APPENDIX A
Terms of Reference

Consultancy Terms of Reference - Powerlink Revenue Reset

Review of capital expenditure, operating and maintenance expenditure and service standards

Background

The Australian Energy Regulator (AER), in accordance with its responsibilities under the National Electricity Rules (rules), is to conduct an inquiry into the appropriate revenue cap to be applied to the non-contestable elements of the transmission services provided by Powerlink Queensland (Powerlink) from 1 July 2007 to 30 June 2012.

As part of the AER's inquiry, a review by an appropriately qualified consultant of Powerlink's proposed capital expenditure (capex), historic capex, operational expenditure (opex) and service standards proposals is required. The consultant's review will assist the AER in assessing Powerlink's proposal relative to the requirements of the rules. In particular, Part B of chapter 6 of the rules requires, *inter alia*, that:

- in setting the revenue cap, the AER must have regard to the potential for efficiency gains in expected operating, maintenance and capital costs, taking into account the expected demand growth and service standards
- the regulatory regime seeks to achieve an environment which fosters efficient use of existing infrastructure, efficient operating and maintenance practices and an efficient level of investment
- in setting the revenue cap, the AER must have regard to the provision of a fair and reasonable risk-adjusted cash flow rate of return on efficient investment.

In this context, the consultant's review will need to inform the AER on:

- the appropriateness of Powerlink's methods to forecast capex and opex allowances, including the methods Powerlink has or will use to check the reasonableness of the results
- the adequacy, efficiency and appropriateness of the capex projects planned by Powerlink to meet its present and future service requirements
- the prudency of capex undertaken by Powerlink in the current regulatory period
- the adequacy, efficiency and appropriateness of the opex forecast by Powerlink as being necessary to meet its present and future service requirements
- the appropriate performance incentive scheme for service standards.

Terms of reference

Forecast capital expenditure

AER's ex-ante capex regime

The AER's Statement of principles for the regulation of electricity transmission revenues – 8 December 2004 (SRP) provides a regulatory framework focused on improving investment outcomes in the National Electricity Market (NEM). The framework is aimed at:

- providing greater certainty for stakeholders
- improving the assessment framework for the evaluation of a transmission network service provider's (TNSP) capex proposal
- establishing a more light-handed regime that provides regulated firms with the incentive to pursue improved investment outcomes.

An important element of the regulatory framework is the ex-ante capex incentive mechanism which places a strong reliance on an ex-ante investment cap. The ex-ante capex regime, in contrast to the ex-post capex regime, places a greater emphasis on conducting a rigorous review of forecast investment before that investment is undertaken.

Assessment of Powerlink's capex proposal

The consultant is required to review Powerlink's proposed capex program in accordance with clause 6.2.2 of the rules, in particular, with regard to achieving an efficient and prudent level of investment in electricity transmission infrastructure.

The consultant will be required to provide an independent view on the prudency and efficiency of Powerlink's investment proposal. If the consultant finds that Powerlink's proposal over or underestimates its statutory requirements for transmission investment, the consultant will be required to provide an alternative estimate.

The consultant must critically analyse and comment on the adequacy of Powerlink's capex program to ensure the continued and future operation of the system, taking into account:

- the existing network capacity system
- asset utilisation
- asset lives
- demand growth
- trade-offs between capital and operating expenditure
- information on historical and forecast capex trends
- any other internal or external factor that may be relevant.

The consultant should also specifically comment on the deliverability of Powerlink's capex proposal given the strong demand for resources and materials for infrastructure projects in Queensland and other jurisdictions in the NEM.

The AER expects the consultant to be in a position to make a judgement on the prudency and efficiency of Powerlink's capex proposal after undertaking the following reviews.

1. Review of capital governance framework

The consultant is required to comment on whether Powerlink's capital governance framework allows for the consideration of all relevant issues related to investment projects and whether the information is effectively coordinated across the organisation. The assessment of the capital governance framework should be informed by the consultant's detailed review of a sample of projects (see point 5 – Detailed review of projects).

2. Review of capex strategies, policies and procedures

The consultant should comment on whether Powerlink's capex strategies, policies and procedures are reasonable, implemented across the organisation and are likely to result in efficient investment outcomes. The review should include an assessment of:

- long term network development strategies
- policies and procedures for:
    - identifying network constraints, replacement of assets and non-network needs
    - developing investment proposals once a need is established
    - analysing alternative investment options and identifying the most cost effective option
    - ensuring that investment projects take place on a timely basis, with minimum network disruption and at least cost.
- the integration and consistency of policies and procedures across investment categories
- Powerlink's capex policies and procedures compared to industry best practice.

For example, the consultant should review the appropriateness of Powerlink's asset management strategies, processes and procedures in ensuring that assets are maintained or replaced on a timely basis with minimum network disruption and at least cost.

The assessment of whether the strategies, policies and procedures are applied in practice should be informed by the consultant's detailed review of a sample of investment projects (see point 5 – Detailed review of projects).

3. Review of Powerlink's probabilistic forecasting approach

Powerlink has advised that it has adopted a probabilistic approach to determine its forecast capex requirement as a result of the uncertainties involved in forecasting future customer demand and generation developments. It has developed a number of theme sets representing possible variations in the key drivers for the development of Powerlink's network over the next regulatory period. The outcome of this forecasting approach is a probability weighted average capex requirement for each year of the regulatory period.

The consultant is required to assess the adequacy and appropriateness of Powerlink's probabilistic forecasting approach by:

- determining the reasonableness of the assumptions and inputs used for the theme sets (for example, economic growth expectations, load growth forecasts, generation scenarios and expected customer connections)
- assessing the resulting scenarios and their probabilities to determine if they are reasonable and appropriate
- undertaking a detailed review of the transmission plans resulting from two scenarios to determine whether they are reasonable and appropriate.

4. High level review of the proposed capital program

The AER understands that Powerlink's forecast capex program involves around 400 projects. The consultant will need to undertake a high level review of the projects contained in each of Powerlink's main capex categories and set out:

- a brief description of each project
- the need for the project (as identified by Powerlink)
- Powerlink's estimate of the project's cost
- Powerlink's proposed timing for the project
- a recommendation as to whether or not the project should be included in Powerlink's capital works program, and if so, at what cost and timing.

5. Detailed review of specific projects

The consultant will be required to undertake a detailed review of a number of specific projects from each of Powerlink's main capex categories. The projects to be reviewed will be identified by the AER in consultation with the consultant, based on a risk and materiality assessment. The consultant's review will include a critical evaluation of whether or not:

- Powerlink has adequately assessed the need for the project in accordance with its regulatory and statutory obligations
- it considers there is a genuine need for the project
- Powerlink has considered the complete range of investment alternatives, their feasibility, costs (and where relevant benefits) and timing
- it agrees with the estimated costs (and where relevant benefits) determined by Powerlink for the proposed project are appropriate and reasonable
- it agrees with the timing of the proposed project (if not, whether the project could be deferred within the period or into the next regulatory period)
- the project aligns with Powerlink's strategic plans, and governance arrangements, and capex policies and procedures have been adhered to
- the information provided by Powerlink is accurate and complete
- the proposed project is prudent and efficient and, if so, the value and timing at which the project should be recognised in the ex-ante cap.

The consultant will need to analyse information prepared by Powerlink on the investment, including regulatory test documentations, business cases, and planning studies.

6. Assessment of proposed contingent projects

Contingent projects are significant but uncertain investments that are not included in the main ex-ante cap. Excluding such projects from the main ex-ante cap is intended to improve the accuracy of the allowance by ensuring that it remains reasonably aligned with efficient costs.

In assessing contingent projects the consultant will be required to review:

- whether Powerlink's proposed contingent projects are appropriately classified as contingent projects based on the criteria set out in Appendix F and G of the SRP Background Paper

- whether the proposed trigger events proposed by Powerlink are appropriate

- the likelihood of the proposed contingent projects being commenced within the upcoming regulatory period

- whether there are investments in the main ex-ante cap that would be more appropriately classified as a contingent projects and appropriate trigger events for these projects.

Key deliverables

The consultant is to:

- discuss its findings and conclusions regarding:
    - the adequacy and appropriateness of Powerlink's capital governance framework
    - the effectiveness of Powerlink's strategies, policies, procedures in delivering efficient and prudent capex
    - the adequacy and appropriateness of Powerlink's probabilistic methodology to forecast capex
    - its high level review of Powerlink's proposed capital program
    - its detailed review of specific projects
    - its assessment of Powerlink's contingent projects and their associated triggers
- comment on and provide its recommendation on an efficient and prudent capex allowance for the upcoming regulatory period (by capex category).

