geebung to Ascot to the Brisbane River, including Brisbane International Airport and the Trade Coast precinct.

Demand in the area will, over time, exceed the capacity of the 275/110kV transformers at South Pine, as well as the 110kV circuits from South Pine to Nudgee.

6.2 Recommended Project Overview

This project comprises the construction of a 275kV double circuit transmission line between Nudgee Substation and Sandgate, to connect to the existing 275kV section constructed between South Pine Substation and Sandgate. A new 275/110kV substation is to be established at Nudgee, with two 275/110kV transformers to connect through to the existing 110kV bus.

6.3 Investment Need

This project is required to achieve the following capital expenditure objectives identified in clause 6A.6.7(a) of the Rules:

- meet the expected demand for prescribed transmission services over that period;
- comply with all applicable regulatory obligations or requirements associated with the provision of prescribed transmission services; and
- maintain the reliability, safety and security of the transmission system through the supply of prescribed transmission services.

The key investment drivers for this project are to provide adequate capacity to meet the demand in the Nudgee and Brisbane Airport region. It has been co-ordinated with other network developments for the greater Brisbane area through joint planning activities with ENERGEX.

6.4 Investment Timing

This project is scheduled for completion in 2016 (scenario 5).

6.5 Investment Options

Alternative options considered were:

- upgrading the 275/110kV transformation capacity at South Pine Substation, establishing a new 110kV circuit between Sandgate and Nudgee, and extending the 110kV bus at Sandgate and Nudgee substations; and
- establishing a new 110kV circuit between Nudgee and Murarrie substations, located south of the Brisbane River. This option would also include installing a 3rd 275/110kV

transformer and establishing a 275kV bus at Murarrie Substation, as well as extending the 110kV bus at Murarrie and Nudgee substations.

Economic assessment was performed for these options across the 20 scenarios.

7 Bergins Hill to Drewvale 275kV Reinforcement Stage 1

Project No: CP.02222.2

Category: Augmentation

Median timing commissioning date: 2016

Median timing estimated cost: $76.1m ($ nominal)

Contribution to capital expenditure forecast: $68.0m ($ nominal)

7.1 Background

The greater south east Brisbane area, including parts of the Brisbane CBD, Australia TradeCoast precinct and Port of Brisbane, is heavily reliant on the 275kV circuits from the Blackwall and Greenbank Switching Stations to the Goodna, Larapinta, Belmont and Loganlea 275/110kV substations.

Due to on-going demand growth, thermal limitations are forecast to occur across the Blackwall to Goodna and Blackwall to Larapinta 275kV circuits under both system intact and contingency conditions. The critical contingencies are loss of the Blackwall to Goodna, Blackwall to Larapinta and Greenbank to Loganlea 275kV circuits.

The objective of this project is increase the transfer capability from Blackwall Substation into Larapinta, Belmont and Loganlea substations.

7.2 Recommended Project Overview

This project comprises the construction of a new double circuit 275kV overhead transmission line (initially operating in parallel as a single circuit) between Bergins Hill and Drewvale.

The project utilises sections of the existing Blackwall to Swanbank B circuits to facilitate connection of the new transmission line into Blackstone Substation.

7.3 Investment Need

This project is required to achieve the following capital expenditure objectives identified in clause 6A.6.7(a) of the Rules:

- meet the expected demand for prescribed transmission services over that period;
- comply with all applicable regulatory obligations or requirements associated with the provision of prescribed transmission services; and
- maintain the reliability, safety and security of the transmission system through the supply of prescribed transmission services.

The key investment drivers for this project are to provide adequate capacity to meet demand within the greater south east Brisbane area, including parts of the Brisbane CBD, Australia TradeCoast precinct and Port of Brisbane. It has been co-ordinated with other network development for the greater Brisbane area through joint planning activities with ENERGEX.

7.4 Investment Timing

The project is scheduled to be completed by 2016 (scenario 5).

7.5 Investment Options

Alternative options considered were:

- construction of a new 275kV transmission line between Greenbank Substation and Drewvale; and
- construction of a new 275kV transmission line between Nudgee and Murarrie substations.

Economic assessment was performed for these options across the 20 scenarios.

8 Gin Gin Substation Plant Replacement

Project No: CP.01710

Category: Replacement

Median commissioning date: 2016

Median timing estimated cost: $51.2m ($ nominal)

Contribution to capital expenditure forecast: $51.2m ($ nominal)

8.1 Background

Gin Gin Substation is a major 275/132kV that was constructed in 1975 and has been expanded over a number of augmentation projects.

8.2 Recommended Project Overview

This project consists of the targeted replacement of the assets that are suffering from degrading reliability and obsolescence issues. The transformers and secondary systems present in good condition and therefore not considered as part of these works.

