Application Notice

Proposed New Large Network Assets

South West Brisbane Area

Joint Report by Powerlink Queensland & ENERGEX Limited
29 October 2004

Disclaimer

While care was taken in preparation of the information in this paper, and it is provided in good faith, Powerlink and ENERGEX accept no responsibility or liability for any loss or damage that may be incurred by any person acting in reliance on this information or assumptions drawn from it. This Application Notice has been prepared for the purpose of inviting information, comment and discussion from interested parties. The document has been prepared using information provided by a number of third parties. It contains assumptions regarding, among other things, economic growth and load forecasts which may or may not prove to be correct. All information and underlying assumptions should be independently verified to the extent possible before assessing any investment proposals.

DOCUMENT PURPOSE

For the benefit of those not familiar with the National Electricity Code (NEC) and the National Electricity Market (NEM), Powerlink and ENERGEX offer the following clarifications on the purpose and intent of this document:

1. The document is produced in accordance with the NEC, which requires Powerlink and ENERGEX to carry out joint forward planning, and to issue this type of document for 'new large network assets' as defined in the NEC.

2. The NEC requires Powerlink and ENERGEX to identify, evaluate and compare both network and non-network proposals to determine which can overcome future supply requirements at the lowest cost to electricity consumers. This document contains the results of this evaluation in accordance with NEC requirements.

3. The purpose of this document is to recommend a proposal for a specific set of future issues, in time for the proposal to be implemented, and allow input by industry participants and other interested parties. Other works being carried out by ENERGEX and Powerlink have been considered in planning studies, but only works required to be completed in 2006 can be recommended in this document.

What the document does NOT mean:

A. It does NOT mean that the lights are about to go out. The identified supply requirements are expected to arise some years into the future, assuming that demand for electricity continues to grow. There is enough time between now and then to implement a solution.

B. It does NOT mean that Powerlink and ENERGEX have been surprised, or that anything is "out of the ordinary". On the contrary, it is part of the normal, routine planning processes in the NEM.

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EXECUTIVE SUMMARY

Introduction

Electricity demand in the South West Brisbane Area is forecast to grow strongly at around 8% per annum in the next three years, due to significant residential, commercial and industrial development and the continued installation of domestic air conditioners. This area extends from south of Runcorn to north of Browns Plains and west to Abermain and Raceview.

This strong demand growth is forecast to increase loadings on the electricity transmission and distribution networks supplying this area, such that the technical capability of the supply network will be fully utilised by the summer 2006/07. Augmentation will be required at this time to ensure customers continue to receive a reliable electricity supply.

Powerlink Queensland and ENERGEX recognise the importance of maintaining a reliable electricity supply to their customers, and have undertaken an extensive joint planning investigation to identify feasible supply proposals to address the future requirements.

This Application Notice has been prepared as part of a standard National Electricity Code process for the approval of new large network assets. It contains the results of the joint planning investigation and economic assessment of feasible supply solutions. In accordance with the ACCC Regulatory Test, the supply solution that meets the reliability requirements at the lowest total present value cost to electricity customers is recommended for implementation.

Options Considered

Powerlink and ENERGEX carried out consultation with Code Participants and interested parties to identify feasible network and non-network options, to address the South West Brisbane Area future supply requirements. No feasible non-network solutions were identified within the study area.

In addition to the consultation process, alternative network augmentation options to address the future supply requirements were considered. Joint planning studies were carried out between Powerlink and ENERGEX to evaluate these alternatives.

Two feasible network options were evaluated in detail to compare the present value of the costs to market participants, in accordance with the Regulatory Test. The augmentation options to address the South West Brisbane Area requirements for late 2006 are:

Option 1	Establish new 110 kV substations at Algester, Goodna and Sumner
Option 2	Augment capacity at existing 110 kV substations at Runcorn, Richlands and Redbank Plains

Evaluation and Conclusion

The ACCC Regulatory Test requires that, for reliability augmentations, the recommended option represent the lowest present value cost in a majority of reasonable scenarios.

To allow comparison of options on an equivalent basis, the economic analysis was carried out over fifteen years, and included consideration of anticipated/modelled projects that are expected to be required in this period to meet forecast growth in electricity demand in the South West Brisbane Area. Market development scenarios and other analytical techniques were used to check the sensitivity of the outcome to changes in underlying assumptions.

The economic analysis in this paper identifies Option 1 as the least cost solution for each of the scenarios considered, over the fifteen year analysis timeframe. Sensitivity analysis shows this result to be robust under a range of assumptions.

Consequently, this Application Notice proposes to implement this option to address the future supply requirements of the South West Brisbane Area in late 2006. The proposed new large network assets are:

- Establishment of 110/33 kV and 33/11 kV substations at Algester, including 33 kV works to Coopers Plains, Acacia Ridge and Calamvale, at an estimated cost of $40.0M.
- Establishment of a 110/33 kV substation at Goodna, with 33 kV works to Carole Park Central and 33 kV connections into existing circuits to Carole Park, Springfield, Cooneana and Redbank, at an estimated cost of $34.1 M.
- Establishment of a 110/11 kV substation at Sumner, at an estimated cost of $17.3 M.

Construction of these proposed augmentations is expected to begin in 2005, for commissioning by late 2006, in time for the 2006/07 summer period.

Powerlink and ENERGEX invite submissions from Code Participants and interested parties on this Application Notice. The closing date for submissions is Friday 10th December, 2004.

1. INTRODUCTION

Electricity demand in the South West Brisbane Area is experiencing strong growth as a result of increasing population and significant housing and commercial development. This strong growth is forecast to continue. The "South West Brisbane Area" includes the area south of Runcorn to north of Browns Plains and west to Abermain and Raceview.

As part of their commitment to maintaining a reliable supply to customers in the area, Powerlink and ENERGEX have undertaken routine joint planning studies to identify future supply requirements. Based on the forecast growth for this area, it has been determined that a planning decision is now required to enable works to be constructed by late 2006. This will ensure a reliable electricity supply in the South West Brisbane Area for the forecast 2006/07 summer peak loads.

This document has been prepared as part of a standard National Electricity Code (NEC) process for the planning of new large electricity network assets. Where a Network Service Provider proposes to establish a new large network asset, it is required to issue an 'Application Notice' under clause 5.6.6 of the National Electricity Code. This 'Application Notice' must contain information regarding:

- the reasons the augmentation is required, including, if relevant, why it is considered a 'reliability augmentation' as defined in the Code;
- feasible options available to address the future supply requirements, including non-network alternatives;
- the recommended solution, including the timetable for implementation; and
- why the solution satisfies the Regulatory Test prescribed by the Australian Competition and Consumer Commission (ACCC).

This document contains a draft recommendation for works to be undertaken by late 2006 to meet reliability of electricity supply obligations for the 2006/07 summer peak loads. This draft recommendation is based on:

- the assessment that a planning decision is now required to maintain a reliable power supply in the South West Brisbane Area during single network contingencies for the 2006/07 peak load period;
- the consultation undertaken by Powerlink and ENERGEX to identify potential solutions to address these future supply requirements; and
- analysis of feasible options in accordance with the Regulatory Test prescribed by the Australian Competition and Consumer Commission (ACCC).

The recommended solution maximises the net economic benefits to participants in the National Electricity Market while meeting the reliability standards in the National Electricity Code. These economic benefits arise from maintaining a reliable power supply during single network contingencies at the least cost to the market and therefore to end-use customers.

2. BACKGROUND: EXISTING SUPPLY SYSTEM

2.1 "South West Brisbane" Geographic Area

The geographic area referred to in this 'Application Notice' as the South West Brisbane Area includes the area south from Runcorn to north of Browns Plains and west to Abermain and Raceview.

Land usage in this area is zoned predominantly residential with significant bands of industry concentrated along the Ipswich Motorway at Carole Park, Wacol, Darra, Sumner, Rocklea, Archerfield, Acacia Ridge and Coopers Plains, and the Logan Motorway at Larapinta and Heathwood.

2.2 Network Ownership

The two electricity network owners relevant to the supply of electricity to the South West Brisbane Area comprise:

- Powerlink Queensland (Transmission Network Service Provider) who is the owner and operator of the Queensland high voltage transmission grid, including the 275 kV and a majority of the 110 kV transmission network supplying the South West Brisbane Area.
- ENERGEX (Distribution Network Service Provider) who owns and operates the electricity distribution network in south-east Queensland, including the South West Brisbane Area.

2.3 Transmission Network

2.3.1 Existing Transmission Network

The 275 kV and 110 kV transmission network, owned by Powerlink, that supplies the South West Brisbane Area is shown in Figure 1.

Bulk power is supplied to the South West Brisbane Area from Powerlink's 275 kV substations at Swanbank, Belmont, Rocklea and Loganlea. The Swanbank Power Station generating units (4 x 120 MW and 1 x 385 MW) connect to the Queensland transmission network at Swanbank substation.

Power is transformed at these substations from 275 kV to 110 kV and in turn supplies several 110/33 kV bulk supply substations. From here, power is supplied to the ENERGEX distribution network and on to customers (refer section 2.4.1).

Swanbank substation supplies the Raceview and Abermain 110/33 kV bulk supply substations and the Redbank Plains 110/11 kV zone substation via 110 kV double circuit transmission lines. A double circuit 110 kV transmission line between Belmont and Rocklea substations supplies both Runcorn and Richlands 110/33 kV bulk supply substations. Rocklea substation also supplies the Archerfield 110/33 kV bulk supply substation.

In addition several 50 MVAr capacitor banks provide reactive (voltage) support in the South West Brisbane Area.

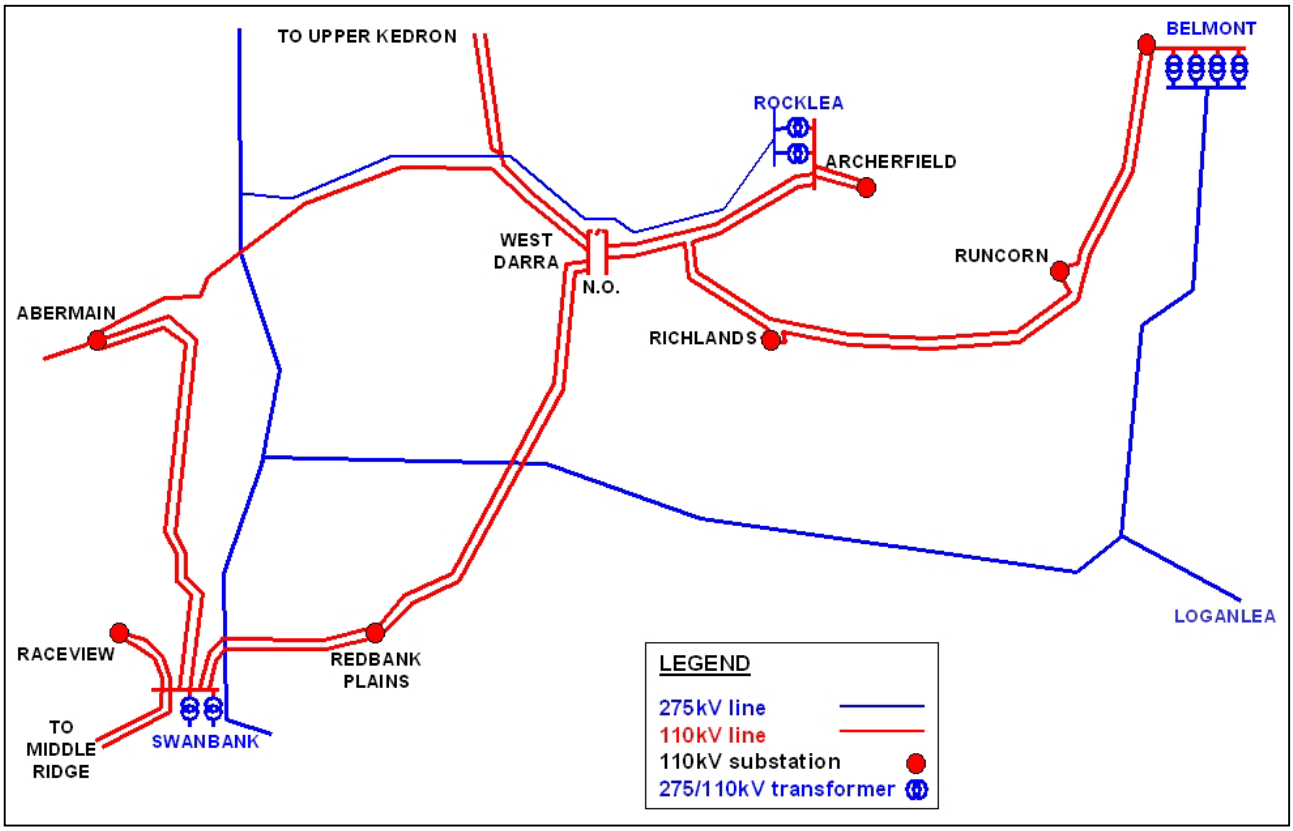


Figure 1
South West Brisbane Study Area Transmission Network

2.3.2 Committed Transmission Network Augmentations

The following committed transmission network augmentations are already being implemented in response to the growing electricity usage in the South West Brisbane Area.