Historic capital expenditure

The consultant is required to assess the prudency of the capex undertaken by Powerlink during the 2002-2006/07 regulatory period. The ACCC's Draft Statement of Principles for the Regulation of Transmission Revenues (DRP) outlines the test for prudent investment as, '… the amount that would be invested by a prudent TNSP acting efficiently in accordance with good industry practice'.[1] The AER understands that Powerlink's historic capex program includes around 300 projects.

Further guidance on the process for reviewing historic capex is contained in the SRP and the ACCC's April 2005 TransGrid and EnergyAustralia revenue cap decisions. Appendix B of the SRP sets out the prudency test for revenue caps operating under the DRP. The test involves a systematic examination of the critical decisions in selecting and delivering investments. The purpose of the examination is to establish whether the TNSP made decisions at each stage of the investment process consistent with good industry practice. The examination consists of three consequential stages:

1. Assess whether there is a justifiable need for the investment

[1] ACCC, 1999, Draft Statement of Principles for the Regulation of Transmission Revenues, p. 53.

2. Assuming the need for an investment is recognised, assess whether the TNSP proposed the most efficient investment to meet that need

3. Assess whether the project that was analysed to be the most efficient was developed, and if not, whether the difference reflects decisions that are consistent with good industry practice.

The prudency test should be applied to all projects regardless of whether they have or have not been assessed under the regulatory test.[2]

In undertaking the ex-post prudency assessment of projects, and having regard to the information/analysis available to Powerlink at the time it made the decisions to invest, the consultant's task is to assess and comment on whether a prudent TNSP would have made the same decisions. If the consultant determines that different decisions would have been made by a prudent TNSP than those which were actually made by Powerlink, then it must quantify the difference in investment under each set of decisions. By implication, this difference represents the cost of inefficiency to be excluded from the regulated asset base (RAB).

Estimated project costs may only be available for capex which is expected to be commissioned near the end of the 2002-2006/07 regulatory period or where construction began late in the 2002-2006/07 regulatory period and commissioning is not expected in the next regulatory period. However, the regulatory test documentation or business cases for these projects should have been completed. Accordingly, the consultant will be required to make judgements on whether there was a justifiable need for the project and whether Powerlink proposed the most efficient investment to meet that need (i.e. steps 1 and 2 of the prudency test).

The consultant is also required to review:

- Powerlink's proposed schedule of remaining and standard asset lives, and comment on their reasonableness

- any capex efficiency savings claimed by Powerlink and provide a view on their reasonableness.

Augmentation capex

The consultant is required to:

- review the investment processes and procedures adopted by Powerlink for all historic augmentation capex and consider whether they have ensured that only prudent capex was undertaken

- apply the prudency test to a sample of historic augmentation capex projects in accordance with the relevant regulatory test in existence at the time the project was assessed by Powerlink.[3] The AER will identify, in consultation with the consultant, what augmentation projects are to be included in the sample for detailed review. It is likely that projects with a high materiality or whose actual cost significantly varies from the regulatory test cost estimate will be selected for review

- provide analysis of its review and set out its recommendation on the prudent level of historic augmentation capex.

[2] The regulatory test, which was first promulgated in December 1999, is an economic cost-benefit test used by transmission and distribution businesses in the NEM to assess the efficiency of network augmentations.

[3] Note that a revised version of the regulatory test has been in operation since August 2004.

Non-augmentation network capex

The consultant is required to:

- review the investment processes and procedures adopted by Powerlink for all historic non-augmentation network capex and consider whether they have ensured that only prudent capex was undertaken. This capex category relates to replacement, easements, connections and security and compliance projects

- apply the prudency test to a sample of non-augmentation network projects. The AER will identify, in consultation with the consultant, what non-augmentation network projects are to be included in the sample for review. It is expected that the sample for detailed review would mainly focus on replacement projects as it is likely that they will constitute the highest proportion of non-augmentation projects

- provide analysis of its review and set out its recommendation on the prudent level of historic non-augmentation network capex.

Non-network capex

The consultant is required to:

- review the investment processes and procedures adopted by Powerlink for all historic non-network capex and consider whether they have ensured that only prudent non-network capex was undertaken. This capex category mainly relates to investment that supports the business such as buildings, business systems and information technology

- apply the prudency test to a sample of non-network projects. The sample of projects chosen for detailed review will be decided by the AER in consultation with the consultant

- provide analysis of its review and set out its recommendation on the prudent level of historic non-network capex.

Key deliverables

The consultant is to comment on and provide a view on the prudent historic capex undertaken by Powerlink in the 2002-2006/07 regulatory period. To this end, the consultant must provide analysis and discussion of:

- its review of Powerlink's investment processes and procedures, and its findings and conclusions on whether these have ensured that only prudent capex was undertaken

- the prudency findings associated with its review of specific projects, including any prudency adjustments that the consultant considers are justified and any capex efficiency savings claimed by Powerlink

- its recommendation on the prudent level of historic capex that should be included in Powerlink's RAB (by capex category).

Operating and maintenance expenditure

The consultant is required to undertake a review which analyses and comments on the following matters in relation to the contribution of opex to Powerlink's delivery of transmission services:

- the efficiency of Powerlink's forecast opex for each year of the regulatory period and whether there exists scope for any efficiencies

- the appropriateness of Powerlink's allocation of opex costs to specific activities, including the distinctions between regulated and non-regulated activities, between routine maintenance and renewals, and the treatment of joint and common costs, especially corporate administration expenses, financing charges and depreciation

- the effectiveness of Powerlink's operating practices and procedures and asset management system in ensuring that only necessary and efficient opex occurs

- the key internal and external factors that may affect the level of efficient opex required by Powerlink over the upcoming regulatory period (for example, the relationship between capex and opex, changes in regulatory or legislative requirements (eg. land clearing regulations), impact of skills shortage on labour costs and changes in material costs)

- the efficacy of Powerlink's procedures for ensuring that efficient costs are paid for contract maintenance work in view of limited availability of contractors in Queensland and the amount of work currently being tendered for

- the appropriateness of the methodology that Powerlink uses to forecast its opex requirements, including an evaluation of Powerlink's work unit approach to estimating maintenance costs.

Historic opex

In determining the efficiency of Powerlink's forecast opex, the consultant will need to give consideration to Powerlink's historic (actual) opex outcomes over the 2002-2006/07 regulatory period. The purpose of this review is to identify any long term trends in opex and to determine an efficient starting opex for the upcoming regulatory period. As part of that analysis, the consultant is to:

- analyse and explain variations between forecast and actual outcomes for the 2002-2006/07 regulatory period

- identify and analyse trends (by expense category and in total) for the 2002-2006/07 regulatory period

- provide its view on an efficient opex level at the start of the next regulatory period by identifying any inefficiencies, anomalies or one-off type expenditures that should be removed from Powerlink's historic opex.

Forecast opex

In determining the efficiency of Powerlink's forecast opex, the consultant is required to:

- explain the reasons for and reasonableness of any step jump between historic opex levels and the forecast level of opex at the start of the upcoming regulatory period

- identify and analyse trends (by expense category and in total) in Powerlink's forecast opex proposal for the upcoming regulatory period

- compare historic opex information to forecast opex information

- recommend an efficient opex allowance for Powerlink (by expense category) for the upcoming regulatory period, including whether an efficiency target should apply.

As a check on its final opex recommendation, the consultant should assess its recommendation against current available indicators (benchmarks) based on key controllable costs and with reference to national and international best practice.

The consultant is also required to review Powerlink's grid support allowance claim, and any supporting material, and comment on whether the requested allowance is reasonable. The consultant will need to ensure that there is no overlap between this allowance and capex allowed for in the ex-ante allowance.

Key deliverables

The consultant is to discuss its findings and conclusions in relation to:

- its review of Powerlink's operating practices, procedures and asset management systems for ensuring only efficient opex occurs
- its review of historic opex outcomes over the 2002-2006/07 regulatory period and its view on an efficient opex level at the start of the upcoming regulatory period
- the reasons for and reasonableness of any step jump in opex levels between the two regulatory periods, including analysis of trends in Powerlink's forecast opex proposal
- its recommendation on an efficient opex allowance for Powerlink for the upcoming regulatory period, including whether an efficiency target should apply.