8.3 Investment Need

This project is required to achieve the following capital expenditure objectives identified in clause 6A.6.7(a) of the Rules:

- meet the expected demand for prescribed transmission services over that period;
- comply with all applicable regulatory obligations or requirements associated with the provision of prescribed transmission services; and
- maintain the reliability, safety and security of the transmission system through the supply of prescribed transmission services.

The key investment drivers for this project are to:

- asset performance and condition as the assets under consideration are obsolete and therefore replacement will improve the reliability of supply from central to southern region by replacing those assets; and
- replacing those assets at the end of their useful lives.

8.4 Investment Timing

This project is required to achieve the following capital expenditure objectives identified in the Non Load Driven Plan. It has been co-ordinated with the significant program of works at the remote ends (Gladstone and Wurdong).

8.5 Investment Options

The options considered were:

- maintenance only;
- in situ replacement of both switchyards; and
- rebuild 132kV on adjacent site, rebuild 275kV in-situ.

The in-situ replacement of both switchyards is the preferred outcome as it has the lowest viable NPV and addresses the risk issues in a comparable way with the alternate option.

9 Stanwell to Broadsound Series Capacitors (70% and 65% Compensation)

Project No: CP.02271.2

Category: Augmentation

Median commissioning date: 2016

Median timing estimated cost: $59.0m ($ nominal)

Contribution to capital expenditure forecast: $41.1m ($ nominal)

9.1 Background

The North and Far North Queensland area comprises all areas north of Broadsound and Dysart that take supply from the main Queensland electricity grid. The majority of the electricity used in North and Far North Queensland is generated at base load power stations in Central and Southern Queensland. It is transferred to North and Far North Queensland via Powerlink's 275kV and 132kV transmission network.

The transfer capacity of Powerlink's network between Central and North Queensland is measured across the 132kV line just north of Dysart and the 275kV lines into Nebo. The combined transfer capability of these lines (known as the "CQNQ limit") is governed by a range of limit equations which dynamically maximise the transmission capacity available to electricity market participants at any given point in time.

Section 14 provides a project summary for CP.01156.2 Stanwell to Broadsound 2nd circuit 275kV. This project (CP.02271.2) is the continuation of increasing the power transfer capability to North Queensland.

Following the commissioning of CP.01156.2, transfer limits will be set by voltage stability for either, the loss of a large North Queensland Power Station at times of high generation or the loss of a Stanwell to Broadsound feeder. This project provides a high level of series compensation on the Stanwell to Broadsound feeders. This addresses voltage stability for both critical contingencies and results in higher transfer limits.

9.2 Recommended Project Overview

This project comprises the installation of three 275kV series capacitor banks at Broadsound Substation, on the Stanwell to Broadsound circuits. A high level of compensation results in the most economic alternative. Compensation level was further selected to optimise the overall thermal capacity of the parallel circuits. The higher capacity circuits will be compensated to 70% of their reactance and the lower capacity circuit to 65% of its reactance.

9.3 Investment Need

This project is required to achieve the following capital expenditure objectives identified in clause 6A.6.7(a) of the Rules:

- meet the expected demand for prescribed transmission services over that period;
- comply with all applicable regulatory obligations or requirements associated with the provision of prescribed transmission services; and
- maintain the reliability, safety and security of the transmission system through the supply of prescribed transmission services.

This project is justified by providing net economic benefits to the market. When power transfer limits into North Queensland are reached, high cost peaking plant is typically dispatched to

maintain system security. This project will raise network transfer limits and avoid or reduce the energy production from high cost generation.

9.4 Investment Timing

The timing of this project is dependent on the load economic growth rate and generation scenario. This project is triggered by 2014 in high economic growth scenarios. The project is scheduled to be completed by 2016 in scenario 4 (medium growth scenario).

9.5 Investment Options

Alternative options considered were:

- do nothing;
- a new Stanwell to Broadsound 275kV double circuit transmission line;
- a new Stanwell to Broadsound 275kV double circuit transmission line, single side strung; and
- low level of series compensation.

Economic assessment was performed for these options across the 20 scenarios.

10 Western Downs to Halys 500kV Easement Acquisition

Project No: CP.01423

Category: Easements

Median commissioning date: 2014

Median timing estimated cost: $43.3m ($ nominal)

Contribution to capital expenditure forecast: $39.0m ($ nominal)

10.1 Background

The Bulli zone in South West Queensland is defined as the area south west of Tarong and Middle Ridge (Toowoomba) substations. The Bulli zone is a net exporter of electricity to the Queensland Region. Significant generation within the zone is located at the Braemar and Millmerran substations. Surplus generation from the southern states is also exported to the Bulli zone via the Queensland to New South Wales interconnector (QNI).

The vast reserves of gas and coal from the Surat Basin are anticipated to fuel significant generation investment within the Bulli zone during the next regulatory period. As evidenced by the ROAM Scenarios these new generation projects are expected to meet the majority of the load growth in the Queensland Region. As a result, the capability of the transmission network connecting the Bulli zone to the rest of the Queensland interconnected main transmission system is critical for delivering mandated reliability supply obligations.