Project	Objective	Date to be Operational
Operational change to reconfigure the transmission lines between West Darra and Upper Kedron substations	Optimise use of the existing network in the South West Brisbane Area	Late 2004
Works to upgrade the capacity of the Swanbank to Abermain 110 kV feeders	Optimise use of the existing network in the South West Brisbane Area	Late 2005
110 kV, 50 MVAr capacitor banks at Rocklea, Runcorn and Loganlea	Provide additional voltage support to meet load requirements in the wider South East Queensland area, which incorporates the South West Brisbane Area	Late 2005

2.4 Distribution Network

2.4.1 Existing Distribution Network

ENERGEX owns an interconnected 33 kV distribution network that delivers power from Powerlink's bulk supply substations to a number of 33/11 kV zone substations and on to customers in the South West Brisbane Area as shown below in Figure 2.

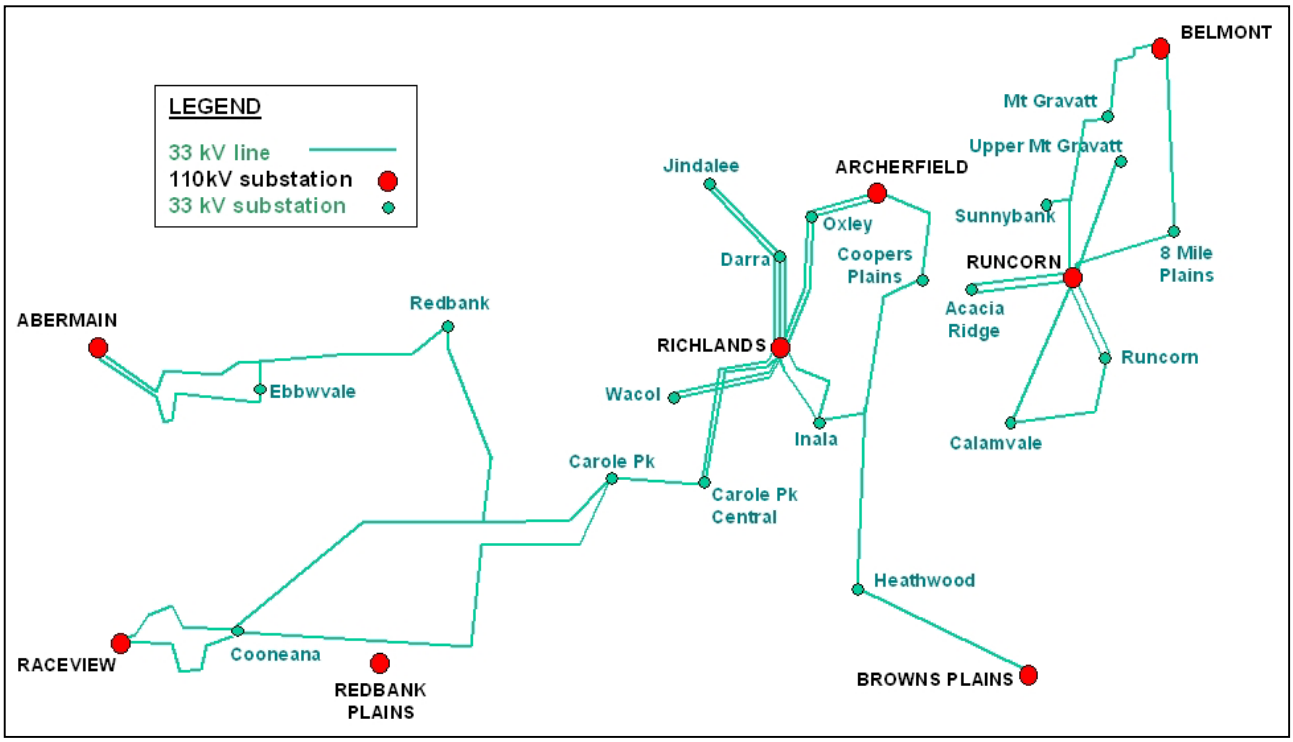


Figure 2
South West Brisbane Study Area Distribution Network

Abermain bulk supply substation normally supplies Ebbwvale and Redbank zone substations within the study area, plus North Ipswich, Amberley, Karrabin, Ebenezer, Rosewood, Marburg, Mt Crosby and Mt Crosby Westbank zone substations. Alternate supply to Redbank zone substation is available from Raceview bulk supply substation.

Raceview bulk supply substation (owned by ENERGEX) normally supplies Cooneana, and Carole Park zone substations within the study area, plus Flinders, Kalbar, Roderick Street and Booval zone substations.

Richlands bulk supply substation normally supplies Darra, Jindalee, Inala, Carole Park Central and Wacol zone substations. Alternate supply to Carole Park Central zone substation is available from Raceview bulk supply substation.

Runcorn bulk supply substation supplies Acacia Ridge, Runcorn and Calamvale zone substations within the study area, plus Upper Mt Gravatt, Sunnybank, and TR1 at Eight Mile Plains zone substations. TR2 at Eight Mile Plains and alternate supply to Sunnybank zone substation is supplied from Belmont bulk supply substation.

2.4.2 Committed and Proposed Distribution Network Augmentations

The following distribution network augmentations are already planned for the period up to 2006 in response to the growing electricity usage in the South West Brisbane Area.

Project	Objective	Date to be Operational
Establish a new 110/11 kV substation at Bundamba (1 x 60 MVA transformer)	Increase supply capacity in the Bundamba area.	Late 2005
Install a second 80 MVA, 110/33 kV transformer at Archerfield	Increase supply capacity in the Archerfield area.	Late 2005
Establish a new 33/11 kV substation at Springfield (2 x 25 MVA transformers, supplied from Raceview)	Increase supply capacity in the Springfield area.	Late 2005
Increase substation capacity at several existing substations in the South West Brisbane Area	Increase supply capacities at Calamvale, Heathwood, Crestmead, North Maclean and Eight Mile Plains.	Late 2005
Install a third 80 MVA, 110/33kV transformer at Raceview	Increase supply capacity in the Raceview area.	Late 2005
Increase substation capacity at Inala	Increase supply capacity in the Inala area.	Late 2005
Install two 5 MVAr, 11 kV capacitor banks at Acacia Ridge	Provide additional voltage support to meet load requirements in the Acacia Ridge area.	Late 2005
Install a new 33 kV double circuit cable from Archerfield to Rocklea	Transfer the Rocklea and Salisbury loads off Tennyson to reduce demand on Tennyson.	Late 2006
Install one 5 MVAr, 11 kV capacitor bank each at Jindalee and Redbank	Provide additional voltage support to meet load requirements in the Jindalee and Redbank areas.	Late 2006
Increase 33/11 kV substation capacity at Runcorn	Increase supply capacity in the Runcorn area.	Late 2006
Install two 5 MVAr, 11 kV capacitor banks at Calamvale	Provide additional voltage support to meet load requirements in the Calamvale area.	Late 2006
Install one 20 MVAr, 33 kV capacitor bank at Runcorn	Provide additional voltage support to meet load requirements in the Runcorn area.	Late 2006

2.5 Committed Future Generation and Demand Side Developments

There are no committed generation developments expected to have a significant impact on the supply requirements in the South West Brisbane Area.

CS Energy recently announced its plans for the 750MW Kogan Creek Power Project. However, this power station is located 50 km south east of Chinchilla and 37 km west of Dalby, and is well outside the South West Brisbane study area.

ENERGEX's current program of works and demand side management initiatives prior to 2006 have also been taken into consideration in the development of this document.

ENERGEX and Powerlink are not aware of any other committed generation or demand side management initiatives relevant to the study area. All existing ENERGEX demand side management programs (eg – hot water control systems) have been considered in the planning studies for the area.

3. BACKGROUND: ELECTRICITY DEMAND

3.1 Overview of Load Characteristics

The South West Brisbane Area, with a peak demand of around 400 MW, accounts for approximately 10% of the total ENERGEX electricity demand in south east Queensland. Electrical load in the study area is characterised by:

- commercial/industrial loads located in Upper Mount Gravatt, Coopers Plains, Rocklea, Acacia Ridge, Archerfield, Darra, Wacol, Sumner, Carole Park, Heathwood, Redbank and Bundamba;
- urban residential loads located in Upper Mount Gravatt, Eight Mile Plains, Runcorn, Stretton, Sunnybank, Calamvale, Parkinson, Coopers Plains, Acacia Ridge, Algester, Archerfield, Oxley, Inala, Forest Lake, Jindalee, Darra, Richlands, Wacol, Carole Park, Springfield, Goodna, Redbank Plains, Redbank, Collingwood Park, Ebbwvale, Bundamba, and Blackstone; and
- rural residential loads located in Willawong, Pallara, Heathwood, Larapinta, Durack, and Doolandella.

3.2 Load Forecast

Electricity demand in the South West Brisbane Area has been increasing due to:

- urban and commercial development in the Calamvale, Stretton, Forest Lake and Springfield areas;
- development of the Brisbane South Industrial Park alongside the Logan Motorway at Heathwood; and
- an uptake in the installation of air conditioning in domestic dwellings.

Demand forecasts issued by ENERGEX in November 2003 for the substations supplying this area predict an average growth rate of around 8% per annum for the next three years dropping to around 3% per annum for subsequent years.

Forecasting of electrical load is based upon econometric analysis coupled with knowledge of localised developments and historical information and trends. Load forecasts are reviewed on a regular basis (annually), and when significant changes in circumstances occur.

Forecast coincident loads (MW) at substations relevant to the study area (at time of state summer peak) are shown in the following table. Some of these substations also supply load outside the south west Brisbane study area, so the sum of peak demands shown exceeds 400 MW.

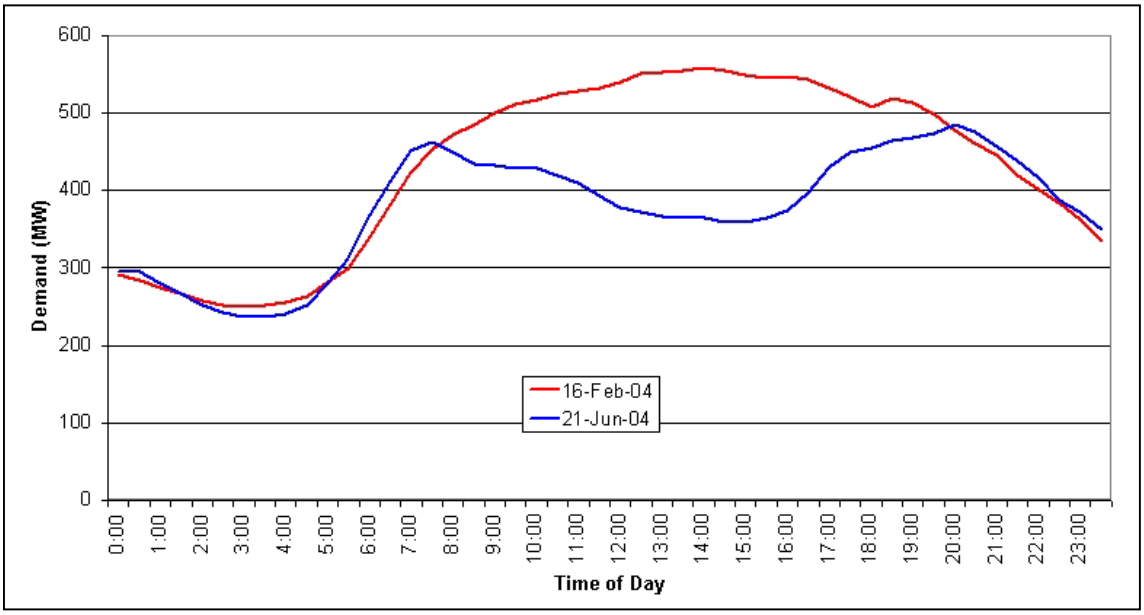
South West Brisbane Area Substations – Coincident Summer Peak Demand Forecast

Substation	Summer Peak Demand (MW)								
	04/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13
Runcorn	138.8	144.2	154.6	155.7	160.7	166.1	171.1	176.0	181.1
Archerfield	60.7	63.4	107.0	108.5	112.2	116.3	120.1	123.8	127.7
Richlands	138.0	143.8	153.6	155.9	162.0	168.6	175.0	181.1	187.7
Redbank Plains	15.4	16.6	20.2	20.9	21.3	21.8	22.2	22.5	22.9
Bundamba	0.00	17.7	18.7	18.4	18.6	18.7	18.8	18.9	18.9
Raceview	101.0	107.7	114.3	114.5	118.5	122.7	126.7	130.5	134.6
Abermain	125.8	127.6	128.3	143.5	146.8	150.5	153.7	156.7	159.9
Total	579.7	621.0	696.7	717.4	740.1	764.7	787.6	809.5	832.8

3.3 Pattern of Use

Figure 3 shows the daily load profile on the days of peak summer 2003/04 and winter 2004 demand. Both curves show a typical predominantly commercial/industrial load characteristic where the load increases rapidly until approximately 8:00 am and then remains relatively flat until approximately 8:00 pm and decreasing thereafter.

Figure 3
Daily Load Profiles for the South West Brisbane Area on Peak Load Days Summer 2003/04 and Winter 2004



4. REASONS AUGMENTATION IS REQUIRED

4.1 Planning Criteria for Network Development

Powerlink and ENERGEX must comply with technical standards in the National Electricity Code because they are a Transmission Network Service Provider (TNSP) and Distribution Network Service Provider (DNSP) respectively. In particular, requirements relating to reliability and system security contained in Schedule 5.1 of the Code must be met.