Service standards

The consultant must recommend appropriate performance measures, targets and weightings to be applied to Powerlink over the upcoming regulatory period.

These recommendations should be based on the framework outlined in the Service Standards Decision and Guidelines.[4] The consultant should also have regard to Sinclair Knight Merz's 2003 report[5] and any other obligations contained in the legislation, the rules, regulations and directions or licence requirements issued pursuant to such instruments.

The services standards guidelines (guidelines) contain the framework through which the AER applies service standards incentives to revenue cap decisions. The consultant must assess the consistency of Powerlink's proposed performance measures, definitions and exclusions with the guidelines. In the event that Powerlink proposes alternative measures, definitions or exclusions to those outlined in the guidelines the consultant must assess the proposed changes and make recommendations as to their appropriateness.

The consultant must also review Powerlink's proposed targets (including any caps, collars or deadbands) and measure weightings and consider their appropriateness. Should the consultant find Powerlink's targets or measure weightings to be inappropriate it must recommend appropriate alternatives.

Key deliverables

The consultant must recommend appropriate service standard performance measures, performance targets and measure weightings.

[4] ACCC, 2003, *Service Standards Decision* and *Service Standards* Guidelines.

[5] Sinclair Knight Merz, 2003, *Transmission Network Service Provider (TNSP) – Service Standards Final Report*.

APPENDIX B
Detailed Historic Project Review

Please note that all costs in this Appendix **exclude** FDC.

AUGMENTATION PROJECTS

Lilyvale 275 kV Reinforcement - CP.00384

Need Identified

This project increases the capacity of the existing transmission system to meet a demand increase in the area. Analysis by Powerlink identified a need to reinforce the system to ensure that the firm capacity could be maintained. The need is clearly identified as the load was expected to grow to the extent that the N-1 reliability criterion could not be met by the summer of 2004-2005. The need was identified with initial approval in March 2003.

Most Efficient Option Selected

The business case developed by Powerlink identifies that the regulatory test was conducted. Demand side options were accounted for in the initial scope identification and further demand management was not made available. The most cost effective option was selected from the two augmentations and six options were evaluated in the regulatory test. The project initial cost was identified as $23.8 million.

Most efficient Option Realised

The planned project was delivered within budget for an actual cost of $25.8 million and was commissioned in December 2004.

Recommendation

We consider that all requirements of the prudency test were met and recommend that the value of $25.8 million be included in the opening RAB.

Molendinar 275 kV Establishment - CP.00667

Need Identified

The need for this project was clearly defined and identified through joint planning studies with Energex. The two companies agreed that without further augmentation the capacity of the Mudgeeraba substation would be exceeded during a contingency event by 2003.

Most Efficient Option Selected

Powerlink and Energex conducted joint planning studies and identified that the establishment of a new substation was the most economically efficient option after applying the ACCC's regulatory test. The proposed project cost was $23.7 million.

Most Efficient Option Realised

The project was delivered to budget and on time, at the actual project cost of $23.5 million. Commissioning occurred in November 2003.

Recommendation

We consider that all requirements of the prudency test were met and recommend that the value of $23.5 million be included in the opening RAB.

Woree 132 kV SVC - CP.00668

Need Identified

The need for this project was identified as voltage support in the Cairns area due to ongoing demand growth. Studies identified that the voltage would exceed statutory limits during a maintenance outage by the summer of 2005.

Most Efficient Option Selected

Powerlink conducted the regulatory test on two augmentation options after considering the two proposed non network alternatives. One of the options met the requirements of the regulatory test and the most efficient proposal was realised. The value of the proposal was $16.30 million.

Most Efficient Option Realised

The project was delivered below budget and on time at a value of $14.8 million. Commissioning occurred in December 2005

Recommendation

We consider that all requirements of the prudency test were met and recommend that the actual cost of $14.8 million be included in the opening RAB.

Cairns Reinforcement - CP.00707 & CP.00742

Need Identified

Stage 1 of this project was undertaken prior to the start of the current regulatory period. This project is Stage 2, the need for which was identified in the original project evaluation in 1996.

Most Efficient Option Selected

Justification for the project was demonstrated through the regulatory test and the option chosen was the most efficient option to implement. A staged implementation was planned with the implementation date of this second stage being based on demand growth. As the demand did not grow as quickly as expected the project was delayed by one year.

Most Efficient Option Realised

The scope of the project did not change significantly from that originally envisaged and the project was delivered marginally over budget (7%) but below the 15% contingency considered in the regulatory test sensitivity analysis.

Recommendation

We consider that all requirements of the prudency test were met and recommend that the actual project cost of $49.2 million be included in the opening RAB.

Stanwell – Broadsound 275 kV Line reinforcement - CP.00753

Need Identified

The need for this line was identified on the basis of demand forecasts.

Most Efficient Option Selected

Powerlink completed the regulatory test in accordance with the National Electricity Code requirements and the highest ranked option was proposed. The initial cost estimate was $33.3 million (escalated to completion) but after completion of the consultation process and further evaluation this was increased to $39.0 million to reflect the use of double circuit towers instead of a single circuit tower design.

A double circuit tower line was built and one side was strung in 2002 with the expected stringing of the second side in 2012/13. From the analysis of the two options available construction of one circuit on double circuit towers and the later stringing of the second circuit was the most economically efficient option.

No legal clearance costs (approximately $1 million associated with obtaining the legal right to construct on the previously acquired easement) were included in the economic evaluation (see section 3.5.2 for further discussion).

Most Efficient Option Realised

No major changes to the final approved project scope were experienced during construction and final commissioning occurred in November 2002.

Recommendation

The actual project cost was 5% under budget. We consider that all requirements of the prudency test were met and recommend that the actual project cost of $37.4 million be included the opening RAB.

Darling Downs Transmission Reinforcement - CP.00762

Need Identified

There were three identified constraints to be resolved at two different locations, voltage and thermal constraints at Middle Ridge, and thermal constraints within the South East Queensland area.

Most Efficient Option Selected

Each of the constraints had differing implementation timelines and two smaller projects could have resolved the constraints independently. However we are satisfied that the selected project option was the most cost effective when all the constraints were taken into account. Powerlink undertook consultation in accordance with the ACCC's regulatory test and the best ranked solution was developed at an initial value of $73.0 million. This was revised to $81.0 million by Powerlink's Board due largely to prolongation cost caused by legal action

Most Efficient Option Realised

The project cost exceeded the originally approved cost due to delays, but was within the 15% contingency considered under the regulatory test sensitivity analysis. The budget overruns were due to protracted legal challenges and public consultations. In addition, there was a fatal construction incident that added to the delay and the original commissioning date of November 2003 was delayed until April 2005.

Recommendation

We consider that all requirements of the prudency test were met and recommend that the actual project cost of $80.90 million be included in the opening RAB.

Belmont 275 kV Line Reinforcement - CP.00771

Need Identified

It was clearly identified that additional capacity would be required by 2003/04.

Most Efficient Option Selected

In accordance with the regulatory test, Powerlink undertook public consultation to determine the most efficient option to address the emerging need. The analysis demonstrated that a double circuit transmission line was the best ranked solution with an approved cost of $66.2 million. We note that the options evaluated in the regulatory test did not include a single circuit on either single circuit or double circuit towers.

Powerlink provided evidence to indicate that single circuit had been considered but the benefits were marginal against those of a double circuit. Hence this option was rejected prior to the regulatory test being applied.

Most Efficient Option Realised

The double circuit option was implemented, but delays due to legal action increased the approved cost to $82.0 million. The same legal action would have applied to the single circuit option so the ranking of the different project options would not have changed, had this cost been foreseen.

Recommendation

We consider that all requirements of the prudency test were met and recommend that the actual project cost of $81.1 million be included in the opening RAB.

Loganlea 275 kV Substation Establishment - CP.00854

Need Identified

On the basis of the demand forecast, system limitations with the southern Brisbane supply arrangements were identified. Demand was growing steadily and it had been estimated that reliability would be compromised by late 2001 without corrective action.

Most Efficient Option Selected

Powerlink undertook consultation with Energex to identify technical solutions to address the emerging limitations. The joint planning studies demonstrated that the establishment

of a new substation at Loganlea was the best solution. Initially we were concerned that the options evaluated were limited, but after reviewing additional information provided by Powerlink we are satisfied that the selected alternative was the most prudent when the forecast demand growth was taken into account.