As additional generators connect within the Bulli zone network limitations emerge between the Bulli and South West Queensland zones. Thermal, voltage and transient stability limitations under contingency conditions limit the power transfer capability out of the Bulli zone. These limitations constrain power from generators within the Bulli zone and northerly flow on QNI. The constraints result in insufficient capability to meet peak power demands in the Queensland region unless action to augment the network is undertaken.

10.2 Recommended Project Overview

This project secures and designates a new double width easement for two 500kV double circuit transmission lines between Western Downs and Halys substations. The scope includes the acquisition of all permits and approvals pre-requisite for access to the easement for all construction activity. The scope delivers compliance with all environmental, cultural and heritage, and health and safety obligations.

'Ministerial Designation' shall be completed by the Site Access Date (SAD) of late 2014.

10.3 Investment Need

This project is required to achieve the following capital expenditure objectives identified in clause 6A.6.7(a) of the Rules:

- meet the expected demand for prescribed transmission services over that period;
- comply with all applicable regulatory obligations or requirements associated with the provision of prescribed transmission services; and
- maintain the reliability, safety and security of the transmission system through the supply of prescribed transmission services.

The key investment driver for this project is to provide access to a contiguous easement by the required SAD such that the capital construction project can be delivered to meet Powerlink's mandated reliability of supply obligations.

10.4 Investment Timing

The timing of this easement is by 2014 unless in the scenario analysis the timing for the first 500kV line between Western Downs and Halys substations precedes 2016.

10.5 Investment Options

Alternative options are covered as part of the construction project (CP.01477.2) described in Section 2.

11 Collinsville to Proserpine 132kV Transmission Line Life Extension

Project No: CP.02507

Category: Replacement

Median commissioning date: 2015

Median timing estimated cost: $38.0m ($ nominal)

Contribution to capital expenditure forecast: $38.0m ($ nominal)

11.1 Background

Collinsville to Proserpine 132kV transmission line is located in tropical north Queensland and suffers from significant corrosion and reliability performance issues.

11.2 Recommended Project Overview

This project comprises the works required to extend the life of the existing asset.

11.3 Investment Need

This project is required to achieve the following capital expenditure objectives identified in clause 6A.6.7(a) of the Rules:

- meet the expected demand for prescribed transmission services over that period;
- comply with all applicable regulatory obligations or requirements associated with the provision of prescribed transmission services; and
- maintain the reliability, safety and security of the transmission system through the supply of prescribed transmission services.

The key investment drivers for this project are:

- asset condition – the major component of the built section is in poor (and degrading) condition; and
- asset performance – the asset is becoming more susceptible to failure and, without action is likely to present an increasing impact on the reliability of supply to the Proserpine and Whitsunday area as well as an increased risk to the public.

11.4 Investment Timing

This project is required to achieve the following capital expenditure objectives identified in the Non Load Driven Plan. The timing for the works has been co-ordinated with the remote ends to determine the start date.

11.5 Investment Options

The options considered were:

- maintenance only;
- surface preparation and painting;
- member replacement;
- In situ tower replacement; and
- new line on new easement.

The surface preparation and painting is considered to be the best option as it is the lowest viable NPV.

12 Callide A Switchyard Replacement

Project No: CP.01546

Category: Replacement

Median commissioning date: 2015

Median timing estimated cost: $36.9m ($ nominal)

Contribution to capital expenditure forecast: $36.2m ($ nominal)

12.1 Background

Callide A Substation is a 132kV substation that was constructed in 1962.

12.2 Recommended Project Overview

This project consists of the replacement of the substation with a smaller footprint due to the reduced requirement for connection of the Callide A generators.

12.3 Investment Need

This project is required to achieve the following capital expenditure objectives identified in clause 6A.6.7(a) of the Rules:

- meet the expected demand for prescribed transmission services over that period;
- comply with all applicable regulatory obligations or requirements associated with the provision of prescribed transmission services; and
- maintain the reliability, safety and security of the transmission system through the supply of prescribed transmission services.

The key investment drivers for this project are to:

- asset performance and condition as the assets under consideration are obsolete and therefore replacement will improve the reliability of supply by replacing those assets; and
- replacing those assets at the end of their useful lives.

12.4 Investment Timing

This project is required to achieve the following capital expenditure objectives identified in the Non Load Driven Plan. Outage availability and lack of critical spares determine the timing.

12.5 Investment Options

The options considered were:

- maintenance only;
- rebuild on adjacent site; and
- in situ replacement.

The risk profile for the works on the existing site does not provide a reasonable outcome when compared to the adjacent site. While some elements can be readily quantified (reduced maintenance costs), this option has the advantage of a number of addressing other significant risks including lower risk in implementation and reduced ongoing operational risk due to a much smaller, simplified substation footprint.