Schedule 5.1 also includes details of credible contingencies and levels of redundancy to be considered in planning and operating the transmission network.

Planning for augmentation of the interconnected 275 kV and 110 kV network is based on the ability to meet peak load with the worst single credible fault or contingency (N-1). The connection agreement between ENERGEX and Powerlink includes obligations regarding the reliability of supply as required under clause 5.1.2.2 of the Code. Capacity is required to be provided to the South West Brisbane Area such that the forecast peak demand can be supplied with the most critical element out of service, ie. N-1. Powerlink's transmission authority requires Powerlink to plan and develop its network such that the power transfer available through the power system will be adequate to supply the forecast peak demand during the most critical single network element outage.

Sufficient capacity is required to be provided in the ENERGEX 33 kV network to meet the forecast peak demand under intact conditions. Further, ENERGEX's current planning guidelines will result in the 33 kV network moving towards N-1 capacity at time of peak load.

Augmentation is required by late 2006 to ensure Powerlink and ENERGEX will be able to meet these obligations for the forecast peak loads in the 2006/07 summer, therefore, solutions to address the forecast supply requirements are classified as a reliability augmentation[1].

[1] A transmission network augmentation that is necessitated solely by inability to meet the minimum network performance requirements set out in schedule 5.1 or in relevant legislation, regulations or any statutory instrument of a participating jurisdiction.

4.2 Future Supply Requirements – South West Brisbane

Powerlink and ENERGEX have carried out joint planning, and identified that action is required to maintain a reliable electricity supply to the South West Brisbane Area in late 2006, to cater for future growth.

4.2.1 Future Supply Requirements – Transmission Network

Powerlink and ENERGEX have performed routine joint planning studies for the South West Brisbane Area, based on the existing system and load forecasts described in section 3.2, and typical generation dispatch during summer peak periods.[2] Sensitivity analysis was carried out as part of the planning studies to examine sensitivity to changes in planning assumptions (refer section 9.2).

These studies have determined that during summer peak demand periods from late 2006 onwards, the capability of the existing transmission system supplying the South West Brisbane Area will be exceeded under the following contingency (N-1) conditions:

- If either the Richlands – West Darra or Belmont – Richlands 110 kV line is out of service, the line remaining in service would have insufficient capacity to meet the forecast growth in demand; and

- If the Rocklea – Runcorn 110 kV line is out of service, the Belmont – Runcorn 110 kV line would have insufficient capacity to meet the forecast growth in demand.

If one of the following transformers is out of service, the adjacent transformer remaining in service would have insufficient capacity for summer 2006/07:

- Richlands 110/33 kV transformers; and

- Runcorn 110/33 kV transformers.

Supply augmentation is required by late 2006 to address these reliability of supply requirements, and ensure Powerlink meet their regulatory obligations, described in section 4.1.

4.2.2 Future Supply Requirements – Distribution Network

ENERGEX has an ongoing program of work to increase the supply capability of its distribution network in south-east Queensland. Some of these works are being carried out, or are planned for, the South West Brisbane Area as outlined in sections 2.4.2. The distribution issues covered by this document are those South West Brisbane requirements where joint planning by Powerlink and ENERGEX has identified that they can best be solved by establishing a 'new large network asset' (as defined in the National Electricity Code) in summer 2006/07.

Load flow studies indicate increased capacity will be required in the following 33 kV networks by summer 2006/07 to cater for load growth and to ensure a reliable electricity supply can be maintained:

- Abermain to Ebbwvale and Redbank;
- Raceview to Cooneana and Carole Park;
- Richlands to Carole Park Central;
- Richlands to Darra and Jindalee;

[2] The output of embedded generation continues to be included as a reduction in forecast peak demand and therefore has already been accounted for.

- Archerfield to Coopers Plains;
- Runcorn bulk supply to Runcorn and Calamvale; and
- Runcorn to Acacia Ridge.

Peak electrical demand forecasts for the study area indicate that increased transformer capacity will be required in the following areas by summer 2006/07 to cater for load growth and ensure a reliable electricity supply can be maintained:

- Coopers Plains, Acacia Ridge and Calamvale areas;
- Darra and Jindalee areas; and
- Redbank area.

Conclusion on South West Brisbane Area Future Supply Requirements

The planning analysis above outlines the need for future action to reinforce supply to the South West Brisbane Area by late 2006 to ensure continued reliability of electricity supply. This is to avoid line and transformer overloads that are forecast to occur only if no action was to be taken. Because this reinforcement is necessitated solely to meet reliability of supply obligations, it is a 'reliability augmentation' as defined in the Code.

5. OPTIONS CONSIDERED

5.1 Identification and Assessment of Options

Powerlink identified in its 2003 and 2004 Annual Planning Reports[3] an expectation that action would be required in this timeframe to address future supply requirements in the South West Brisbane Area. No information was put forward by industry participants in response to the Annual Planning Report.

During August and September 2004, Powerlink and ENERGEX sought information from a number of Code Participants and interested parties regarding potential solutions to address the network requirements from late 2006 onwards in order to meet reliability requirements. Only existing and committed non-network projects that would be operational prior to late 2006 would be considered viable solutions to maintaining a reliable electricity supply to the South West Brisbane Area.

Powerlink and ENERGEX have also carried out joint planning studies to consider non-network and network options. This included load flow analysis and other technical assessment to determine the capability of potential options to supply future customer electricity needs in the South West Brisbane Area.

A summary of the consultation and joint planning outcomes, together with an outline of the options and anticipated/modelled projects considered, are contained in sections 5.2 to 5.4. Further details on feasible options to address the future supply requirements in the South West Brisbane Area are provided in section 6.0, with economic evaluation of options contained in Appendix 2.

5.2 Non-Network Options

The consultation process described above in section 5.1 sought to identify feasible non-network options to be included in the analysis. Powerlink and ENERGEX have considered the feedback from these parties regarding potential options to address the South West Brisbane Area future supply requirements.

5.2.1 Demand Side Management

Demand Side Management (DSM) initiatives involve reducing the amount of power that needs to be supplied through the electricity network. This can be achieved through agreements to interrupt customer electricity supply during peak periods, through energy efficiency initiatives or use of alternative fuel sources such as gas.

Powerlink's demand and energy forecasts include all existing and foreseen DSM initiatives incorporated in ENERGEX's load forecast for the South West Brisbane Area. These initiatives, which include routine hot water switching activities, are therefore already being used to defer augmentations as long as practical.

No new Demand Side Management initiatives in the South West Brisbane Area were advised to Powerlink and ENERGEX.

[3] Published in June 2003 and 2004 respectively.

5.2.2 New Local Generation

An allowance for potential cogeneration and renewable energy developments embedded[4] in the distribution network in the relevant area is already included in ENERGEX's forecasts of electricity demand. Generation above the levels allowed would be required if local generation were to reduce demand on the transmission and distribution networks and defer the need for other forms of action.

To be considered as a viable option, a new generation proposal would need to be committed and operational prior to late 2006. The consultation process did not identify any parties or new generation proposals in the South West Brisbane Area capable of meeting this requirement. Powerlink and ENERGEX have therefore concluded that there are no additional generation proposals that can be considered as a viable option to reduce the demand on the electricity network supplying the South West Brisbane Area prior to late 2006.

Conclusion on Non Network Options

Powerlink and ENERGEX have concluded there are no viable non-network options to address the future supply requirements in the South West Brisbane Area. Demand side management initiatives are insufficient to offset one year's demand growth in the South West Brisbane Area. There is no indication that sufficient new local generation could be developed by the required timeframe of late 2006.

[4] An embedded generator connects directly to the distribution network. Output from such generators therefore reduces the expected energy that the transmission grid is required to deliver. Embedded generators may also reduce the demand the transmission grid is required to deliver, depending on their mode of operation.

5.3 Network Options

In addition to the consultation process to identify possible non-network and other alternatives, Powerlink and ENERGEX have carried out joint planning to determine the most appropriate network option to address the future supply requirements in the South West Brisbane Area. The joint planning process between Powerlink and ENERGEX seeks to identify solutions that will ensure a reliable electricity supply, at the lowest overall cost to customers.

5.3.1 Feasible Augmentation Options

An overview of feasible network options considered is provided below, with further details provided in section 6. A range of viable network options were considered and the two which best met the requirements of the National Electricity Code are presented in detail in this document.

Feasible Network Augmentations	
Establish new 110 kV substations at Algester, Goodna and Sumner	This option involves establishing two new 110/33 kV substations at Algester and Goodna, and one 110/11 kV substation at Sumner by late 2006. The Algester component would include new 33 kV works to Coopers Plains, Acacia Ridge and Calamvale. Similarly, the Goodna works would include a new 33 kV connection to Carole Park Central and 33 kV connections into existing circuits to Carole Park, Springfield, Cooneana and Redbank.
Augment capacity at existing 110 kV substations at Runcorn, Richlands and Redbank Plains	This option involves augmenting transformer capacity at the existing Runcorn and Richlands substations, with new 33 kV works from Runcorn to Acacia Ridge, from Richlands to Sumner and Carole Park Central, and from Browns Plains to Stretton. New 33/11 kV transformer capacity would need to be established at Stretton and Sumner. In addition, new 110/33 kV transformer capacity would need to be established at Redbank Plains with 33kV works to Springfield, Redbank, Cooneana and Carole Park. This option also requires augmentation of the 33kV connections to Coopers Plains from Archerfield.

It should be noted that the options described above deliver different increments in supply capacity to the South West Brisbane Area. These differences are taken into account in the economic comparison of options by considering future anticipated/modelled projects that are expected to be required under each option during the planning horizon.

Conclusions on Augmentations of the Electricity Network

With respect to possible augmentations of the electricity network, Powerlink and ENERGEX:

- Examined in detail two alternative augmentations of the transmission and distribution network that would address the future supply requirements in the South West Brisbane Area in accordance with the National Electricity Code; and
- These options are considered further in section 6, in combination with anticipated/modelled augmentations to address future supply requirements in the South West Brisbane Area.

5.4 Anticipated/ Modelled Projects

In accordance with the ACCC Regulatory Test, the economic analysis of options includes future anticipated/modelled projects that may be required within the planning horizon. All options are expected to require a series of augmentations during the fifteen year period analysed to meet the increasing demand forecast for the South West Brisbane Area over that period. Works required beyond 2006 are not recommended for approval in this Application Notice, but are included to ensure the proposed augmentations are compared on an equivalent basis. The sensitivity of the analysis to these assumptions is tested through the use of market development and other reasonable scenarios.

Some anticipated/modelled projects are common to all of the options considered[5], with the scope of works and timing varying depending on what works are undertaken in the earlier years. The variation in timing and scope occurs because further augmentations match continuing load growth in the area. Some augmentations provide a larger increment in network capability, and therefore provide for forecast load growth further into the future before additional action would be required.

It should be noted some of the anticipated/modelled projects for one option form part of the proposed augmentations in the other option (ie – they will be necessary in 2006 rather than at a later time).

[5] meaning that by the end of the 15 year period of analysis, the transmission and distribution network configuration would be similar for all options.

6. FEASIBLE OPTIONS

This section provides an overview of the feasible proposed augmentation options identified, with full details of the financial analysis contained in Appendix 2.

The proposed network augmentations to address the future supply requirements of the South West Brisbane Area, in late 2006 are:

Option 1	Establish new 110 kV substations at Algester, Goodna and Sumner
Option 2	Augment capacity at existing 110 kV substations at Runcorn, Richlands and Redbank Plains

Both development options involve a series of works, to address the increasing electricity demand that is expected to occur in the South West Brisbane Area.

Other anticipated/modelled projects are also included in each option when they are anticipated to be required to maintain ongoing reliability of supply to the South West Brisbane Area over the next fifteen years.

Works required beyond 2006 are not recommended for approval in this Application Notice, but are included to ensure the proposed augmentations are compared on an equivalent basis. The sensitivity of the analysis to these assumptions is tested through the use of market development scenarios.

Timings for anticipated/modelled projects are based on meeting future electricity supply requirements for the South West Brisbane Area based on the load forecast prepared by ENERGEX in November 2003 and published in Powerlink's Annual Planning Report in June 2004. Load forecasts are reviewed annually and actual timings of the anticipated/modelled projects may change as a result of the ongoing review of load forecasts for the area during the 15 year planning horizon.

6.1 Option 1 – Establish New 110 kV Substations at Algester, Goodna and Sumner

Option 1 addresses the future supply requirements in the South West Brisbane Area by establishing three new 110 kV substations and associated new 33 kV works[6].

Proposed Augmentations		
Date Reqd	**Proposed Augmentation**	**Capital Cost ($M)**
Late 2006	Establish a new 110/33 kV and 33/11 kV substation at Algester, including 33 kV works to Coopers Plains, Acacia Ridge and Calamvale	40.0
Late 2006	Establish a new 110/33 kV substation at Goodna, with 33 kV works to Carole Park Central and 33 kV connections into existing circuits to Carole Park, Spingfield, Cooneana and Redbank	34.1
Late 2006	Establish a new 110/11 kV substation at Sumner	17.3

A new 110/33 kV substation would be established at Algester, with two 100 MVA transformers. This new substation will connect into the existing Rocklea – Richlands – Runcorn – Belmont 110 kV lines, reducing the loading on the existing transmission system during N-1 contingencies. In addition, establishing the new 110/33 kV and 33/11 kV Algester substations and new 33 kV circuits to Coopers Plains, Acacia Ridge and Calamvale effectively reduces loading on the transformers at the existing substations at Richlands, Runcorn, Archerfield, Coopers Plains, Acacia Ridge and Calamvale.