Most Efficient Option Realised

A scope change occurred to address objection by the local council and community because of proximity to a school. Powerlink modified the design to take into account this objection and this increased the estimated cost from the original $19.0 million to $26.0 million. The actual project cost was $23.5 million and the project was commissioned in March 2002, one year late.

Recommendation

We consider that all requirements of the prudency test were met and recommend that the full actual project cost of $23.5 million included in the opening RAB.

Gold Coast Transmission Reinforcement - CP.01002

Need Identified

The need for this project was clearly identified and it was clear that the additional capacity would be required by 2005/06 in the Gold Coast / Tweed area.

Most Efficient Option Selected

Powerlink and Energex conducted joint planning studies with their NSW counterparts, TransGrid and Country Energy to identify technical solutions. A 275 kV augmentation following initial interconnector support was the first ranked project alternative following an economic analysis. The most efficient of the identified project alternatives was selected for implementation.

Most Efficient Option Realised

Although the original budget for this project was exceeded by 38% from $50.50 million to $69.60 million, Powerlink provided evidence that the project had been re-evaluated under the regulatory test when the cost increase was first identified and, even allowing for the additional cost the original option was still the most efficient. The final cost was $68.2 million and commissioning is expected to occur in October 2006.

Recommendation

We consider that all requirements of the prudency test were met and recommend that the expected actual cost at completion of $68.20 million be included in the opening RAB.

Algester 110 kV Substation Establishment – CP.01081

Need Identified

This is one of three projects planned to meet the increasing demand in the South West Brisbane area. The other two projects (which have not been reviewed) are Summer 110 kV Substation Establishment - CP.01038 and Goodna 110 kV Substation Establishment - CP.01121

Most Efficient Option Selected

The three projects were all considered together as the identified need required the multiple project solution. The need was identified through a joint planning process with Energex. Of the project alternatives evaluated the most efficient on a long term basis were agreed and implemented at an initial estimated cost of $35.30 million. Powerlink increase the estimate to $35.60 million on completion of the regulatory test and the scope was more clearly defined.

Most Efficient Option Realised

All three projects are due to be completed in October 2006 and no variation from the original proposal has been identified. The estimated cost at completion is $39.3 million.

Recommendation

PB Associates were satisfied that all stages of the prudency test conditions were met and recommend the estimated value at completion of $39.30 million be rolled into the opening RAB. Since this project is due to commission in October 2006, no costs have been requested to be included in the forecast capex for the first year of the next regulatory period.

Belmont – Murarrie Transmission Line Reinforcement - CP.01094

Need Identified

Powerlink identified an emerging supply limitation in the transmission system supplying Brisbane CBD. From late 2005 the thermal capacity of the 110 kV circuits supplying Brisbane CBD would be exceeded during a contingency event.

Most Efficient Option Selected

Powerlink and Energex conducted joint planning studies to identify technical solutions to address the network limitation looking at both the Powerlink and Energex networks. After jointly evaluating the options in accordance with the regulatory test the construction of 275kV reinforcement was found to be the most economically efficient alternative.

Most Efficient Option Realised

The first ranked option was implemented and will be completed by October 2006. The approved project cost was $42.6 million (escalated to completion) and the actual project cost at completion is expected to be $47.7 million.

Recommendation

The identification of the need was clear and the options were well established to ensure that the most efficient alternative was implemented. We recommend that the estimated cost at completion of $47.70 million be included in the opening RAB.

CONNECTION PROJECTS

Murarrie 110 kV Establishment - CP.00755

Belmont – Murarrie Easement Acquisition - CP.01030

Belmont – Murarrie Line Acquisition - CP.01055

Need Identified

The long term requirement was to meeting the increasing demand supplied from Murrarrie substation.

Most Efficient Option Selected

We have reviewed these projects together as they are all interlinked. For the purposes of the regulatory test Powerlink initially set up only one project (CP.00755) which included the establishment of a 110 kV bus at Murarrie and the upgrading of the Powerlink's double circuit 110 kV transmission line between Belmont and Murarrie. This was found to be the most cost effective option and the business case was approved by the Powerlink board.

However it was later found that the proposal could not be implemented as the load at Murarrie could not be fed from Energex's single circuit 110 kV Belmont-Murarrie line while the Powerlink double circuit line was upgraded. Following a further economic assessment, Powerlink then decided to purchase the single circuit line from Energex and widen the easement to accommodate a double circuit 275 kV line. Following this change of scope, the project was split into three, with the line purchase and easement widening being given separate project numbers. A new project (CP.01094) was established for the construction of the new line.

Most Efficient Option Realised

It was not clear from the business case that all options were considered, but Powerlink was able to clarify the situation for us and supply information to support the decision to implement the selected option.

After reviewing this information we believe that the original scope of the three projects lead to the most efficient outcome, but the scope of project CP.01030 was extended to include the purchase by Powerlink of a block of land to establish a cable sealing end for Energex 110kV cables that was not originally scoped. The change of location of the transition towers was caused by the change in line route. The additional land did not change the efficiency ranking of the options and the most efficient option was implemented.

Recommendation

The total cost of the three projects on completion is estimated to be $24.4 million, which is 7% higher than the initially approved cost for the original project scope of $22.80 million.

CP.00755: We recommend that the actual cost of $16.1 million be included in the opening RAB.

CP.01030: We recommend that the projected actual cost of $6.0 million for procuring the easement as already scoped be included in the RAB. It is not clear whether Powerlink

followed the correct procedure in evaluating and approving the purchase of the land for the termination of the Energex cable. However we understand that this is a connection asset and that Energex has accepted the associated costs. We therefore recommend that this additional cost of $3.4 million also be included in the opening RAB.

In total for CP.01030 we recommend that $9.4 million is included in the opening RAB.

CP.01055: We recommend that the actual cost of $1.06 million be included in the opening RAB.

Mackay Transformer Reinforcement - CP.00791

Need Identified

The need for this project was identified through a joint planning process with Ergon Energy. The thermal capacity of the two remaining transformers at Mackay substation would be exceeded during a contingency event on a third transformer.

Most Efficient Option Selected

Joint planning between Powerlink and Ergon Energy considered that the least cost solution would be replacing one of the existing transformers with a larger new transformer. The approved cost was $2.5 million.

Most Efficient Option Realised

The project was delivered within budget and on time in November 2002.

Recommendation

We consider that all requirements of the prudency test were met and recommend that the actual project cost of $2.06 million be included in the opening RAB.

Bundamba 110 kV Substation Establishment - CP.01079

Need Identified

Energex requested an additional connection to supply the Bundamba areas. It was identified that the capability of the distribution system in the Bundamba area would be exceeded under system normal conditions from April 2005.

Most Efficient Option Selected

Energex and Powerlink considered that the establishment of a 110/11kV substation at Bundamba was technically feasible and this was demonstrated to be the lowest cost option to cater for long term growth through a joint planning and costing exercise. The initial approved cost was $3.96 million with a completion date of March 2004.

Most Efficient Option Realised

During implementation Energex changed the location of the substation site that necessitated additional expenditure by Powerlink on civil works and transmission line structures. Energex agreed with the extra costs associated with the change in location. The final approved cost was $5.1 million which was achieved. The project was commissioned in May 2005.

Recommendation

We consider that all requirements of the prudency test were met and recommend that the actual cost of $5.10 million be included in the opening RAB.

Queensland Rail Mindi Establishment - CP.01199

Need Identified

Queensland Rail requested that Powerlink establish a substation at Mindi by February 2007. The establishment of this substation was for rail infrastructure augmentation and a specialist traction transformer is being installed to allow for additional rail traffic.

Most Efficient Option Selected

This was a connection request by a customer – Queensland Rail. As it was a connection asset it does not require public consultation or a regulatory test to be undertaken.

Powerlink demonstrated that the investment would be cost effective and costs associated with the asset would be recovered from Queensland Rail. The initial cost estimate was $11.80 million.

Most Efficient Option Realised

This project is estimated to be completed in February 2007 and on budget of $12.00 million

Recommendation

We assume that new connection assets that supply Queensland Rail are treated the same as new assets supplying Energex, Ergon Energy. On this basis we consider that all requirements of the prudency test were met and recommend that the actual cost of $12.00 million be included in the opening RAB.