13 Western Downs to Halys 500kV DCST Operating at 275kV (circuits 5 and 6)

Project No: CP.02477.3

Category: Augmentation

Median commissioning date: 2017

Median timing estimated cost: $342.9m ($ nominal)

Contribution to capital expenditure forecast: $35.8m ($ nominal)

13.1 Background

The Bulli zone in South West Queensland is defined as the area south west of Tarong and Middle Ridge (Toowoomba) substations. The Bulli zone is a net exporter of electricity to the Queensland Region. Significant generation within the zone is located at the Braemar and Millmerran substations. Surplus generation from the southern states is also exported to the Bulli zone via the Queensland to New South Wales interconnector (QNI).

The vast reserves of gas and coal from the Surat Basin are anticipated to fuel significant generation investment within the Bulli zone during the next regulatory period. As evidenced by the ROAM scenarios these new generation projects are expected to meet the majority of the load growth in the Queensland Region. As a result, the capability of the transmission network connecting the Bulli zone to the rest of the Queensland interconnected main transmission system is critical for delivering mandated reliability supply obligations.

A pre-requisite to this project is the construction of the first 500kV line between Western Downs and Halys substations (CP.01477.2). As additional generators connect within the Bulli zone network to meet increasing demand across Queensland limitations re-emerge between the Bulli and South West Queensland zones. Thermal and voltage stability limitations under contingency conditions again limit power transfer capability out of the Bulli zone. These limitations constrain power from generators within the Bulli zone and northerly flow on QNI. The constraints result in insufficient capability to meet peak power demands in the Queensland region unless further action to augment the network is undertaken.

13.2 Recommended Project Overview

This project comprises the construction of a double circuit transmission line between Western Downs and Halys substations. The line is approximately 135km in length and will be built on the double width 500kV easement acquired prior to the construction of the first line. The line is to be constructed for 500kV but will be initially operated at 275kV.

13.3 Investment Need

This project is required to achieve the following capital expenditure objectives identified in clause 6A.6.7(a) of the Rules:

- meet the expected demand for prescribed transmission services over that period;
- comply with all applicable regulatory obligations or requirements associated with the provision of prescribed transmission services; and
- maintain the reliability, safety and security of the transmission system through the supply of prescribed transmission services.

The key investment driver for this project is to provide adequate transmission capacity out of the Bulli zone to meet demand in the Queensland Region (excluding the load in the Bulli zone)

13.4 Investment Timing

Expenditure on this project within the next regulatory period only occurs in five scenarios. The timing of this project in the four high economic growth scenarios ranges from 2017 to 2018. For scenario 17 (medium economic growth) the project is required by 2018.

13.5 Investment Options

Alternative options considered were:

- replacing the Middle Ridge 330/275kV 1300MVA transformer to a 1500MVA transformer;
- establish Ebenezer 330/275kV Substation west of Brisbane and upgrade the transmission line between Middle Ridge and Ebenezer to 330kV operation;
- establish third 330/275kV transformer connected to the Braemar West 275kV switchyard;
- establish third 330/275kV transformer connected to the Braemar West 275kV switchyard and connect a 330kV series at Braemar;
- construction of a new 500kV transmission line between Western Downs and Halys substations with one side strung, operating at 275kV; and
- construction of a new 500kV transmission line between Western Downs and Halys substations, operating at 500kV.

Economic assessment was performed for these options across the 20 scenarios.

14 Stanwell to Broadsound 275kV Stringing 2nd Circuit

Project No: CP.01156.2

Category: Augmentation

Median commissioning date: 2013

Median timing estimated cost: $54.2m ($ nominal)

Contribution to capital expenditure forecast: $35.5m ($ nominal)

14.1 Background

The North and Far North Queensland area comprises all areas north of Broadsound and Dysart that take supply from the main Queensland electricity grid. The majority of the electricity used in North and Far North Queensland is generated at base load power stations in Central and Southern Queensland. It is transferred to North and Far North Queensland via Powerlink's 275kV and 132kV transmission network.

The transfer capacity of Powerlink's network between Central and North Queensland is measured across the 132kV just north of Dysart and the 275kV lines into Nebo. The combined transfer capability of these lines (known as the "CQNQ limit") is governed by a range of limit equations which dynamically maximise the transmission capacity available to electricity market participants at any given point in time.

The power transfer capability into North Queensland is presently limited by voltage stability for the loss of a large generator, and both thermal and voltage limitations for the loss of a Stanwell to Broadsound feeder. Stanwell to Broadsound was constructed in 2002 as a double circuit transmission line with a single side strung, in preparation for future capacity needs for power into North Queensland. This project establishes the second circuit of this double circuit construction.

14.2 Recommended Project Overview

This project comprises the completion of the double circuit between Stanwell and Broadsound. The line is approximately 127km in length and requires approximately 15 weeks for completion by a stringing crew. The impact of de-energising the existing circuit, even at the most optimum time of the year, would result in significant network support costs to maintain transfers within secure levels.