A new 110/33 kV substation would also be established at Goodna (with two 100 MVA transformers) and connect into the existing 110 kV transmission lines between Redbank Plains and West Darra. New 33 kV circuits would be established to Carole Park Central and connections made to nearby 33 kV circuits supplying Carole Park, Redbank, Cooneana and Springfield. These works will provide additional capacity to the distribution network in these areas which are experiencing significant commercial and industrial development. Loading will be reduced on the Richlands, Raceview and Abermain substations and the 33 kV distribution networks from Raceview to Cooneana and Carole Park, Abermain to Ebbwvale and Redbank, and Richlands to Carole Park Central.

A new 110/11 kV substation would be established at Sumner (with two 60 MVA transformers) and connect into one of the existing West Darra to Rocklea 110 kV transmission lines with associated new 11 kV distribution network connections. These works will provide additional capacity to the distribution network in the Jindalee and Darra areas by concentrating a supply source in the industrial development area at Sumner. Loadings will be reduced on the existing Richlands, Darra and Jindalee substations and the 33 kV distribution network from Richlands to Darra and Jindalee.

[6] Additional future works by ENERGEX at voltages below 33 kV will also be required to address localised issues.

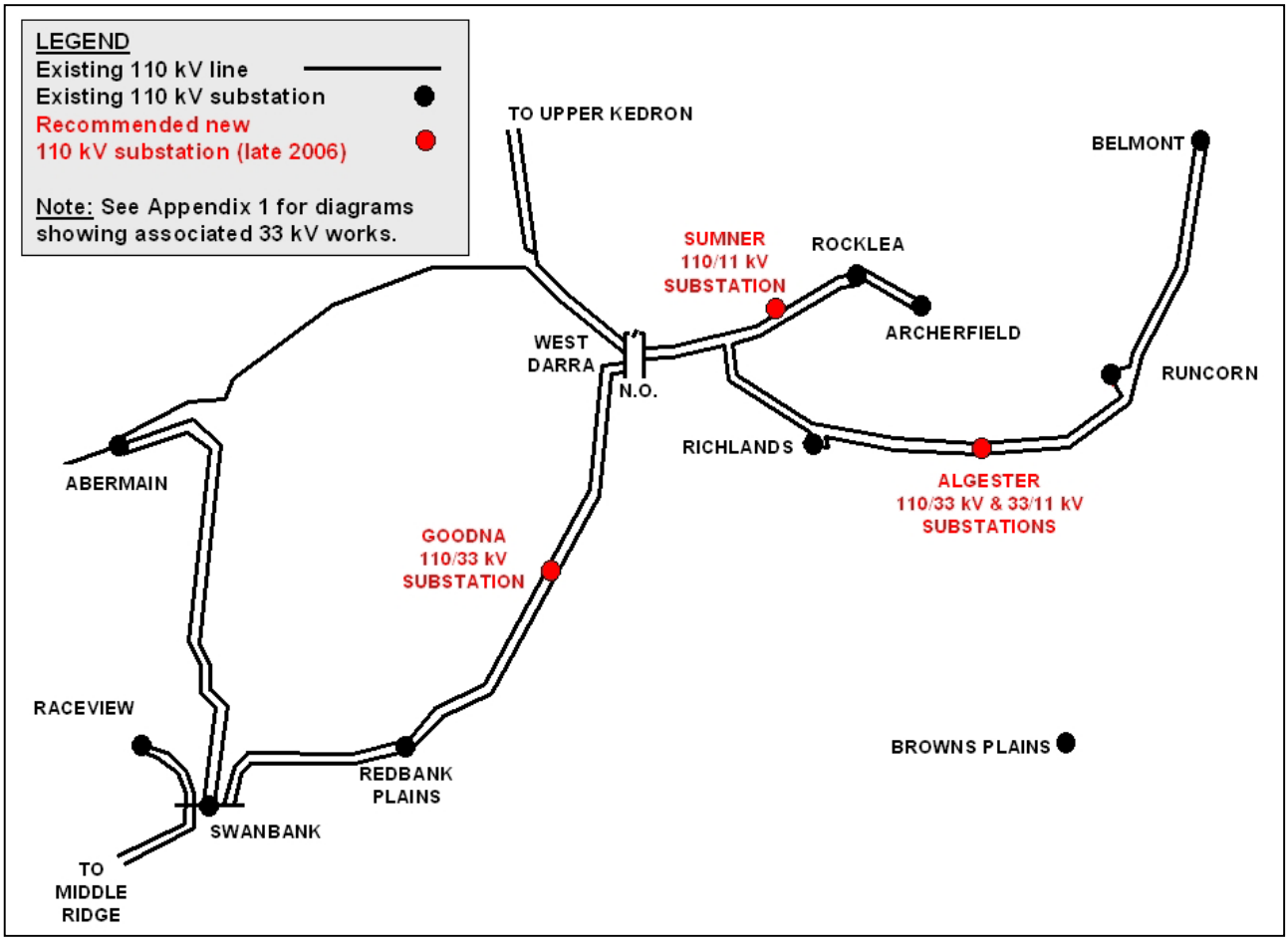


Figure 4
Option 1 – Establish New 110 kV Substations at Algester, Goodna and Sumner

Anticipated/Modelled Projects – Option 1

Further works will be required beyond 2006 as the South West Brisbane Area continues to grow. The anticipated/modelled projects[7] likely to be required in Option 1 based on current load forecasts are shown in the table below[8]. The anticipated timings for these augmentations have been determined through planning studies, which examined when further action is required. Scenarios have been developed to test the sensitivity of the analysis to factors which might affect the assumptions regarding anticipated/modelled projects.

As shown in the table below, further works on the distribution and transmission networks are anticipated to continue to meet forecast load growth. Works would be a combination of augmenting existing substations and establishing new substations and connections.

[7] The ACCC Regulatory Test defines 'anticipated projects' as "projects … which have expected commissioning dates within five years" and 'modelled projects' as "other investments which are likely to be commissioned in response to growing demand…".
[8] Additional future works at voltages below 33 kV will also be required to address localised issues.

Anticipated/Modelled Projects[9]		
Date Reqd	**Anticipated Future Projects**	**Capital Cost ($M)**
Late 2007	Augment 33/11 kV transformer capacity at Coopers Plains	1.9
Late 2008	Augment 33/11 kV transformer capacity at Acacia Ridge and new 33 kV circuits between Goodna and Redbank	6.4
Late 2008	Establish 275/110 kV substation at Goodna	12.0
Late 2012	Establish new 33/11 kV substation at Stretton, including 33 kV circuits from Browns Plains	10.2
Late 2012	Establish new 110 kV injection into the Richlands – Algester – Runcorn transmission network	12.0
Late 2013	Augment 275/110 kV transformer capacity at Goodna	7.0
Late 2016	Augment 110/33 kV transformer capacity at Runcorn and Goodna, including fault level[10] upgrades	19.1
Late 2019	Augment 110/33 kV transformer capacity at Algester, including fault level upgrades	7.9

[9] Some future developments common to both options 1 and 2 have not been included as they have no impact on the relative ranking of options in the Regulatory Test analysis (see Section 8.4).

[10] Short circuits on electricity networks can cause high fault currents to flow. These fault currents can be many times higher than normal load currents and the power network must be specially designed to withstand and interrupt the highest fault currents that are expected to occur.

6.2 Option 2 – Augment Capacity at Existing 110 kV Substations at Runcorn, Richlands and Redbank Plains

Option 2 addresses the future supply requirements in the South West Brisbane Area by augmenting the capacity of existing 110 kV substations and associated new 33 kV works[11].

Proposed Augmentations		
Date Reqd	**Proposed Augmentation**	**Capital Cost ($M)**
Late 2006	Works in the Richlands – Runcorn area including augmentation of 110/33 kV transformer capacity and additional 110 kV circuit connections at both Runcorn and Richlands, fault level[12] upgrades and 33 kV works between Runcorn and Acacia Ridge, Archerfield and Coopers Plains, Richlands and Carole Park Central. In addition, establishment of a 33/11 kV substation at Stretton with 33 kV connections from Browns Plains, and augmenting 33/11 kV transformer capacity at Coopers Plains and Acacia Ridge.	50.2
Late 2006	Add 110/33 kV transformer capacity to Redbank Plains 110/11 kV substation with 33 kV connections to Carole Park, Springfield, Cooneana and Redbank.	42.4
Late 2006	Establish 33/11 kV substation at Sumner with 33 kV connections from Richlands	14.9

Option 2 involves augmenting three existing 110 kV substations and extensive 33 kV and 11 kV distribution works.

The existing 110/33 kV transformer capacity at Runcorn would be augmented with the addition of a third transformer. The existing three transformers at Richlands would be augmented with larger size transformers, and two new 110/33 kV transformers would be installed at Redbank Plains. The additional capacity would ensure load could be met when one of the transformers is out of service at any of these substations.

New 33/11 kV substations would be established at Sumner and Stretton (initially with two 25 MVA transformers) with associated 33 kV connections to Richlands and Browns Plains respectively and 11 kV distribution connections.

The extensive 33 kV and 11 kV works described above in option 2 for the South West Brisbane Area would ensure a reliable electricity supply could be maintained for the forecast growth in demand by late 2006.

[11] Additional future works at voltages below 33 kV will also be required to address localised issues.

[12] Short circuits on electricity networks can cause high fault currents to flow. These fault currents can be many times higher than normal load currents and the power network must be specially designed to withstand and interrupt the highest fault currents that are expected to occur.

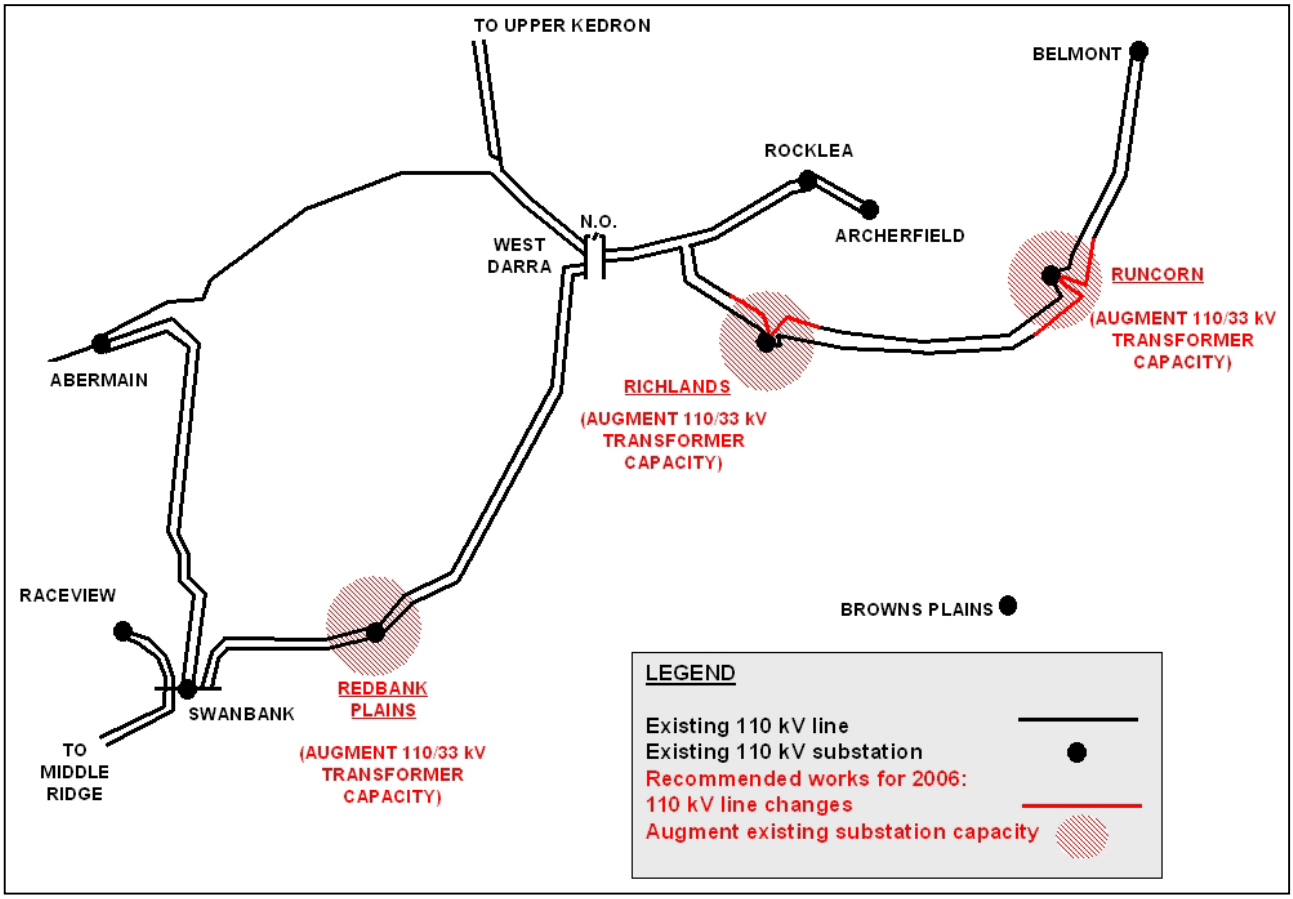


Figure 5
Option 2 – Augment Capacity at Existing 110 kV Substations at Runcorn, Richlands and Redbank Plains

Anticipated/Modelled Projects – Option 2

Under Option 2, as for Option 1, further works will be required beyond 2006 to maintain a reliable power supply as the South West Brisbane Area continues to grow. The anticipated/modelled projects[13] likely to be required in Option 2 based on current load forecasts are shown in the table below[14]. The anticipated timings for these augmentations have been determined through planning studies which examined how long the proposed and anticipated works will address the future supply requirements before further action is required. Scenarios have been developed to test the sensitivity of the analysis to factors which might affect the assumptions regarding anticipated/modelled projects.