REPLACEMENT PROJECTS

Substation Protection Upgrade Stage 2 –CP.00079

Need Identified

Powerlink undertook a survey of its protection systems throughout Queensland to determine that the fault clearance times complied with the National Electricity Code. A number of systems were identified as sub standard and were marked for upgrades to ensure that they complied with the Code requirements

Most Efficient Option Selected

The options were limited as this was a replacement project. Powerlink used an established method for analysing the system compliance and replaced the old protection systems with modern equivalents.

Most Efficient Option Realised

During implementation the scope was extended and provision was made for the installation of additional equipment and replacement of additional protection systems. Work was already being undertaken on the circuits affected and the timing of the additional work avoided additional outages.

A component of the project cost ($220,000) was transferred to opex due to maintenance works that were carried out at the time as this project was undertaken. This maintenance work avoided additional planned circuit outages.

Recommendation

We consider that all requirements of the prudency test were met and recommend that the full project cost of $0.7 million be included in the opening RAB.

Gladstone South Substation Rebuild - CP.00177

Need Identified

The operating flexibility of the substation was restricted due to fault level limitations and the need for replacement of aged assets was identified to ensure that operational flexibility was restored. In addition, the protection system was identified as being inadequate via a reliability study.

Most Efficient Option Selected

Powerlink evaluated a number of project alternatives and selected an option that included up-rated equipment to ensure operational flexibility. While it could be argued that fault level upgrades should more properly be considered augmentations, Powerlink treats them as asset replacements because they do not directly increase the power transfer capacity of the system under normal conditions. This is discussed in Section 4.5.1.2.

The operating flexibility allows for post event control that can allow for the power transfers to be maintained after a fault. The estimated cost of the recommended option was $13.6 million and was due for completion in 2003.

Most Efficient Option Realised

No major changes to the project scope were experienced during the project and the project was delivered on time in October 2003.

Recommendation

We consider that all requirements of the prudency test were met and recommend the actual project cost of $13.6 million be rolled into the opening RAB.

Cairns 132 kV Substation Rebuild - CP.00836

Need Identified

The Cairns 132kV substation was originally built in the 1950's and is the main connection point for Ergon. A condition assessment recommended that eight circuit breakers and their foundations be replaced within three years.

Most Efficient Option Selected

Two options were considered – rebuilding in situ or transferring to a nearby substation. After conducting economic studies the least cost option of transferring to the nearby substation was approved for implementation.

Most Efficient Option Realised

The project is underway and due for commissioning in October 2006 at an expected cost of $12.8 million against an original estimate of $11.0 million.

Recommendation

We consider that the first two requirements of the prudency test were met and are confident that the most efficient long term option has been implemented. However at the time of this review the overspend had not been approved, but we also acknowledge that the project has yet to commission and this situation may be addressed. We therefore recommend that $12.1 million, which provides for the approved cost plus the 10% allowed contingency be included in the opening RAB.

Middle Ridge 110 kV Substation Rebuild & Secondary Systems Replacement - CP.01068

Need Identified

Both the control systems and the circuit breakers were identified as being at the end of their economic life and requiring replacement to ensure reliability of operation. In addition an increase in fault levels was imminent after the commissioning of the Middle Ridge – Millmerran circuit

Most Efficient Option Selected

The option of rebuilding in-situ was limited for Middle Ridge due to the complexity of the site. Powerlink undertook a study to assess what equipment required replacement due to inadequate condition or performance and the scope was developed to minimise the cost of the implementation strategy to those plant items that were unsatisfactory. The original scope of works was estimated to cost $7.9 million and completion was expected in May 2003.

Most Efficient Option Realised

A number of significant changes to the project scope occurred and included an increase in complexity to manage the plant condition for staging of the works and live substation works to reduce outage times. Additional costs to the protection and control systems were also incurred. Most of these costs were incurred after the project had started, and therefore were committed to be completed. Completion was in June 2006 at a cost of $12.8 million.

Recommendation

We consider that all requirements of the prudency test were met and recommend that the cost at completion of $12.78 million be included in the opening RAB.

South Pine 275 kV Substation Refurbishment - CP.01092

Need Identified

A condition assessment was made of South Pine 275kV substation and it was established that the original assets were in poor condition and were reaching the end of their operational life.

Most Efficient Option Selected

Major refurbishment or replacement was required to achieve the desired level of performance and to maintain reliability of supply. Due to the location of the substation the options were limited, and the relocation option that was evaluated would need to include the cost of the new site. After review it was decided that an in-situ replacement would occur and the approved cost was $14.3 million on completion.

Most Efficient Option Realised

The project is underway and due to be completed in August 2006. The cost at completion is expected to come in above budget and above the allowed budget threshold as the business case justified a project cost of $15.73 million ($14.3 million plus 10% contingency). The cost at completion is estimated to be $15.9 million, $170,000 over the maximum approved funding.

Recommendation

We are confident that the most efficient long term option has been implemented, but note that the cost of the project was in excess of the approved funding. The reasons for this excessive overrun are not known. Given that it was a replacement project scope creep may have been an issue but no approval for the additional capex was given. In these circumstances we recommend that only $15.73 million, which is the maximum amount of capex that Powerlink staff were authorised to spend under existing procedures without going back to the board for further funding approval, be included in the opening RAB.

Molendinar 110 kV Busbar Establishment - CP.01142

Need Identified

In joint planning with Energex, Powerlink identified the need to establish four additional 110 kV substations bays at Molendinar to increase the functionality and rating of the original assets in order to maintain a reliable supply to the Gold Coast area.

Most Efficient Option Selected

Given the condition of the existing substation, a complete refurbishment was determined to be the most appropriate solution in order to ensure long term supply reliability in the area.

A business case was prepared to justify the project and evaluate different project alternatives and the most cost effective option was implemented at an initial estimate of $17.60 million.

Most Efficient Option Realised

This project is currently due for completion in December 2006 and is expected to come under budget. No major changes have been identified to date.

Recommendation

We consider that all the requirements of the prudency test have been met and we are confident that the most efficient long term option has been implemented. We therefore recommend that the estimated cost at completion of $17.0 million be included in the opening RAB.

EASEMENT ACQUISITIONS

Stanwell – Broadsound Easement Legal Clearance - CP.00345

Need Identified

The need was to meet additional legal requirements to allow the construction of a 275 kV augmentation to the transmission network on an easement that Powerlink had previously acquired.

Most Efficient Option Selected

A business case was not prepared and no other options assessed. The construction of the additional line was scheduled to occur in 2002 – just under one year following completion of this project. We note that the estimated cost of obtaining the required legal clearance was not included in the economic assessment of the line construction project (CP.0753), potentially leading to a situation where the most economic alternative for that project was not implemented. However, based on our high level analysis, if the cost of this project had been included into the base cost of CP.00753, the construction of the 275 kV line would still have been the most economically efficient option.

Most Efficient Option Realised

The original scope of the project was $0.7 million, but after the discovery of endangered ecosystems and opposition from traditional landowners the cost escalated to $1.5 million.

Recommendation

This project was really an extension of project CP.00753 but was treated separately for administrative purposes. Hence it was not formally evaluated as a separate project, although we believe the cost should have been included in the evaluation of CP.00753.

Nevertheless, given that the 275 kV line was required, and that the existing easement was available, Powerlink had no alternative but to undertake the work under this project to allow the easement to be used. We therefore recommend that the actual project cost of $1.5 million be included in the opening RAB.

Springdale – Tarong Easement Acquisition - CP.00704

Need Identified

This project has been identified as a strategic fit for the future development of a 500 kV network to meet the future growth in South East Queensland. There is a need to ensure that the future growth in significant load areas is planned for.

Most Efficient Option Selected

While a line between Halys and Blackwall of which Springdale to Tarong is part of the route will not be required before 2013 with medium load growth, under high growth scenarios it may be required by 2010. To apply the second stage of the prudency test requires that "*Powerlink implemented the most efficient investment to meet the need".*

This test requires the project to be completed in its entirety (or for work in progress to be justified). As any line to be constructed on this easement will not be required by 2010 at the earliest, it is not possible to determine with certainty that the easement will prove to

be the most economically efficient option at an initial estimate of $8.20 million. Therefore we are unable to strictly apply the second stage of the prudency test.

Nevertheless, we have reviewed Powerlink's planning criteria and are satisfied that a network augmentation will be required in the medium term and the location of this easement is appropriate for meeting this requirement.