This project establishes the second circuit with minimal outages, and therefore minimal network support, by utilising techniques for stringing in close proximity to live conductors.

14.3 Investment Need

This project is required to achieve the following capital expenditure objectives identified in clause 6A.6.7(a) of the Rules:

- meet the expected demand for prescribed transmission services over that period;
- comply with all applicable regulatory obligations or requirements associated with the provision of prescribed transmission services; and
- maintain the reliability, safety and security of the transmission system through the supply of prescribed transmission services.

This project is justified by providing net economic benefits to the market. When power transfer limits into North Queensland are reached, high cost peaking plant is typically dispatched to maintain system security. This project will raise network transfer limits and avoid or reduce the energy production from high cost generation.

14.4 Investment Timing

The timing of this project is dependent on the load economic growth rate and generation scenario. Under the medium economic growth rate scenarios the timing varies from 2013 to 2014 (scheduled to be completed by 2014 in scenario 5). For the low economic growth scenarios the timing varies from 2016 to 2017. For the high economic growth scenarios the timing is 2012.

14.5 Investment Options

Alternative options considered were:

- do nothing; and
- de-energised stringing with multiple crews.

Economic assessment was performed for these options across the 20 scenarios.

15 Mackay Substation Replacement

Project No: CP.01128

Category: Replacement

Median commissioning date: 2015

Median timing estimated cost: $33.5m ($ nominal)

Contribution to capital expenditure forecast: $33.5m ($ nominal)

15.1 Background

Mackay is a significant substation in the North Queensland network with 132kV circuits to Pioneer Valley, Nebo and Proserpine. In addition, the 132kV switchyard has three 132/33kV transformers (2 x 80MVA, 1 x 30MVA), which provide connections to Ergon for local demand in the surrounding communities.

The original primary plant and secondary systems at Mackay Substation were installed in 1968 and are now in poor physical condition, subject to reliability issues and obsolescence arising from lack of manufacturer support and spares. Subsequent developments at Mackay Substation have occurred to meet increasing electricity demand that have introduced a mix of new and re-used primary plant and secondary systems.

15.2 Recommended Project Overview

The recommended project involves replacing 132kV primary plant, 2 Transformer and secondary systems with new plant and equipment on a parcel of land adjacent to the existing Mackay Substation.

15.3 Investment Need

This project is required to achieve the following capital expenditure objectives identified in clause 6A.6.7(a) of the Rules:

- meet the expected demand for prescribed transmission services over that period;
- comply with all applicable regulatory obligations or requirements associated with the provision of prescribed transmission services; and
- maintain the reliability, safety and security of the transmission system through the supply of prescribed transmission services.

The key investment drivers for this project are to address:

- Reliability and performance – primary plant assets are becoming more susceptible to failure and as such, likely to present a significant impact on the reliability of supply to Mackay and surrounding regions. Secondary systems assets functionality does not meet requirements for effective fault response and management.
- Obsolescence – older primary plant and all secondary systems assets are without manufacturer, maintenance and design support and have limited availability of spares.

15.4 Investment Timing

In order to ensure appropriate management of reliability, performance and obsolescence risks, the recommended project option is scheduled to be completed by 2015.

15.5 Investment Options

Alternative options considered were:

- maintenance only;
- in situ replacement of 132kV primary plant, 2 Transformer and secondary systems; and
- replacement of 132kV primary plant with GIS, 2 Transformer and secondary systems.

16 Steel Conductor OHEW Fault Rating Upgrade – Stage 1

Project No: CP.02583

Category: Replacement

Median commissioning date: 2015

Median timing estimated cost: $30.0m ($ nominal)

Contribution to capital expenditure forecast: $30.0m ($ nominal)

16.1 Background

Overhead earth wires on transmission lines perform the functions of shielding the phase conductors from lightning strikes and providing paths to earth for faults initiated along the transmission lines and within substations. Fault currents on the overhead earth wires can be experienced along any section of the transmission line, but in general the highest currents are within close proximity of the substations and generators, which represent the energy source for fault currents.

Due to significant system expansion and continual load growth throughout the state of Queensland, the capacity of older overhead earthing wire systems needs to be increased.

16.2 Recommended Project Overview

A project is required to carry out the progressive replacement of steel conductor type overhead earth wire systems for all transmission lines where the existing overhead earth wires are forecast to have inadequate fault current performance. The replacement of overhead earth wire (for fault current rating) needs to at least match the design fault current rating of equipment at the source end substation(s).

16.3 Investment Need

This project is required to achieve the following capital expenditure objectives identified in clause 6A.6.7(a) of the Rules:

- meet the expected demand for prescribed transmission services over that period;
- comply with all applicable regulatory obligations or requirements associated with the provision of prescribed transmission services; and
- maintain the reliability, safety and security of the transmission system through the supply of prescribed transmission services.