As for option 1, the anticipated/modelled projects are a combination of transmission and distribution works, and both augmenting the existing network and establishing new substations.

[13] The ACCC Regulatory Test defines 'anticipated projects' as "projects … which have expected commissioning dates within five years" and 'modelled projects' as "other investments which are likely to be commissioned in response to growing demand…".
[14] Additional future works at voltages below 33 kV will also be required to address localised issues.

Anticipated/Modelled Projects[15]		
Date Reqd	**Anticipated Future Projects**	**Capital Cost ($M)**
Late 2008	Augment 33/11 kV transformer capacity at Sumner and new 33 kV circuits between Redbank Plains and Redbank	11.5
Late 2008	Establish 33/11 kV substation at Algester with new 33 kV circuits from Acacia Ridge	9.8
Late 2008	Establish 275/110 kV substation at West Darra	12.0
Late 2010	Add 110/11 kV transformers at existing Archerfield 110/33 kV substation	7.0
Late 2010	Establish new 110 kV injection into the Richlands – Algester – Runcorn transmission network	12.0
Late 2013	Augment 275/110 kV transformer capacity at Rocklea	12.0
Late 2015	Establish 110/33 kV substation at Algester with 33 kV connections to Coopers Plains and Calamvale	25.7
Late 2019	Augment 33 kV circuit capacity between Richlands and Sumner	4.1

[15] Some future developments common to both options 1 and 2 have not been included as they have no impact on the relative ranking of options in the Regulatory Test analysis (see Section 8.4).

7. SCENARIOS CONSIDERED

7.1 Context for Evaluation of Options

All feasible solutions to the identified supply requirements must be viewed in the context of wider developments in the National Electricity Market:

- The Queensland Government is proceeding with the implementation of its policy requirement for Queensland energy retailers to source 13% of their energy from gas-fired generation from 1 January 2005. The 13% Gas Scheme is designed to deliver on the government policy objectives of diversifying the State's energy mix towards a greater use of gas and encouraging new gas infrastructure in Queensland, while reducing the growth in greenhouse gas emissions;
- Commonwealth legislation has been in effect since 1 January 2001 to encourage increased generation from renewable energy sources. Powerlink has incorporated independent forecasts of additional renewable energy generation into the forecasts of demand and energy used in assessing future supply requirements; and
- NEMMCO's Statement of Opportunities (SOO) issued in July 2004 contained information on existing and committed generation developments in Queensland. There is currently a considerable margin between supply capacity and demand, with several large new generating units commissioned in Queensland in the past three years.

7.2 Assumed Market Development Scenarios

The ACCC Regulatory Test requires that options to address network requirements be assessed against a number of reasonable scenarios. These scenarios need to take account of:

- the existing system;
- future network developments;
- variations in load growth;
- committed generation and demand side developments; and
- potential generation and demand side developments.

The purpose of utilising this approach is to test the present value costs of the solutions being evaluated under a range of plausible scenarios.

7.2.1 Existing Network and Future Transmission Developments

No market development scenarios have been developed related to new network developments proposed by Powerlink and ENERGEX outside the South West Brisbane Area. These are independent of the future supply requirements that are the subject of this report, and are considered to be common to all options analysed. Future network developments which are relevant to the South West Brisbane Area have been included as anticipated/modelled projects in the analysis.

7.2.2 Variations in Load Growth

Three scenarios have been developed to consider sensitivity to variations in forecast customer electricity demand:

Scenario	Forecast Electricity Demand Level
Scenario A	Medium (medium economic growth and typical weather conditions)
Scenario B	High (higher economic growth and typical weather conditions)
Scenario C	Low (lower economic growth and typical weather conditions)

These scenarios are based on typical weather (50% probability of exceedance) forecast for electricity usage, with varying levels of economic growth[16]. The forecasts include all known information about existing and planned demand side initiatives, and also include independent forecasts of local embedded generation developments.

The November 2003 forecast anticipates about 8% increase in demand per year for the next three years, and then about 3% for subsequent years. Scenarios A, B and C have been developed based on different levels of demand growth[17].

7.2.3 Existing and Committed Generators

As noted in section 2.5, there are no recently committed generators proposing to establish within the South West Brisbane Area prior to 2006. For this reason, no scenarios have been developed in which the output of existing and/or committed generators is increased.

7.2.4 Potential New Generation

NEMMCO's 2004 Statement of Opportunities indicated that additional investment in major generation may be required in the medium term, but any such investment is considered unlikely to occur in the South West Brisbane Area. No new stand-alone generation was proposed in response to the consultation process undertaken by Powerlink and ENERGEX, and is considered unlikely because of a lack of economic fuel sources and the high density of residential and commercial development within the area. Hence no market development scenarios have been developed to consider the establishment of major new stand-alone generators in the South West Brisbane Area.

Smaller local generation or demand side developments may occur in the South West Brisbane Area, but these are unlikely to affect the required timing for network augmentation addressed by this Application Notice.

[16] Refer 2004 Annual Planning Report (available under "Network Development" on Powerlink's website – www.powerlink.com.au)

[17] Scenario B (higher economic growth) is modelled by accelerating 3 years' forecast growth into 2 years. Similarly, scenario C (lower economic growth) is modelled by decelerating 2 years' forecast growth into 3 years.

8. FORMAT AND INPUTS TO ANALYSIS

8.1 Regulatory Test Requirements

The requirements for the comparison of options to address future supply requirements are contained in the Regulatory Test prescribed by the Australian Competition and Consumer Commission (ACCC)[18].

The Regulatory Test requires that, for reliability augmentations[19], the recommended option be the option that "minimises the present value of costs, compared with a number of alternative options in a majority of reasonable scenarios".

The Regulatory Test contains guidelines for the methodology to be used to identify the lowest cost option. For example, information to be considered includes construction, operating and maintenance costs, the cost of complying with existing and anticipated laws and regulations, and reasonable forecasts of the 'efficient operating costs of competitively supplying energy to meet forecast demand'. However, the Regulatory Test specifically excludes indirect costs, and costs that cannot be measured as a cost in terms of financial transactions in the electricity market.

8.2 Inputs to Analysis

A solution to address future supply requirements in the South West Brisbane Area as outlined in this document is required to satisfy reliability requirements linked to Schedule 5.1 of the National Electricity Code, the requirements of the Queensland Electricity Act, Powerlink's Transmission Authority and ENERGEX's Distribution Authority[20].

According to the ACCC Regulatory Test, this means that the costs of all options must be compared, and the least cost solution is considered to satisfy the Regulatory Test. The results of this evaluation, carried out using a discounted cash flow model to determine the present value (PV) cost of the various options, are shown in section 9.1.

Cost inputs to the economic analysis are described below.

8.3 Cost of Network Augmentations

The cost to implement each of the feasible options and the anticipated/modelled projects outlined in section 6 have been estimated by Powerlink and ENERGEX[21]. Sensitivity studies have been carried out using variations in the capital cost estimates of plus or minus 15% (see section 9.2).

The financial analysis considers all foreseeable cost impacts of the proposed network augmentations to market participants as defined by regulatory processes. The estimated saving in the cost of network losses for each option has been included based on the assumption of typical

[18] Powerlink and ENERGEX are required to evaluate options for new transmission developments under the Regulatory Test in accordance with clause 5.6 of the National Electricity Code.
[19] Where an option is necessitated solely by the inability to meet the minimum network performance requirements set out in schedule 5.1 of the Code or in relevant legislation, regulations or any statutory instrument of a participating jurisdiction.
[20] Refer section 4.0.
[21] Each network service provider estimated the costs of proposed augmentations in their own networks, in 2004/05 real dollars.

load factor and an average cost of losses of $25/MWh[22]. Sensitivity studies have also been carried out on the assumed cost of losses (see section 9.2).

8.4 Other Inputs to Analysis

While a solution must be adopted by late 2006 to address the future supply requirements, the financial analysis contains anticipated projects required to address long-term supply reliability requirements, excepting some future developments common to all options which have been excluded. The sensitivity of the timing of these anticipated projects to load growth and generation development scenarios (and therefore the incidence of the capital expenditure) has been taken into account in the financial analysis.

Capital and operating costs for some items which are common to all options were not included in the analysis. These common costs include the capital and operating costs of other future works, where these costs are independent of the identified future supply requirements or where they are independent of the proposed augmentation. As such, they have no impact on the relative ranking of options resulting from the analysis. Where the timing of common works is affected by the proposed options, the cost of the other works proposed has been included in the financial analysis.

[22] Network losses are a function of the length and capacity of individual network elements, and the power being transferred through them. In heavily loaded systems, additional network elements reduce the amount of power that must be forced through the existing network, and therefore reduce total losses.

9. FINANCIAL ANALYSIS

The economic analysis undertaken considered the present value (PV) cost of alternative options over the fifteen year period from 2004/05 to 2019/20. Full details of this analysis are contained in Appendix 2.

9.1 Present Value Analysis

Financial analysis was carried out to calculate and compare the Present Value (PV) of the costs to market participants of each option under the range of assumed scenarios.

A fifteen year analysis period was selected as an appropriate period for financial analysis. A discount rate of 10% was selected as a relevant commercial discount rate, and sensitivity analysis was conducted to test this assumption.

Under the Regulatory Test, it is the ranking of the options which is important, rather than the actual present value results. This is because the Regulatory Test requires the recommended option to have the lowest present value cost compared with alternative projects.

The following table is a summary of the economic analysis contained in Appendix 2. It shows the present value cost of each alternative, and identifies the best ranked option, for the range of scenarios considered. The summary shows that Option 1 has the lowest present value cost under all three scenarios.

Summary of Economic Analysis for the Three Scenarios

Discount rate 10%	**Option 1 New 110kV Substations**		**Option 2 Augment Existing 110kV Subs**	
Scenario A Medium Growth	PV ($M)	$73.66	PV ($M)	$92.28
	Rank	1	Rank	2
Scenario B High Growth	PV ($M)	$82.06	PV ($M)	$101.90
	Rank	1	Rank	2
Scenario C Low Growth	PV ($M)	$65.13	PV ($M)	$81.13
	Rank	1	Rank	2

9.2 Sensitivity Analysis

In addition to examining the impact of a range of reasonable scenarios, the sensitivity of the option ranking to other critical parameters was also examined.

The effect of varying these parameters over their credible range was investigated using standard Monte Carlo techniques[23]. The following table shows the parameters that were investigated in the sensitivity analysis, the distribution that was assumed for each parameter and the range of values.

[23] Using the @Risk add-in for Microsoft Excel.

Parameter	Distribution
Capital Cost of Transmission Augmentations	The capital cost of the proposed augmentations and anticipated/modelled projects was tested for sensitivity to variations of plus or minus 15% from the expected value. The variation in each cost was modelled as a triangular distribution with the assumption that the costs are statistically independent. This means that the cost of each network component is allowed to vary within plus and minus 15% independently of the over or underspend of the other components.
Cost of losses	The sensitivity to the average cost of losses was tested by allowing this parameter to vary randomly between $20/MWh and $30/MWh using a triangular distribution with a mode of $25/MWh.

The Monte Carlo analysis assigns a value to each of the above parameters according to its distribution and then ranks the options. This simulation is done many times (in this case, 1,000 times) to cover a large number of combinations of parameters. The analysis identifies which option is the best ranked option (the option that has the lowest cost on a present value basis for the largest number of samples) and gives the frequency for which this option 'wins'.

In addition to the above sensitivity testing, the sensitivity of the ranking of options to the discount rate assumption was also investigated by repeating the above analysis with a discount rate of 8%, 10% and 12%. The following table shows the 'winning option' (option 1) and the frequency for which it 'wins' for each scenario and discount rate across the range of parameters assessed.

Results of Sensitivity Analysis for Varying Discount Rates

	Discount Rate		
	8%	10%	12%
Scenario A - Medium Growth	1(100%)	1(100%)	1(100%)
Scenario B - High Growth	1(100%)	1(100%)	1(100%)
Scenario C - Low Growth	1(100%)	1(100%)	1(100%)

As can be seen in this table, the results of the sensitivity analysis are consistent with the base case economic analysis, and the outcome is robust in terms of the variations in parameters assessed.

On the basis of the financial analysis and the sensitivity testing, Option 1 is the option that satisfies the ACCC Regulatory Test. Technical details and the construction timetable for Option 1 are provided in Appendix 1.

9.3 Inter-Network Impact

Powerlink is required under the National Electricity Code to assess whether a proposed new large network asset is reasonably likely to have a material inter-network impact. Powerlink have determined that the proposed new large network asset (Option 1) will not impose power transfer constraints or adversely impact on the quality of supply within the New South Wales network.