Most Efficient Option Realised

The easement will not be required until 2010 at the earliest.

Recommendation

We were unable to fully apply the prudency test but are satisfied that this is an appropriate strategic acquisition and that a network augmentation using this easement will be required in the medium term Therefore we recommend that the actual cost of $7.18 million be included in the opening RAB.

Millmerran – Middle Ridge Easement Acquisition - CP.01034

Need Identified

The need for the easement had been recognised in advance of implementation of the new line (CP.00762). The need was driven by the planning of the route ahead of the actual construction. The project was approved in July 2002 at an estimated cost of $4.85 million.

Most Efficient Option Selected

As this is an easement, to ensure that the most efficient option was chosen is dependent on what actually occurs. In this case the main project occurred approximately one year after this acquisition occurred. However both options considered in the evaluation of CP.00762 required this easement.

After examining this project we are satisfied that it is a strategic fit with the main project (CP.00762) as the location of this acquisition is key to the main project.

Most Efficient Option Realised

The project came in over the initial budget of $4.85 million to $8.90 million and was reassessed for efficiency. We considered it to be the most efficient option as it was common in all the options analysed in CP.00762

PB Associates Recommendation

We recommend that the actual cost of $8.28 million be included in the opening RAB.

Ebenezer Substation Site Acquisition - CP.01226

Need Identified

Joint planning between Powerlink and Energex identified the need for a future substation in the industrial area of Ebenezer.

Most Efficient Option Selected

Construction of Ebenezer substation is not anticipated in the short term and investigations revealed that developers were pursuing and purchasing land in the Ebenezer area.

Three sites were considered for the future establishment of the proposed substation and the least cost option was chosen. The cost of the project was estimated to be $3.3 million and is due to be completed in December 2006.

This purchase (like all other long term easement acquisitions) is not readily assessable under the terms of the prudency test

Most Efficient Option Realised

Powerlink approved the total cost of $4.5 million with a contingency of $1.5 million to cater for escalating property prices. The expected cost at completion is $4.5 million.

Recommendation

Easement acquisitions of this type do not strictly meet the terms of the second stage of the prudency test, but after assessing the strategic fit of this purchase we are satisfied that it is appropriate. Therefore we recommend that the value of $4.5 million be rolled into the RAB.

OTHER COMMISSIONED NETWORK PROJECTS

Runcorn 110/33 kV Spare Transformer - CP.01222

Need Identified

Energex identified that the failure of a transformer at Runcorn substation would be a significant risk during the summer peak load of 2004/05 and 2005/06.

Most Efficient Option Selected

As Powerlink already had a spare transformer available, a contingency plan was established to manage the loss of one of the two existing transformers by locating the system spare to the site – Runcorn.

The cost of $4.36 million comprising civil works for a foundation was approved in October 2004, after the alternative of purchasing a new transformer had also been considered. The relocation of the transformer reduced the risk of an extended power outage since it could have been connected to the network quickly in the event of a fault on one of the two existing transformer. However the transformer was not connected to the system or put into service as this would have meant that the transformer was no longer available as a system spare.

Most Efficient Option Realised

Powerlink demonstrated that this was the lowest cost option as the cost for the transformer foundation would have been incurred wherever it was located and by moving it to a site with load limitations mitigated a potential loss of load.

Recommendation

We consider that all requirements of the prudency test were met and recommend that the actual project cost of $0.415 million be included in the opening RAB. A minor error has been detected in the templates spreadsheet where the estimated cost of $1.14 million included works undertaken for Energex. The estimated cost at completions is $0.415 million

Mackay Area Telecommunication Reinforcement - CP.01244

Need Identified

A need was identified to increase the data carrying capability of the telecommunications systems as more demanding SCADA systems, remote asset monitoring system and protection systems were installed.

Most Efficient Option Selected

Three options were considered to establish the required high capacity telecommunication path and a retrofit of the fibre optic was shown to be the least cost alternative.

Most Efficient Option Realised

This project is due to be completed in November 2006 and is expected to be completed on time and over the original budget of $2.01 million, at $2.21 million. Powerlink

programmed a 10% contingency into this project from the start, and the total came within the 10%, so no further assessment was carried out.

Recommendation

We consider that the requirements of the prudency test have been met and recommend that the estimated cost of $2.21 million be included in the opening RAB. The templates spreadsheet has an estimate of $2.9 million, but was reduced to remove contingency amounts included in the estimate and to reflect that Ergon Energy are establishing a site on route. The current estimate at completion is $2.21 million.

BUSINESS AND INFORMATION TECHNOLOGY

Upgrade Desktop Server Configuration - CP.96211

Need Identified

The need was clearly identified as the existing IT equipment was obsolete. The original approved cost estimate was $0.53 million.

Most Efficient Option Selected

Suppliers bidding for the work advised Powerlink that the original tender scope would not meet the objectives of the project. Powerlink then revised the tender scope and this increased the cost of the project to $2.5 million.

Most Efficient Option Realised

The cost eventually increased to $3.3 million after the scope again proved inadequate. Taking into account the timing of the project, the tendered value of $2.5 million was efficient, but the additional cost was incurred near completion stage when most of the project costs were already sunk. We think the final change of scope should have been identified and included in the original tender.

Recommendation

We have reviewed this project and consider that the scope of the project as finally implemented was reasonable, given the requirements of the business. In hindsight we think this project could have been better managed. We nevertheless recommend that the actual cost of $3.3 million be included in the opening RAB.

Desktop Replacement 02/03 - CP.96300

Need Identified

This project provides for an annual spend of $1.50 million on replacing office computers over a three year cycle, the 2002/03 out turn was $1.75 million as additional expenditure was approved and made on additional software, upgrades and new information technology equipment.

Most Efficient Option Selected

The project was not tendered solely by Powerlink, but by the Australian Pacific Utilities Group (APUG) so that the tender price was based on the bulk purchasing power of all the participants. Five companies responded, and Powerlink decided on the second lowest tender. Selecting the lowest tender would have increased costs to Powerlink since it would have incurred changeover costs associated with contracting with a new entity. Powerlink is part of the APUG, and expects to obtain lower prices by purchasing its requirements through a larger tender than on its own. We agree and consider that Powerlink acted prudently to minimise its costs.

Most Efficient Option Realised

The contract was agreed to and the project was implemented just above budget at $1.75 million in June 2003.

Recommendation

We consider that all requirements of the prudency test were met and recommend that the annual cost of $1.75 million be included in the opening RAB.

Electronic Document and Records Management System - CP.96502

Need Identified

Powerlink has implemented the above project to ensure that it complies with legislation regarding document management.

Most Efficient Option Selected

The business case provides evidence that various options for record management were considered and the selected alternative was an efficient investment. The original cost was estimated to be $4.50 million.

Most Efficient Option Realised

The project is likely to come in slightly over budget, but less than the 10% contingency, and on time but does not conclude until August 2006.

Recommendation

We consider that all requirements of the prudency test were met and recommend that the estimated cost at completion of $4.62 million be included in the opening RAB.

SECURITY AND COMPLIANCE

Collinsville – Strathmore – Clare Fibre Optic - CP.00203

Need Identified

Powerlink identified that the existing communication and protection signalling systems between Collinsville and Clare were of insufficient capacity. They were power line carrier and microwave links.

Most Efficient Option Selected

This project was part of a larger project to remove obsolete communications throughout the Powerlink network. We consider that the project was prudent and economically efficient given that obsolete systems existed and were starting to impact on reliability. The project cost was estimated to be $3.2 million in 2000/01.

Powerlink has identified a need to move the protection signalling across to fibre optic to improve reliability. Additionally the use of remote signalling and data transfer is increasing, to the extent that the capacity of the existing system is starting to be exceeded.

Most Efficient Option Realised

The project was delivered under budget and on time at $2.5 million in June 2002.

Recommendation

We consider that all requirements of the prudency test were met and recommend that the actual cost of $2.5 million be included in the opening RAB.

Relocation of NOC Infrastructure - CP.01298

Need Identified

After a review of the security of the infrastructure, a need to address weaknesses was identified.

Most Efficient Option Selected

Powerlink commissioned a security audit of its NOC infrastructure and the audit recommended that certain works be undertaken as soon as possible. The recommended option was estimated to cost $1.6 million at completion.

Most Efficient Option Realised

This project is expected to come slightly over the estimated budget, but below the 10% contingency.