The key investment drivers for this project are to address:

- Operational risks – to ensure the safe operation and performance of a number of identified built sections under fault conditions.

16.4 Investment Timing

In order to ensure appropriate management of operational risks, the recommended project option is scheduled to be completed by 2015.

16.5 Investment Options

The option of splitting the existing network to limit fault currents will require expensive duplication of many network elements to maintain supply reliability which is a much more expensive option with no offsetting benefits. As such, no other options have been considered.

17 Mudgeeraba 110kV Primary and Secondary Replacement

Project No: CP.01679

Category: Replacement

Median commissioning date: 2017

Median timing estimated cost: $33.3m ($ nominal)

Contribution to capital expenditure forecast: $29.4m ($ nominal)

17.1 Background

Mudgeeraba Substation was initially developed as the 110kV bulk supply point for the southern section of the Gold Coast and also for the Northern New South Wales area. The initial development in 1971 consisted of 6 x 110kV feeder bays. Subsequent development included the first 275/110kV transformer and associated 110kV bay in 1975 and a second transformer and 110kV bay in 1976. Further development occurred throughout the 1980s and early 1990s in response to increasing demand in the Gold Coast and surrounding regions.

Recently, parts of the original 110kV switchyard at Mudgeeraba have been upgraded due to inadequate continuous and fault ratings and poor reliability.

17.2 Recommended Project Overview

The recommended project option involves the replacement of the remainder of 110kV primary plant assets, associated structures and foundations and complete secondary systems.

This option resulted from an earlier investment decision to undertake the staged replacement of 110kV primary plant, with the second stage to incorporate 110kV secondary system replacement.

17.3 Investment Need

This project is required to achieve the following capital expenditure objectives identified in clause 6A.6.7(a) of the Rules:

- meet the expected demand for prescribed transmission services over that period;
- comply with all applicable regulatory obligations or requirements associated with the provision of prescribed transmission services; and
- maintain the reliability, safety and security of the transmission system through the supply of prescribed transmission services.

The key investment drivers for this project are to:

- Reliability and performance – primary plant assets are becoming more susceptible to failure being in poor condition and subject to decreasing reliability. Reliability analysis shows that the original protection relays are experiencing increasing failure rates
- Obsolescence – older primary plant and all secondary systems assets are without manufacturer, maintenance and design support and have limited availability of spares.

17.4 Investment Timing

In order to ensure appropriate management of reliability, performance and obsolescence risks, the recommended project option is scheduled to be completed by 2017.

17.5 Investment Options

No further alternative options were considered as this project is the balance of works to complete an earlier project.

18 EMS Replacement

Project No: CP.02364

Category: Replacement

Median commissioning date: 2017

Median timing estimated cost: $29.4m ($ nominal)

Contribution to capital expenditure forecast: $29.4m ($ nominal)

18.1 Background

Powerlink's Energy Management System (EMS), supplied by SNC-Lavalin Energy Control Systems (SLECS), was commissioned in 1999. This system was subsequently upgraded in late 2010/11 to SNC's latest EMS platform, known as the SLECS EMS GENe system.

Powerlink's asset management strategy for the EMS is to maintain the hardware and software at a level where the manufacturer still supports the products. Based on a five year renewal cycle put forward by the vendor, a subsequent software and hardware upgrade will be required by 2017.

18.2 Recommended Project Overview

The recommended project option includes the replacement of the SLECS EMS hardware, operating system, relational database system and applications, incorporating any essential product developments aligned with the EMS Strategic Development Plan.

18.3 Investment Need

This project is required to achieve the following capital expenditure objectives identified in clause 6A.6.7(a) of the Rules:

- meet the expected demand for prescribed transmission services over that period;
- comply with all applicable regulatory obligations or requirements associated with the provision of prescribed transmission services; and
- maintain the reliability, safety and security of the transmission system through the supply of prescribed transmission services.

The key investment driver for this project is to address the obsolescence of the EMS based on the vendor's nominated hardware and software renewal cycle. The capability of the EMS to operate reliably and perform in a way that meets Powerlink's business requirements is linked to ensuring the maintenance of hardware and software at a level where the manufacturer supports product maintenance and development.

18.4 Investment Timing

In order to ensure appropriate management of obsolescence and associated reliability and performance risks, the recommended project option is scheduled to be completed by 2017.

18.5 Investment Options

No alternative investment options were considered. Market and product evaluations will be conducted at the time of investment to determine the optimal solution.

19 Blackwall iPASS Secondary System Replacement

Project No: CP.01417

Category: Replacement

Median commissioning date: 2015

Median timing estimated cost: $28.5m ($ nominal)

Contribution to capital expenditure forecast: $28.5m ($ nominal)

19.1 Background

In 1999, Powerlink introduced an integrated substation design, Intelligent Plug and Switch Substation, known as iPASS, as part of a series of turnkey projects undertaken by ABB. The foundation projects for the introduction of the iPASS substation technology involved establishing the sites necessary for the Queensland – New South Wales Interconnector (QNI). H036 Blackwall Substation was constructed as a pre-requisite for the interconnection and the ongoing reliability and supportability of the substation design is imperative.