10. CONCLUSIONS

The following conclusions have been drawn from the analysis presented in this report:

- There is no acceptable 'do nothing' option. If the identified future supply requirements are not addressed by the summer of 2006/07, power supply to customers in South West Brisbane will be unable to be maintained during single contingencies. This situation is not consistent with reliability standards which Powerlink and ENERGEX must comply with as Network Service Providers in the National Electricity Market.

- Powerlink and ENERGEX must plan new works now so that construction can commence in 2005 to ensure a continued reliable electricity supply to the South West Brisbane Area in the peak load period of 2006/07, and to position the area for future growth.

- Such action is necessary to comply with electricity reliability standards which Powerlink and ENERGEX must meet, as the local Transmission Network Service Provider and Distribution Network Service Provider respectively. Interruptions to power supply during single network contingencies are not consistent with these reliability standards. Augmentations proposed in this document will prevent such interruptions during critical single contingencies in the transmission and distribution networks supplying the South West Brisbane Area. They are therefore 'reliability augmentations' as defined in the National Electricity Code.

- Powerlink and ENERGEX carried out a Consultation process in August-September 2004 in order to identify any non-network solutions to address the South West Brisbane Area supply requirements. Joint planning studies were carried out between Powerlink and ENERGEX to evaluate potential options to address the future supply requirements in the South West Brisbane Area. Following the consultation and joint planning process, Powerlink and ENERGEX concluded that there were no viable non-network options. Two network augmentation options for late 2006 were evaluated in detail.

- Economic analysis carried out in accordance with the Regulatory Test has identified that proposed augmentation Option 1 - *"Establish New 110 kV Substations at Algester, Goodna and Sumner"* - is the least-cost solution over the fifteen year period of analysis in all scenarios considered. Sensitivity testing showed that the analysis is robust to variation in capital cost and other assumptions. As Option 1 is the lowest cost option in all scenarios, Option 1 is considered to satisfy the ACCC Regulatory Test.

- Should the draft recommendation in this Application Notice be adopted, construction of the network augmentation as per Option 1 will commence in early 2005 to ensure completion by late 2006 to ensure continued reliability of electricity supply to customers.

11. DRAFT RECOMMENDATION

Based on the conclusions drawn from the analysis and the Code requirements relating to "New Large Network Assets", it is recommended that the following action be implemented to address the future supply requirements in the South West Brisbane Area:

- Powerlink and ENERGEX to establish new 110 kV substations at Algester, Goodna and Sumner and associated distribution works. This proposed augmentation has an estimated total cost of $91.4M[24].

The proposed construction timetable for the network augmentation provides for award of construction and equipment contracts in Quarter 1, 2005, commencement of on-site construction in Quarter 2, 2005 and commissioning by late 2006.

12. CONSULTATION

In accordance with Code requirements, Powerlink and ENERGEX invite submissions from Code Participants and interested parties on this Application Notice.

Submissions are due by Friday 10th December, 2004.

Please address submissions to:

Manager Network Assessments
Powerlink Queensland
PO Box 1193
Virginia QLD 4014
Tel: (07) 3860 2300
Fax: (07) 3860 2388
NetworkAssessments@powerlink.com.au

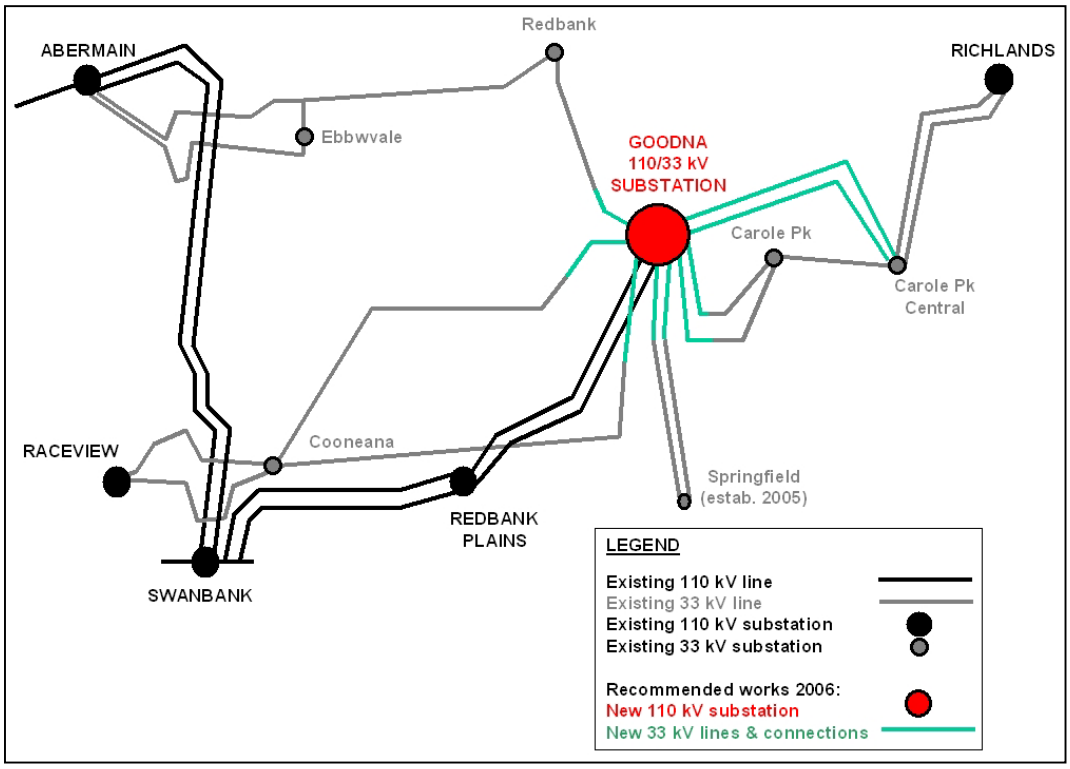
Following consideration of submissions, Powerlink expects to publish a final recommendation in January 2005.

[24] $2004/05 real

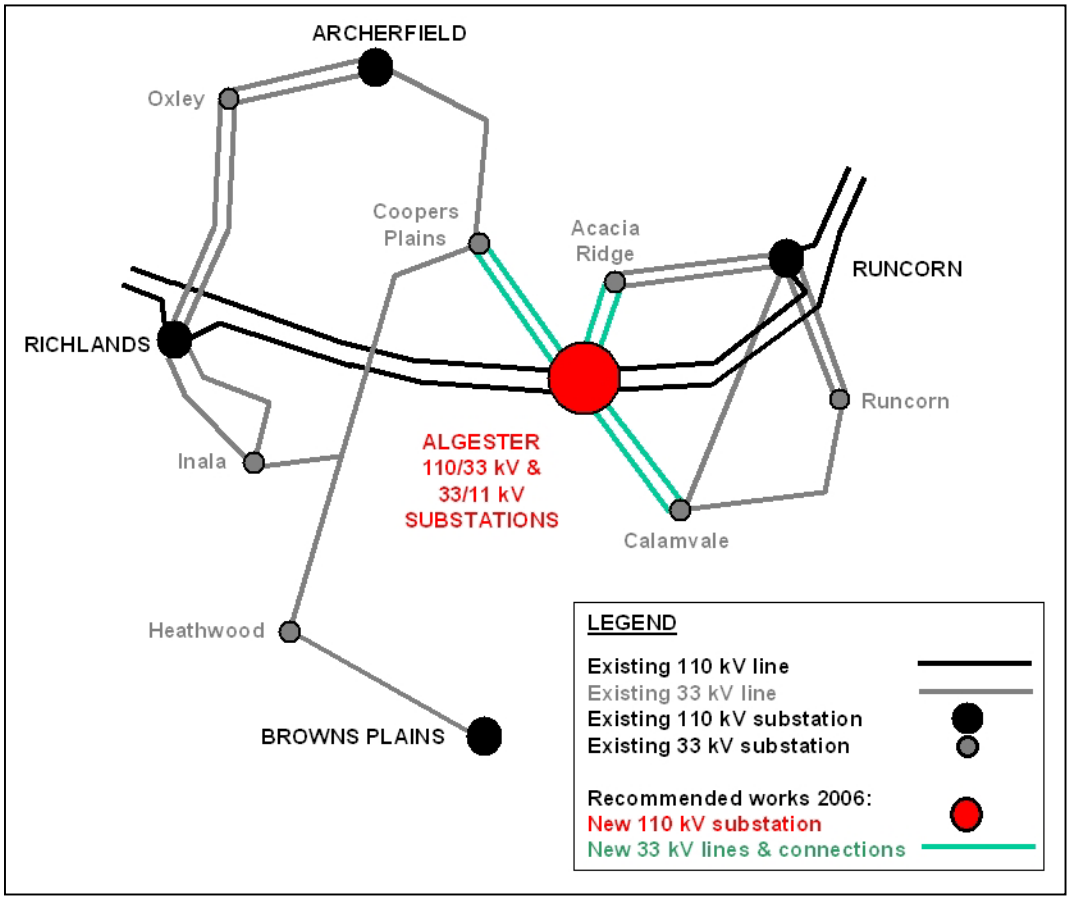
APPENDIX 1 - TECHNICAL DETAILS OF PROPOSED NEW LARGE NETWORK ASSET

Proposed Augmentations	Anticipated Construction Start Date	Target Commissioning Date	Capital expenditure: ENERGEX ($M)	Capital expenditure: Powerlink ($M)
Algester 110/33/11 kV substation – establish 110 kV busbar with 6 switchbays – install 2 x 100 MVA, 110/33 kV transformers – install 33 kV switchrooms at Algester, Acacia Ridge, Calamvale and Coopers Plains – terminate and switch the existing Richlands to Belmont and Runcorn to Rocklea lines into the new substation – install new double circuit 33 kV cable between Algester and Acacia Ridge substations – install new double circuit 33 kV cable between Algester and Calamvale substations – install new double circuit 33 kV cable between Algester and Coopers Plains – install 2 x 25 MVA, 33/11 kV transformers – install 11 kV switchroom at Algester – establish 6 new 11 kV connections	Quarter 1 2005	Quarter 4 2006	27.4	12.6
Goodna 110/33 kV substation – establish 110 kV busbar with 6 switchbays – install 2 x 100 MVA, 110/33 kV transformers – install 33 kV switchroom at Goodna – terminate and switch the existing Swanbank to West Darra and Redbank Plains to West Darra lines into the new substation	Quarter 1 2005	Quarter 4 2006	19.0	15.1

– install new double circuit 33 kV cable between Goodna and Carole Park Central – install new 33 kV cable connection to the existing distribution networks to Cooneana, Carole Park and Springfield substations. – install new 33 kV cable connection to the existing distribution network to Redbank substation.				
Sumner 110/11 kV substation – establish 110 kV busbar with 4 switchbays – install 2 x 60 MVA, 110/11 kV transformers – terminate and switch the existing Rocklea to West Darra line into the new substation – install 11 kV switchroom – establish 8 new 11 kV connections	Quarter 1 2005	Quarter 4 2006	10.1	7.2
TOTAL CAPITAL EXPENDITURE			**56.5**	**34.9**



Option 1 – Goodna 33 kV Works for late 2006



Option 1 – Algester 33 kV Works for late 2006

APPENDIX 2 – FINANCIAL ANALYSIS

Summary

Discount rate 10%	**Option 1 New 110kV Substations**		**Option 2 Augment Existing 110kV Subs**	
Scenario A Medium Growth	PV ($M)	$73.66	PV ($M)	$92.28
	Rank	1	Rank	2
Scenario B High Growth	PV ($M)	$82.06	PV ($M)	$101.90
	Rank	1	Rank	2
Scenario C Low Growth	PV ($M)	$65.13	PV ($M)	$81.13
	Rank	1	Rank	2

Development Options	FY	Capex $M	FY	Capex $M	FY	Capex $M
	Scenario A		Scenario B		Scenario C	
Option 1						
New 110/11kV Sumner Sub	06/07	17.29	06/07	17.29	06/07	17.29
New 110/33/11kV Algester & 33 works	06/07	40.03	06/07	40.03	06/07	40.03
New 110/33kV Goodna sub & 33 works	06/07	34.07	06/07	34.07	06/07	34.07
Proposed and modelled projects						
Augment 33/11 Tx Coopers Plains	07/08	1.91	07/08	1.91	08/09	1.91
Acacia R 33/11 Txs & Goodna-Redbank Opt	08/09	6.41	07/08	6.41	10/11	6.41
Establish 275/110kV Goodna sub	08/09	12.00	07/08	12.00	10/11	12.00
New 33/11kV Stretton & 33 to Browns Pl	12/13	10.16	10/11	10.16	16/17	10.16
New 110kV injection to Algester Area	12/13	12.00	10/11	12.00	16/17	12.00
Augment Goodna 275/110kV (2nd Tx)	12/13	7.00	10/11	7.00	16/17	7.00
Augment 110/33 Tx Runcorn & Goodna	16/17	19.09	12/13	19.09	22/23	19.09
Augment 110/33 Algester, fault level upgrade	19/20	7.85	14/15	7.85	26/27	7.85
Option 2						
New 33/11kV Sumner Sub & 33 works	06/07	14.85	06/07	14.85	06/07	14.85
Richlands-Runcorn augmentations 2006	06/07	50.15	06/07	50.15	06/07	50.15
Augment Redbank Plains Txs & 33 works	06/07	42.39	06/07	42.39	06/07	42.39
Proposed and modelled projects						
New 33/11 sub Algester, works to Ac R	08/09	9.80	07/08	9.80	10/11	9.80
Red.Pl.-Redbank 33, Sumner 3rd Tx	08/09	11.50	07/08	11.50	10/11	11.50
Establish 275/110kV West Darra sub	08/09	12.00	07/08	12.00	10/11	12.00
Add 110/11kV Tx at Archerfield	10/11	7.00	08/09	7.00	13/14	7.00
New 110kV injection to Algester Area	10/11	12.00	08/09	12.00	13/14	12.00
Augment Rocklea 275/110kV	13/14	12.00	10/11	12.00	17/18	12.00
New 110/33 Algester, 33 to CP, Calamv.	15/16	25.73	12/13	25.73	20/21	25.73
Augment 33 between Richlands-Sumner	19/20	4.08	14/15	4.08	26/27	4.08