Recommendation

We consider that the requirements of the prudency test have been met and recommend that the estimated cost to completion of $1.65 million be included in the opening RAB.

SUPPORT THE BUSINESS

Transmission Line Emergency Restoration - CP.01085

Need Identified

A need for an emergency restoration strategy was identified given the amount of high voltage plant that was installed throughout Queensland.

Most Efficient Option Selected

Emergency restoration equipment has been purchased by several TNSPs and they have agreed to share the equipment when needed.

Most Efficient Option Realised

The options were to either purchase direct from the suppliers as a single business or as a group, therefore Powerlink using the larger buying power of the group highlighted that they have been efficient in their choice. Powerlink estimated that their share would be $1.13 million in August 2003. with a commissioning date of December 2005. The project was realised at $1.4 million as additional equipment was purchased to improve utilisation.

Recommendation

We consider that all requirements of the prudency test were met and recommend that the actual project cost of $1.4 million be included in the opening RAB.

Buildings - CP.98200

Need Identified

This is a rolling annual project number controlled by an ongoing internal process.

Most Efficient Option Selected

The capital budget for building works is prepared on an annual basis and is approved by the Chief Financial Officer. The expenditure is managed in accordance with Powerlink's standard capital works process. The majority of building works are relatively minor in nature and are signed off by the Chief Financial Officer in accordance with financial delegations. However, where building works involve significant expenditure a business case is presented for approval in accordance with financial delegation levels.

Most Efficient Option Realised

Specific sub-project numbers are created for each individual building-related job. Costs are accumulated for each individual building sub-project and capitalised individually to a unique asset item in the fixed asset register. The sub-project number is closed following capitalisation, but the standard project number (CP.98200) remains open. As such, the standard project number for commercial buildings will continue on an ongoing basis and will accumulate all building related capex costs.

Table B.1: Annual Building Capitalisations ($m, nominal)

Financial Year	Capitalisations
2001/02	0
2002/03	2.93
2003/04	4.62
2004/05	0.58
2005/06	2.21[1]
2006/07	1.70[1]
TOTAL	**12.04**

Note 1: Estimated by Powerlink

Recommendation

If the standard capital works process is followed then appropriate purchases should be made. We have not reviewed individual sub-projects, but have reviewed the capital works process and as Powerlink have an established process in place to control the expenditure We recommend that the yearly values shown in Table B.1 be rolled into the RAB. In addition, the provisions seem reasonable and do not comprise a material component of the overall capex forecast.

Virginia Office Complex - CP.98201

Need Identified

The need for additional accommodation was clearly justified as some staff are housed in temporary accommodation.

Most Efficient Option Selected

The project alternatives evaluated included extensions to Powerlink's own buildings at its Virginia complex or expanding into rented accommodation at an initial estimate of $12.0 million. The cost evaluation ranking rated rented accommodation as being more expensive than building new premises at an NPV of $8.8 million for building additional space against an NPV of $11.3 million for expanding into an equivalent floor space in rented accommodation.

Most Efficient Option Realised

Once the tenders for the work were received, the cost of the new premises increased by 75% above the estimate to $21.0 million. Powerlink considered that this increase is justified by more stringent security requirements and that this was common to both rented and new build project alternatives.

Powerlink further stated that there were intangible benefits for being on one site but provided no evidence of quantifying the benefits of single site occupancy such as savings in IT, site to site transfers or meetings.

Recommendation

We were unable to verify that the most prudent project alternative was implemented and therefore recommend that the equivalent cost of renting the additional accommodation, which we estimate to be no more than $15 million, be included in the opening RAB. This

is based on the estimated cost of the original project alternative, to which we have added an additional 25% for estimating errors and to cover additional costs.

Tools and Equipment - CP.99204

Need Identified

The tools and equipment budget is a rolling annual figure and follows a standardised purchasing procedure.

Most Efficient Option Selected

Specific sub-projects are created for each individual purchase, using a similar process to that applied to fleet purchases and building works. The costs are accumulated for each individual unit of equipment and capitalised to a unique fixed asset number.

As such, the standard project number for tools and equipment will continue on an ongoing basis and will accumulate the cost all tools and equipment since the account was established.

Most Efficient Option Realised

The budget for tools and equipment is prepared on an annual basis and is approved for each business unit manager. The purchase is managed in accordance with standard procurement practices and final delegation authorities.

Table B.2: Annual Tools and Equipment Capitalisations ($m, nominal)

Financial Year	Capitalisations
2001/02	0.32
2002/03	0.15
2003/04	0.36
2004/05	0.45
2005/06	1.81
2006/07	1.66
Total	**4.75**

Source: Powerlink

Recommendation

If the standard procurement process is followed then appropriate purchases should be made. We are not able to verify that a prudent decision has been made on all of the projects as business cases have not been developed for the expenditure as it is below the threshold to trigger the need to create a formal business case.

PB Associates recommends that the yearly values shown in Table B.2 are rolled into the RAB as they do not appear excessive. We appreciate that the business requires tools and equipment to operate efficiently and that as long as the purchases follow the process as it is defined then the most economical purchases should be made.

AUGMENTATION AND CONNECTION

Alan Sherriff 132/11 kV Substation Establishment & Garbutt Substation - CP.00510

Need Identified

The need was identified through the joint planning process with Ergon Energy. It was agreed that an additional bulk supply point would be needed within five years to meet forecast load increases.

Most Efficient Option Selected

The project included the installation of both augmentation and connection assets. Initially project CP.00510 consisted of the establishment of Alan Sherriff 132/11 kV substation at $5.6 million. This project scope was eventually expanded to include the Garbutt substation and established under different sub-projects (CP.00510A ($5.5 million) and CP.00510/B ($6.1 million)). Using the joint planning process, various overall project alternatives were investigated and the most efficient went forward for accurate costing and evaluation.

A business case was created for each sub-project, and each was justified on its own merits.

Most Efficient Option Realised

The sub-projects were implemented in stages as proposed in their business cases. Both sub-projects came in within their estimated cost (including the contingency).

Recommendation

We consider that all requirements of the regulatory test were met and recommend that the actual project cost of $11.4 million be included in the opening RAB.

Edmonton 132 kV Establishment - CP.00525

Need Identified

The need was identified for an augmentation prior to 2004 due to demand growth in the Edmonton area.

Most Efficient Option Selected

Powerlink established this project following joint planning studies with Ergon Energy in accordance with the code obligations and various options were tested. As a small network asset public consultation was conducted through Powerlink's 2003 APR.

Most Efficient Option Realised

An initial budget of $0.7 million was approved in 2001 for initial works at the future site with a budget increase of $8.5 million to complete the project approved by the board after satisfactory completion of the regulatory test to give a total approved initial cost of $9.2 million. The project was implemented and completed in January 2005 at a cost of $9.68 million.

Recommendation

We consider that all requirements of the regulatory test were met and recommend that the actual project cost of $9.68 million be included in the opening RAB.

APPENDIX C
Detailed Work In Progress Project Review

Please note that all costs in this Appendix **exclude** FDC.

AUGMENTATION PROJECTS

Ross – Townsville South Transmission Reinforcement - CP.01035

Need Identified

Powerlink and Ergon Energy identified an emerging supply limitation in the transmission and distribution systems supplying Townsville area from late 2007 due to thermal capacity constraints.

Most Efficient Option Selected

Following a joint planning process and public consultation through the application of the regulatory test in accordance with the NER requirements, the most economically efficient option to address the limitations was selected for implementation. The original estimate was $17.3 million after escalation to completion.

Most Efficient Option Realised

The best ranked option is being built at the moment and is due for completion in October 2007. The estimated cost at completion is $16.5 million.

Recommendation

We consider that all requirements of the prudency test were met and recommend the estimated cost at completion be allowed. $11.23 million should be included in the WIP component of the opening RAB and $5.14 million[6] included in the forecast capex for the first year of the next regulatory period.

NQ Transmission Reinforcement: Stage 2 - CP.01101

NQ Transmission Reinforcement: Stage 1 - CP.01186

Strathmore 275 kV SVC - CP.01294

Need Identified

The three projects are staged to address the need to meet the required level of reliability in North Queensland over the coming five years. The fundamental requirement was to maintain power transfer capability between the regions of North and Far North Queensland.