Secondary systems technology introduced as part of the iPASS substation design has been progressively phased out of production. ABB established a product support arrangement that expires in 2013, after which there will be no manufacturer support or spares production. Powerlink has implemented strategies to retain spares and in house technical support; however there is a requirement to migrate to secondary systems technology that can be supported over the remaining life of the substation assets. As part of the expiry of support arrangements, ABB have developed
a technical solution to modify primary plant interfaces and replace the iPASS secondary systems.

19.2 Recommended Project Overview

The recommend project option involves replacing all electronics forming part of the iPASS secondary systems interface located on PASS (M1) HV equipment, associated secondary systems and remote ends works for all 275kV iPASS assets located at Blackwall Substation.

19.3 Investment Need

This project is required to achieve the following capital expenditure objectives identified in clause 6A.6.7(a) of the Rules:

- meet the expected demand for prescribed transmission services over that period;
- comply with all applicable regulatory obligations or requirements associated with the provision of prescribed transmission services; and
- maintain the reliability, safety and security of the transmission system through the supply of prescribed transmission services.

The key investment drivers for this project are to address the obsolescence of iPASS secondary systems and associated primary plant interfaces. The replacement will provide a secondary system design supported by the manufacturer, ensuring performance and reliability of the secondary systems can be maintained.

19.4 Investment Timing

In order to ensure appropriate management of obsolescence and associated reliability and performance risks, the recommended project option is scheduled to be completed by 2015.

19.5 Investment Options

Alternative options considered were:

- complete iPASS primary and secondary systems replacement; and
- partial standard secondary systems replacement interfacing with toroidal current transformers.

20 Bergins Hill – Goodna – Belmont Transmission Line Life Extension

Project No: CP.02532

Category: Replacement

Median commissioning date: 2017

Median timing estimated cost: $27.6m ($ nominal)

Contribution to capital expenditure forecast: $27.6m ($ nominal)

20.1 Background

The Bergins Hill – Goodna – Belmont transmission line was constructed in 1972. The double circuit transmission line is an essential component of the transmission network supplying the Brisbane metropolitan area. The transmission line is nearing 40 years of age and operates in a metropolitan/coastal environment that exposes it to accelerated rates of atmospheric pollution, shortening the standard design life of its galvanised components.

A recently conducted condition assessment of the line found extensive corrosion evident on most of the structures and it is estimated the towers' structural components have a further 10 - 15 years of serviceable life remaining. Other components such as bolts and insulator assembly hardware have approximately 5 - 8 years of technical life remaining.

20.2 Recommended Project Overview

The recommended project option involves the life extension of the transmission line through structural repair and painting of all towers, replacement of insulators and conductor hardware, replacement of galvanised steel OHEW and replacement of all tower accessories.

20.3 Investment Need

This project is required to achieve the following capital expenditure objectives identified in clause 6A.6.7(a) of the Rules:

- meet the expected demand for prescribed transmission services over that period;
- comply with all applicable regulatory obligations or requirements associated with the provision of prescribed transmission services; and
- maintain the reliability, safety and security of the transmission system through the supply of prescribed transmission services.

The key investment drivers for this project are to address:

- The need to ensure reliability of supply into the southern Brisbane metropolitan area; and
- The poor physical condition of the transmission line asset including accelerated corrosion rates and degradation of the structures.

20.4 Investment Timing

In order to ensure appropriate management of public safety, reliability and compliance risks the recommended project option is scheduled to be completed by 2017.

20.5 Investment Options

Alternative options considered were:

- cross-arm replacement and tower painting; and
- rebuild of transmission line on a new easement.

21 Moranbah to Goonyella Riverside 132kV Transmission Line

Project No: CP.02453

Category: Augmentation

Median commissioning date: 2014

Median timing estimated cost: $29.2m ($ nominal)

Contribution to capital expenditure forecast: $27.3m ($ nominal)

21.1 Background

The load in the Northern Bowen Basin relates to the mining and transportation of coal. The load is concentrated in a band between Newlands and Dysart, which corresponds to a particularly productive coal seam that supplies around half the world's high quality metallurgical coal. Given the importance of metallurgical coal exports to Queensland's and Australia's economies, it is particularly important that a reliable electricity supply is maintained to the region.

The Northern Bowen Basin transmission network comprises the 132kV network south from Strathmore 275kV Substation (excluding the 132kV circuits to Proserpine), west from Nebo 275kV Substation and north from Lilyvale 275kV Substation. Moranbah is the point at which the 132kV circuits from Strathmore, Nebo and Lilyvale intersect and presently supplies the largest load in the area. A number of 66kV circuits (owned by the DNSP Ergon Energy and privately by mining companies) radiate away from Powerlink's 132kV substations to the individual mines located throughout the region.