Scenario A			Medium Growth														
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
			05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20
Option 1			**New 110kV Substations**														
New 110/11kV Sumner Sub		17.286															
			05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20
=> TUOS			0.000	0.000	1.906	1.880	1.855	1.830	1.804	1.779	1.753	1.728	1.702	1.677	1.652	1.626	1.601
==> PV of TUOS	$10.49																
New 110/33/11kV Algester & 33 works		40.025															
			05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20
=> TUOS			0.000	0.000	4.413	4.354	4.295	4.236	4.177	4.119	4.060	4.001	3.942	3.883	3.824	3.766	3.707
==> PV of TUOS	$24.28																
New 110/33kV Goodna sub & 33 works		34.065															
			05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20
=> TUOS			0.000	0.000	3.756	3.706	3.656	3.605	3.555	3.505	3.455	3.405	3.355	3.305	3.255	3.205	3.155
==> PV of TUOS	$20.67																
Proposed and modelled projects																	
Augment 33/11 Tx Coopers Plains		1.908															
			05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20
=> TUOS			0.000	0.000	0.000	0.210	0.208	0.205	0.202	0.199	0.196	0.194	0.191	0.188	0.185	0.182	0.180
==> PV of TUOS	$1.01																
Acacia R 33/11 Txs & Goodna-Redbank Opt1		6.408															
			05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20
=> TUOS			0.000	0.000	0.000	0.000	0.706	0.697	0.688	0.678	0.669	0.659	0.650	0.641	0.631	0.622	0.612
==> PV of TUOS	$2.96																
Establish 275/110kV Goodna sub		12															
			05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20
=> TUOS			0.000	0.000	0.000	0.000	1.323	1.305	1.288	1.270	1.252	1.235	1.217	1.200	1.182	1.164	1.147
==> PV of TUOS	5.55																
New 33/11kV Stretton & 33 to Browns Pl		10.16															
			05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20
=> TUOS			0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.120	1.105	1.090	1.075	1.060	1.045	1.031
==> PV of TUOS	2.46																
New 110kV injection to Algester Area		12															
			05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20
=> TUOS			0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.323	1.305	1.288	1.270	1.252	1.235	1.217
==> PV of TUOS	$2.90																
Augment Goodna 275/110kV (2nd Tx)		7															
			05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20
=> TUOS			0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.772	0.761	0.751	0.741	0.731	0.720	0.710
==> PV of TUOS	$1.69																
Augment 110/33 Tx Runcorn & Goodna		19.09															
			05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20
=> TUOS			0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.105	2.077	2.049
==> PV of TUOS	$1.65																
Augment 110/33 Algester, fault level upgrade O		7.85															
			05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20
=> TUOS			0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
==> PV of TUOS	$0.00																
Relative Losses																	
			05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20
* Losses $			0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
=> PV of Loss difference	$0.00																
Total for Option 1	**$73.66**																

Scenario A			*Medium Growth*														
			1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*
			05/06	**06/07**	**07/08**	**08/09**	**09/10**	**10/11**	**11/12**	**12/13**	**13/14**	**14/15**	**15/16**	**16/17**	**17/18**	**18/19**	**19/20**
Option 2			**Augment Existing 110kV Subs**														
New 33/11kV Sumner Sub & 33 works		14.9															
			05/06	*06/07*	*07/08*	*08/09*	*09/10*	*10/11*	*11/12*	*12/13*	*13/14*	*14/15*	*15/16*	*16/17*	*17/18*	*18/19*	*19/20*
=> TUOS			0.000	0.000	1.637	1.615	1.594	1.572	1.550	1.528	1.506	1.484	1.463	1.441	1.419	1.397	1.375
==> PV of TUOS	$9.01																
Richlands-Runcorn augmentations 2006		50.1															
			05/06	*06/07*	*07/08*	*08/09*	*09/10*	*10/11*	*11/12*	*12/13*	*13/14*	*14/15*	*15/16*	*16/17*	*17/18*	*18/19*	*19/20*
=> TUOS			0.000	0.000	5.529	5.455	5.381	5.308	5.234	5.160	5.087	5.013	4.939	4.865	4.792	4.718	4.644
==> PV of TUOS	$30.42																
Augment Redbank Plains Txs & 33 works		42.4															
			05/06	*06/07*	*07/08*	*08/09*	*09/10*	*10/11*	*11/12*	*12/13*	*13/14*	*14/15*	*15/16*	*16/17*	*17/18*	*18/19*	*19/20*
=> TUOS			0.000	0.000	4.673	4.611	4.549	4.487	4.424	4.362	4.300	4.237	4.175	4.113	4.050	3.988	3.926
==> PV of TUOS	$25.72																
Proposed and modelled projects																	
New 33/11 sub Algester, works to Ac R		9.8															
			05/06	*06/07*	*07/08*	*08/09*	*09/10*	*10/11*	*11/12*	*12/13*	*13/14*	*14/15*	*15/16*	*16/17*	*17/18*	*18/19*	*19/20*
=> TUOS			0.000	0.000	0.000	0.000	1.080	1.066	1.052	1.037	1.023	1.008	0.994	0.980	0.965	0.951	0.936
==> PV of TUOS	$4.53																
Red.Pl.-Redbank 33, Sumner 3rd Tx		11.5															
			05/06	*06/07*	*07/08*	*08/09*	*09/10*	*10/11*	*11/12*	*12/13*	*13/14*	*14/15*	*15/16*	*16/17*	*17/18*	*18/19*	*19/20*
=> TUOS			0.000	0.000	0.000	0.000	1.268	1.251	1.234	1.217	1.200	1.183	1.166	1.150	1.133	1.116	1.099
==> PV of TUOS	$5.32																
Establish 275/110kV West Darra sub		12.0															
			05/06	*06/07*	*07/08*	*08/09*	*09/10*	*10/11*	*11/12*	*12/13*	*13/14*	*14/15*	*15/16*	*16/17*	*17/18*	*18/19*	*19/20*
=> TUOS			0.000	0.000	0.000	0.000	1.323	1.305	1.288	1.270	1.252	1.235	1.217	1.200	1.182	1.164	1.147
==> PV of TUOS	$5.55																
Add 110/11kV Tx at Archerfield		7.0															
			05/06	*06/07*	*07/08*	*08/09*	*09/10*	*10/11*	*11/12*	*12/13*	*13/14*	*14/15*	*15/16*	*16/17*	*17/18*	*18/19*	*19/20*
=> TUOS			0.000	0.000	0.000	0.000	0.000	0.000	0.772	0.761	0.751	0.741	0.731	0.720	0.710	0.700	0.689
==> PV of TUOS	$2.40																
New 110kV injection to Algester Area		12.0															
			05/06	*06/07*	*07/08*	*08/09*	*09/10*	*10/11*	*11/12*	*12/13*	*13/14*	*14/15*	*15/16*	*16/17*	*17/18*	*18/19*	*19/20*
=> TUOS			0.000	0.000	0.000	0.000	0.000	0.000	1.323	1.305	1.288	1.270	1.252	1.235	1.217	1.200	1.182
==> PV of TUOS	$4.11																
Augment Rocklea 275/110kV		12.0															
			05/06	*06/07*	*07/08*	*08/09*	*09/10*	*10/11*	*11/12*	*12/13*	*13/14*	*14/15*	*15/16*	*16/17*	*17/18*	*18/19*	*19/20*
=> TUOS			0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.323	1.305	1.288	1.270	1.252	1.235
==> PV of TUOS	$2.37																
New 110/33 Algester, 33 to CP, Calamv.		25.7															
			05/06	*06/07*	*07/08*	*08/09*	*09/10*	*10/11*	*11/12*	*12/13*	*13/14*	*14/15*	*15/16*	*16/17*	*17/18*	*18/19*	*19/20*
=> TUOS			0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.836	2.798	2.761	2.723
==> PV of TUOS	$3.09																
Augment 33 between Richlands-Sumner		4.1															
			05/06	*06/07*	*07/08*	*08/09*	*09/10*	*10/11*	*11/12*	*12/13*	*13/14*	*14/15*	*15/16*	*16/17*	*17/18*	*18/19*	*19/20*
=> TUOS			0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
==> PV of TUOS	$0.00																
Relative Losses																	
			05/06	*06/07*	*07/08*	*08/09*	*09/10*	*10/11*	*11/12*	*12/13*	*13/14*	*14/15*	*15/16*	*16/17*	*17/18*	*18/19*	*19/20*
* Losses $			0.000	0.033	0.089	0.089	0.046	0.062	0.026	-0.059	-0.122	-0.177	-0.204	-0.214	-0.223	-0.233	-0.243
=> PV of Loss difference	-$0.24																
Total for Option 2	**$92.28**																

Scenario B			*High Growth*														
			1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*
			05/06	**06/07**	**07/08**	**08/09**	**09/10**	**10/11**	**11/12**	**12/13**	**13/14**	**14/15**	**15/16**	**16/17**	**17/18**	**18/19**	**19/20**
Option 1			**New 110kV Substations**														
New 110/11kV Sumner Sub		17.286															
			05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20
=> TUOS			0.000	0.000	1.906	1.880	1.855	1.830	1.804	1.779	1.753	1.728	1.702	1.677	1.652	1.626	1.601
==> PV of TUOS	$10.49																
New 110/33/11kV Algester & 33 works		40.025															
			05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20
=> TUOS			0.000	0.000	4.413	4.354	4.295	4.236	4.177	4.119	4.060	4.001	3.942	3.883	3.824	3.766	3.707
==> PV of TUOS	$24.28																
New 110/33kV Goodna sub & 33 works		34.065															
			05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20
=> TUOS			0.000	0.000	3.756	3.706	3.656	3.605	3.555	3.505	3.455	3.405	3.355	3.305	3.255	3.205	3.155
==> PV of TUOS	$20.67																
Proposed and modelled projects																	
Augment 33/11 Tx Coopers Plains		1.908															
			05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20
=> TUOS			0.000	0.000	0.000	0.210	0.208	0.205	0.202	0.199	0.196	0.194	0.191	0.188	0.185	0.182	0.180
==> PV of TUOS	$1.01																
Acacia R 33/11 Txs & Goodna-Redbank Opt1		6.408															
			05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20
=> TUOS			0.000	0.000	0.000	0.706	0.697	0.688	0.678	0.669	0.659	0.650	0.641	0.631	0.622	0.612	0.603
==> PV of TUOS	$3.41																
Establish 275/110kV Goodna sub		12															
			05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20
=> TUOS			0.000	0.000	0.000	1.323	1.305	1.288	1.270	1.252	1.235	1.217	1.200	1.182	1.164	1.147	1.129
==> PV of TUOS	6.38																
New 33/11kV Stretton & 33 to Browns Pl		10.16															
			05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20
=> TUOS			0.000	0.000	0.000	0.000	0.000	0.000	1.120	1.105	1.090	1.075	1.060	1.045	1.031	1.016	1.001
==> PV of TUOS	3.48																
New 110kV injection to Algester Area		12															
			05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20
=> TUOS			0.000	0.000	0.000	0.000	0.000	0.000	1.323	1.305	1.288	1.270	1.252	1.235	1.217	1.200	1.182
==> PV of TUOS	$4.11																
Augment Goodna 275/110kV (2nd Tx)		7															
			05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20
=> TUOS			0.000	0.000	0.000	0.000	0.000	0.000	0.772	0.761	0.751	0.741	0.731	0.720	0.710	0.700	0.689
==> PV of TUOS	$2.40																
Augment 110/33 Tx Runcorn & Goodna		19.09															
			05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20
=> TUOS			0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.105	2.077	2.049	2.020	1.992	1.964	1.936
==> PV of TUOS	$4.61																
Augment 110/33 Algester, fault level upgrade O		7.85															
			05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20
=> TUOS			0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.865	0.854	0.842	0.831	0.819
==> PV of TUOS	$1.23																
Relative Losses																	
			05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20
* Losses $			0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
=> PV of Loss difference	$0.00																
Total for Option 1	**$82.06**																