This project is required to address thermal limitations on the existing Moranbah to Goonyella Riverside 132kV circuits under N-1 conditions, subsequent to the establishment of the Nebo to Broadlea 132kV circuits.

21.2 Recommended Project Overview

This project comprises the construction of a double circuit transmission line between Moranbah and Goonyella Riverside substations. It is proposed to parallel the existing 132kV between Moranbah and Goonyella Riverside and the new transmission line would also be initially operated paralleled.

21.3 Investment Need

This project is required to achieve the following capital expenditure objectives identified in clause 6A.6.7(a) of the Rules:

- meet the expected demand for prescribed transmission services over that period;
- comply with all applicable regulatory obligations or requirements associated with the provision of prescribed transmission services; and
- maintain the reliability, safety and security of the transmission system through the supply of prescribed transmission services.

The key investment drivers for this project are to:

• provide adequate capacity to meet the committed demand in the Northern Bowen basin.

21.4 Investment Timing

This project is scheduled to be completed by 2016 (scenario 5), however is dependent on the behaviour of generation in the immediate area, in particular the closure of Collinsville in certain scenarios.

21.5 Investment Options

Alternative option considered was:

- establishing a 2nd 275/132kV transformer at Strathmore and connecting 132kV feeder 7128 Collinsville to Clare South to Strathmore 132kV bus.

Economic assessment was performed for these options across the 20 scenarios.

22 Calvale to Larcom Creek 275kV DCST

Project No: CP.01957

Category: Augmentation

Median commissioning date: 2016

Median timing estimated cost: $127.2m ($ nominal)

Contribution to capital expenditure forecast: $25.3m ($ nominal)

22.1 Background

In December 1993, the Queensland Government established the Gladstone State Development Area (GSDA) under the State Development and Public Works Organisation Act 1971 as an industrial park to attract energy intensive industries, given its proximity to globally competitive electric power. The GSDA originally comprised approximately 6,800 hectares of land at Aldoga, north-west of Gladstone and was extended:

- In 1997 to include the Yarwun Industrial Estate and a materials transportation and services corridor linking the Aldoga and Yarwun areas to Fisherman's Landing and Wiggins Island wharves;
- In December 2001 to include 4,600 hectares of State owned land adjacent to the Aldoga and Yarwun areas;
- In October 2002 to include 7,355 hectares of land at Targinie; and
- To include, as at September 2004, 81 other Targinie properties comprising 1,860 hectares.

Since then, an area on Curtis Island has been set aside and designated for the production and export of LNG. As a result, in the medium to long-term, there is substantial potential for large scale electricity supply requirements in the Gladstone area. Given the size of the GSDA and Curtis Island LNG industrial precincts the potential exists for load in the Gladstone area to increase by as much as 2,500 MW over the next 15 to 20 years.

22.2 Recommended Project Overview

This project involves the construction of a 76km double circuit 275kV line between Calvale and Larcom Creek substations and the rebuild of the single circuit low capacity 275kV line between Larcom Creek and Calliope River substations to a high capacity 275kV double circuit line.

22.3 Investment Need

This project is required to achieve the following capital expenditure objectives identified in clause 6A.6.7(a) of the Rules:

- meet the expected demand for prescribed transmission services over that period;
- comply with all applicable regulatory obligations or requirements associated with the provision of prescribed transmission services; and
- maintain the reliability, safety and security of the transmission system through the supply of prescribed transmission services.

The key investment drivers for this project are to ensure that mandated reliability of supply obligations can continue to be met to the customers within the Gladstone zone and beyond to north and south Queensland.

22.4 Investment Timing

The timing of this project is dependent on the load economic growth rate and generation scenario. It is triggered as early as 2015 for scenario 14 (medium load growth).

22.5 Investment Options

Alternative options considered were:

- install the 2nd 275/132kV Calvale transformer;
- install a 132kV reactor in series with the 132kV circuit/circuits (for the case of two transformers) connecting Calvale to Callide A switchyards;
- reconfiguring the network between Calliope River, Calvale and Gin Gin to form a new connection between Calliope River and Wurdong and divert the original Calvale to Wurdong 275kV circuit to form a Calvale to Gin Gin 275kV circuit;
- directly increase the 275kV transmission capacity between the Central West and Gladstone zones by construction of a double circuit 275kV line between Calvale and Larcom Creek substations with one side strung and the rebuild of the single circuit low capacity 275kV line between Larcom Creek and Calliope River substations to a high capacity 275kV double circuit line; and
- indirectly increase the 275kV transmission capacity between the Central West and Gladstone zones by augmenting the parallel 275kV loop from Calvale to Larcom Creek/Calliope River via Stanwell and Bouldercombe.

Economic assessment was performed for these options across the 20 scenarios.