Scenario B		*High Growth*														
		1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*
		05/06	**06/07**	**07/08**	**08/09**	**09/10**	**10/11**	**11/12**	**12/13**	**13/14**	**14/15**	**15/16**	**16/17**	**17/18**	**18/19**	**19/20**
Option 2		**Augment Existing 110kV Subs**														
New 33/11kV Sumner Sub & 33 works	14.9															
		05/06	*06/07*	*07/08*	*08/09*	*09/10*	*10/11*	*11/12*	*12/13*	*13/14*	*14/15*	*15/16*	*16/17*	*17/18*	*18/19*	*19/20*
=> TUOS		0.000	0.000	1.637	1.615	1.594	1.572	1.550	1.528	1.506	1.484	1.463	1.441	1.419	1.397	1.375
==> PV of TUOS	$9.01															
Richlands-Runcorn augmentations 2006	50.1															
		05/06	*06/07*	*07/08*	*08/09*	*09/10*	*10/11*	*11/12*	*12/13*	*13/14*	*14/15*	*15/16*	*16/17*	*17/18*	*18/19*	*19/20*
=> TUOS		0.000	0.000	5.529	5.455	5.381	5.308	5.234	5.160	5.087	5.013	4.939	4.865	4.792	4.718	4.644
==> PV of TUOS	$30.42															
Augment Redbank Plains Txs & 33 works	42.4															
		05/06	*06/07*	*07/08*	*08/09*	*09/10*	*10/11*	*11/12*	*12/13*	*13/14*	*14/15*	*15/16*	*16/17*	*17/18*	*18/19*	*19/20*
=> TUOS		0.000	0.000	4.673	4.611	4.549	4.487	4.424	4.362	4.300	4.237	4.175	4.113	4.050	3.988	3.926
==> PV of TUOS	$25.72															
Proposed and modelled projects																
New 33/11 sub Algester, works to Ac R	9.8															
		05/06	*06/07*	*07/08*	*08/09*	*09/10*	*10/11*	*11/12*	*12/13*	*13/14*	*14/15*	*15/16*	*16/17*	*17/18*	*18/19*	*19/20*
=> TUOS		0.000	0.000	0.000	1.080	1.066	1.052	1.037	1.023	1.008	0.994	0.980	0.965	0.951	0.936	0.922
==> PV of TUOS	$5.21															
Red.Pl.-Redbank 33, Sumner 3rd Tx	11.5															
		05/06	*06/07*	*07/08*	*08/09*	*09/10*	*10/11*	*11/12*	*12/13*	*13/14*	*14/15*	*15/16*	*16/17*	*17/18*	*18/19*	*19/20*
=> TUOS		0.000	0.000	0.000	1.268	1.251	1.234	1.217	1.200	1.183	1.166	1.150	1.133	1.116	1.099	1.082
==> PV of TUOS	$6.11															
Establish 275/110kV West Darra sub	12.0															
		05/06	*06/07*	*07/08*	*08/09*	*09/10*	*10/11*	*11/12*	*12/13*	*13/14*	*14/15*	*15/16*	*16/17*	*17/18*	*18/19*	*19/20*
=> TUOS		0.000	0.000	0.000	1.323	1.305	1.288	1.270	1.252	1.235	1.217	1.200	1.182	1.164	1.147	1.129
==> PV of TUOS	$6.38															
Add 110/11kV Tx at Archerfield	7.0															
		05/06	*06/07*	*07/08*	*08/09*	*09/10*	*10/11*	*11/12*	*12/13*	*13/14*	*14/15*	*15/16*	*16/17*	*17/18*	*18/19*	*19/20*
=> TUOS		0.000	0.000	0.000	0.000	0.772	0.761	0.751	0.741	0.731	0.720	0.710	0.700	0.689	0.679	0.669
==> PV of TUOS	$3.24															
New 110kV injection to Algester Area	12.0															
		05/06	*06/07*	*07/08*	*08/09*	*09/10*	*10/11*	*11/12*	*12/13*	*13/14*	*14/15*	*15/16*	*16/17*	*17/18*	*18/19*	*19/20*
=> TUOS		0.000	0.000	0.000	0.000	1.323	1.305	1.288	1.270	1.252	1.235	1.217	1.200	1.182	1.164	1.147
==> PV of TUOS	$5.55															
Augment Rocklea 275/110kV	12.0															
		05/06	*06/07*	*07/08*	*08/09*	*09/10*	*10/11*	*11/12*	*12/13*	*13/14*	*14/15*	*15/16*	*16/17*	*17/18*	*18/19*	*19/20*
=> TUOS		0.000	0.000	0.000	0.000	0.000	0.000	1.323	1.305	1.288	1.270	1.252	1.235	1.217	1.200	1.182
==> PV of TUOS	$4.11															
New 110/33 Algester, 33 to CP, Calamv.	25.7															
		05/06	*06/07*	*07/08*	*08/09*	*09/10*	*10/11*	*11/12*	*12/13*	*13/14*	*14/15*	*15/16*	*16/17*	*17/18*	*18/19*	*19/20*
=> TUOS		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.836	2.798	2.761	2.723	2.685	2.647	2.609
==> PV of TUOS	$6.22															
Augment 33 between Richlands-Sumner	4.1															
		05/06	*06/07*	*07/08*	*08/09*	*09/10*	*10/11*	*11/12*	*12/13*	*13/14*	*14/15*	*15/16*	*16/17*	*17/18*	*18/19*	*19/20*
=> TUOS		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.450	0.444	0.438	0.432	0.426
==> PV of TUOS	$0.64															
Relative Losses																
		05/06	*06/07*	*07/08*	*08/09*	*09/10*	*10/11*	*11/12*	*12/13*	*13/14*	*14/15*	*15/16*	*16/17*	*17/18*	*18/19*	*19/20*
* Losses $		0.000	0.033	0.069	0.046	0.010	-0.092	-0.177	-0.210	-0.223	-0.233	-0.243	-0.253	-0.263	-0.279	-0.292
=> PV of Loss difference	-$0.69															
Total for Option 2	**$101.90**															

Scenario C			Low Growth													
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
			05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20
Option 1			**New 110kV Substations**														
New 110/11kV Sumner Sub		17.286															
			05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20
=> TUOS			0.000	0.000	1.906	1.880	1.855	1.830	1.804	1.779	1.753	1.728	1.702	1.677	1.652	1.626	1.601
==> PV of TUOS	$10.49																
New 110/33/11kV Algester & 33 works		40.025															
			05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20
=> TUOS			0.000	0.000	4.413	4.354	4.295	4.236	4.177	4.119	4.060	4.001	3.942	3.883	3.824	3.766	3.707
==> PV of TUOS	$24.28																
New 110/33kV Goodna sub & 33 works		34.065															
			05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20
=> TUOS			0.000	0.000	3.756	3.706	3.656	3.605	3.555	3.505	3.455	3.405	3.355	3.305	3.255	3.205	3.155
==> PV of TUOS	$20.67																
Proposed and modelled projects																	
Augment 33/11 Tx Coopers Plains		1.908															
			05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20
=> TUOS			0.000	0.000	0.000	0.000	0.210	0.208	0.205	0.202	0.199	0.196	0.194	0.191	0.188	0.185	0.182
==> PV of TUOS	$0.88																
Acacia R 33/11 Txs & Goodna-Redbank Opt1		6.408															
			05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20
=> TUOS			0.000	0.000	0.000	0.000	0.000	0.000	0.706	0.697	0.688	0.678	0.669	0.659	0.650	0.641	0.631
==> PV of TUOS	$2.19																
Establish 275/110kV Goodna sub		12															
			05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20
=> TUOS			0.000	0.000	0.000	0.000	0.000	0.000	1.323	1.305	1.288	1.270	1.252	1.235	1.217	1.200	1.182
==> PV of TUOS	4.11																
New 33/11kV Stretton & 33 to Browns Pl		10.16															
			05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20
=> TUOS			0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.120	1.105	1.090
==> PV of TUOS	0.88																
New 110kV injection to Algester Area		12															
			05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20
=> TUOS			0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.323	1.305	1.288
==> PV of TUOS	$1.04																
Augment Goodna 275/110kV (2nd Tx)		7															
			05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20
=> TUOS			0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.772	0.761	0.751
==> PV of TUOS	$0.60																
Augment 110/33 Tx Runcorn & Goodna		19.09															
			05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20
=> TUOS			0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
==> PV of TUOS	$0.00																
Augment 110/33 Algester, fault level upgrade O		7.85															
			05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20
=> TUOS			0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
==> PV of TUOS	$0.00																
Relative Losses																	
			05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20
* Losses $			0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
=> PV of Loss difference	$0.00																
Total for Option 1	**$65.13**																

Scenario C			Low Growth														
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
			05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20
Option 2			**Augment Existing 110kV Subs**														
New 33/11kV Sumner Sub & 33 works		14.9															
			05/06	*06/07*	*07/08*	*08/09*	*09/10*	*10/11*	*11/12*	*12/13*	*13/14*	*14/15*	*15/16*	*16/17*	*17/18*	*18/19*	*19/20*
=> TUOS			0.000	0.000	1.637	1.615	1.594	1.572	1.550	1.528	1.506	1.484	1.463	1.441	1.419	1.397	1.375
==> PV of TUOS	$9.01																
Richlands-Runcorn augmentations 2006		50.1															
			05/06	*06/07*	*07/08*	*08/09*	*09/10*	*10/11*	*11/12*	*12/13*	*13/14*	*14/15*	*15/16*	*16/17*	*17/18*	*18/19*	*19/20*
=> TUOS			0.000	0.000	5.529	5.455	5.381	5.308	5.234	5.160	5.087	5.013	4.939	4.865	4.792	4.718	4.644
==> PV of TUOS	$30.42																
Augment Redbank Plains Txs & 33 works		42.4															
			05/06	*06/07*	*07/08*	*08/09*	*09/10*	*10/11*	*11/12*	*12/13*	*13/14*	*14/15*	*15/16*	*16/17*	*17/18*	*18/19*	*19/20*
=> TUOS			0.000	0.000	4.673	4.611	4.549	4.487	4.424	4.362	4.300	4.237	4.175	4.113	4.050	3.988	3.926
==> PV of TUOS	$25.72																
Proposed and modelled projects																	
New 33/11 sub Algester, works to Ac R		9.8															
			05/06	*06/07*	*07/08*	*08/09*	*09/10*	*10/11*	*11/12*	*12/13*	*13/14*	*14/15*	*15/16*	*16/17*	*17/18*	*18/19*	*19/20*
=> TUOS			0.000	0.000	0.000	0.000	0.000	0.000	1.080	1.066	1.052	1.037	1.023	1.008	0.994	0.980	0.965
==> PV of TUOS	$3.35																
Red.Pl.-Redbank 33, Sumner 3rd Tx		11.5															
			05/06	*06/07*	*07/08*	*08/09*	*09/10*	*10/11*	*11/12*	*12/13*	*13/14*	*14/15*	*15/16*	*16/17*	*17/18*	*18/19*	*19/20*
=> TUOS			0.000	0.000	0.000	0.000	0.000	0.000	1.268	1.251	1.234	1.217	1.200	1.183	1.166	1.150	1.133
==> PV of TUOS	$3.94																
Establish 275/110kV West Darra sub		12.0															
			05/06	*06/07*	*07/08*	*08/09*	*09/10*	*10/11*	*11/12*	*12/13*	*13/14*	*14/15*	*15/16*	*16/17*	*17/18*	*18/19*	*19/20*
=> TUOS			0.000	0.000	0.000	0.000	0.000	0.000	1.323	1.305	1.288	1.270	1.252	1.235	1.217	1.200	1.182
==> PV of TUOS	$4.11																
Add 110/11kV Tx at Archerfield		7.0															
			05/06	*06/07*	*07/08*	*08/09*	*09/10*	*10/11*	*11/12*	*12/13*	*13/14*	*14/15*	*15/16*	*16/17*	*17/18*	*18/19*	*19/20*
=> TUOS			0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.772	0.761	0.751	0.741	0.731	0.720
==> PV of TUOS	$1.38																
New 110kV injection to Algester Area		12.0															
			05/06	*06/07*	*07/08*	*08/09*	*09/10*	*10/11*	*11/12*	*12/13*	*13/14*	*14/15*	*15/16*	*16/17*	*17/18*	*18/19*	*19/20*
=> TUOS			0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.323	1.305	1.288	1.270	1.252	1.235
==> PV of TUOS	$2.37																
Augment Rocklea 275/110kV		12.0															
			05/06	*06/07*	*07/08*	*08/09*	*09/10*	*10/11*	*11/12*	*12/13*	*13/14*	*14/15*	*15/16*	*16/17*	*17/18*	*18/19*	*19/20*
=> TUOS			0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.323	1.305
==> PV of TUOS	$0.66																
New 110/33 Algester, 33 to CP, Calamv.		25.7															
			05/06	*06/07*	*07/08*	*08/09*	*09/10*	*10/11*	*11/12*	*12/13*	*13/14*	*14/15*	*15/16*	*16/17*	*17/18*	*18/19*	*19/20*
=> TUOS			0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
==> PV of TUOS	$0.00																
Augment 33 between Richlands-Sumner		4.1															
			05/06	*06/07*	*07/08*	*08/09*	*09/10*	*10/11*	*11/12*	*12/13*	*13/14*	*14/15*	*15/16*	*16/17*	*17/18*	*18/19*	*19/20*
=> TUOS			0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
==> PV of TUOS	$0.00																
Relative Losses																	
			05/06	*06/07*	*07/08*	*08/09*	*09/10*	*10/11*	*11/12*	*12/13*	*13/14*	*14/15*	*15/16*	*16/17*	*17/18*	*18/19*	*19/20*
* Losses $			0.000	0.033	0.056	0.092	0.089	0.085	0.049	0.043	0.069	0.026	-0.026	-0.072	-0.122	-0.158	-0.187
=> PV of Loss difference	$0.17																
Total for Option 2	**$81.13**																