Most Efficient Option Selected

Through public consultation in accordance with the regulatory test Powerlink determined the most efficient option to address the identified need. The analysis indicated that a combination of staged transmission augmentation and network support from local generators was the best ranked alternative. As these projects are staged, but part of the

[6] This forecast figure used is taken from the Project Packs is different than the original cost provided in Powerlink's proposal spreadsheet as the Project Pack data is more recent estimate

one scheme, the economic evaluation of the various alternatives was completed on the scheme as a whole

Most Efficient Option Realised

CP.01186 and CP.01294 are already under construction and are due to be commissioned in October 2007. They are both expected to come in on budget of $91.20 million and $38.00 million for stage 1 and the SVC respectively, and completed on time.

Recommendation

We consider that all requirements of the prudency test were met and recommend that the estimated capex at the end of the current regulatory period of $64.12 million (stage 1), and $21.02 million (SVC) be included in the WIP component of the opening RAB. We also recommend that the following costs be included in the forecast capex for the next regulatory period: - stage 1, $26.31 million[7]; and the SVC, $16.50 million .

However stage 2 – CP.01101 at an initial estimate of $103.70 million has not been approved and the separate business case for this element of the work has not been completed. Therefore we do not recommend that any component of the estimated cost of this stage 2 be included in the WIP component of the opening RAB,

Mackay Transmission Reinforcement - CP.01124

Need Identified

The need to increase the supply capacity into Mackay in the near future was identified by Powerlink as the forecast demand would cause the capacity to be exceeded under contingency conditions and risk to customer supplies would occur.

Most Efficient Option Selected

The options included consideration of different voltages and the selected option was based on an analysis of the NPV of the different project alternatives thus meeting the requirements of stage two of the prudency test. The project is due for completion in October 2007.

Most Efficient Option Realised

This project is due to be commissioned in October 2007 and has an approved cost of $46.7 million and Powerlink latest estimate is that it will be realised at $47 million

Recommendation

We consider that all requirements of the prudency test were met and recommend that the estimated project cost at the end of this regulatory period ($32.93 million) be included in the WIP component of the opening RAB and furthermore that $13.65 million[8] be included in the forecast capex for the first year of the next regulatory period.

7 This forecast figure used is taken from the Project Packs is different than the original cost provided in Powerlink's proposal spreadsheet as the Project Pack data is more recent estimate

8 This forecast figure used is taken from the Project Packs is different than the original cost provided in Powerlink's proposal spreadsheet as the Project Pack data is more recent estimate

SEQ Augmentation - CP.01138

Need Identified

The need for this augmentation is voltage driven and the voltage stability limit would be reached given the required power transfer under contingency conditions in 2007.

The proposed option will resolve the first constraint (voltage) and will also resolve a thermal limit that will constrain soon after.

Most Efficient Option Selected

Through planning and public consultation in accordance with the NER and conducting the regulatory test Powerlink determined the most economically efficient project alternative to address the emerging limitations. The cost was estimated to be $99.9 million at completion.

Most Efficient Option Realised

This project is due to be completed in October 2007 and the project is expected to come in on budget and on time.

Recommendation

We consider that all the requirements of the prudency test were met and are confident that the most efficient long term option has been implemented. We therefore recommend that the cost of $50.26 million be included in the WIP component of the opening RAB. We also recommend that the remaining balance of $48.30 million be included in the forecast capex for the first year of the next regulatory period.

Townsville East Substation Establishment - CP.01144

Need Identified

The need was established through a joint planning process with Ergon Energy to address thermal capacity restrictions that will occur from 2007.

Most Efficient Option Selected

Powerlink and Ergon Energy undertook joint planning and public consultation in accordance with the NER and the regulatory test requirements to identify the most efficient option is identified to address the supply limitation.

However an interaction with another future limitation was identified and the two companies took this into consideration. The option selected was demonstrated to be most prudent project alternative to resolve both limitations. The project has an approved cost of $24.3 million.

Most Efficient Option Realised

The project is being delivered to cost and is due for completion in October 2007.

Recommendation

We consider that all requirements of the prudency test have been met and are confident that the most efficient long term option will be implemented. We therefore recommend that the estimated cost of $17.53 million of opening capex be included in the WIP component of the opening RAB. We also recommend that the remaining balance of $6.5 million[9] be included in the forecast capex for the first year of the next regulatory period.

Lilyvale – Blackwater 132 kV Transmission Line - CP.01204

Need Identified

Powerlink has identified a voltage constraint by 2007 at Blackwater during outages of the existing 132 kV transmission line. The thermal capacity of an adjacent transmission line would also be breached by late 2008.

Most Efficient Option Selected

In accordance with the regulatory test, Powerlink identified that the most efficient option was the construction of a new 132 kV transmission line at a cost of $30.30 million.

Most Efficient Option Realised

The project is not expected to be completed until October 2007 but was approved by the board in February 2006. Currently no budget overrun is expected and the work should be commissioned on time at a current estimate of $26.50 million.

Recommendation

We consider that the requirements of the prudency test have been met and recommend that the estimated expenditure to the end of the current regulatory period of $16.13 million be included in the WIP component of the opening RAB. We also recommend that $10.12 million be included in the forecast capex in the first year of the next regulatory period.

Abermain 275 kV Substation Establishment & Augmentation - CP.01266

Need Identified

Powerlink has identified through demand growth forecasts that by 2007 there will be limitations in capacity in the Ipswich area.

Most Efficient Option Selected

Powerlink undertook the required consultations and ran the regulatory test to ensure that the most economically efficient project was put forward. From the options included in the business case the most efficient option was to establish a new 275 kV substation at Abermain at an initial estimate of $22.60 million

[9] This forecast figure used is taken from the Project Packs is different than the original cost provided in Powerlink's proposal spreadsheet as the Project Pack data is more recent estimate

Most Efficient Option Realised

The most economically efficient alternative will be implemented and the project is due to be commissioned in 2008 at an estimated cost of $21.0 million.

Recommendation

We consider that all requirements of the prudency test have been met and we are confident that the most efficient long term option will be implemented. We therefore recommend that the estimated cost to the end of this regulatory period of $8.4 million be included in the WIP component of the opening RAB. We also recommend that the remaining balance of $12.23 million be included in the forecast capex over the first two years of the next regulatory period.

REPLACEMENT PROJECTS

SVC 132 kV Secondary Systems Refurbishment & Replacement - CP.00752

Need Identified

The replacement was initially triggered by failed secondary systems but, after a fire destroyed one SVC, modifications to similar equipment became necessary to ensure their continued operation.

Most Efficient Option Selected

The project is due for completion in June 2008. This equipment is specialised and used to support rail services so the range of project alternatives was limited. This project is the replacement of assets that were rolled into the RAB as regulated assets at the last reset. Powerlink is obliged to maintain the quality of supply for Queensland Rail, therefore the replacement is required.

Most efficient Option Realised

The most efficient project is due to be commissioned in June 2008 with a single element of this project being capitalised in this regulatory period of $12.4 million.

For clarity the remaining component of $10.26 million has been included in the forecast capex programme for completion of this project in the next regulatory period and will be treated as forecast capex.

The total project is currently forecast to come under the estimate of $28.90 million at a total of $24 million, but it is noted that the project does not complete until June 2008.

Recommendation

We consider that all requirements of the prudency test have been met and that the most efficient option is being implemented. We recommended that in this regulatory period the estimated project expenditure in this regulatory period of $1.34 million be rolled into the WIP component of the opening RAB and that the remaining $11.05 million of the total estimated cost at completion be included in the forecast capex for the first year of the next regulatory period. It is noted that there is an additional $10.26 million listed in the forecast capex for this project is not assessed here. The remaining total of $10.26 million is included as an element of forecast capex.

Townsville South Secondary Systems Upgrade - CP.01022

Need Identified

The replacement was triggered by the condition and age of the existing equipment and the fact that it was no longer supported by the manufacturer.

Most Efficient Option Selected

A range of project alternatives were considered and the option being implemented was assessed as the most efficient.

Most Efficient Option Realised

The project is under construction now and is expected to be delivered on time and to budget at a cost of $10.5 million.

Recommendation

We consider that all the requirements of the prudency test were met. The project is due to be completed in October 2007. We recommend that the estimated spend in this regulatory period of $8 million is rolled into the RAB and the remaining balance of $2.41 million is included in the forecast capex.

Bohle River – Townsville GT 132 kV Line - CP.01087

Need Identified

The need was clearly identified as the condition of the circuit was poor and it had reached the end of its technical life.

Most Efficient Option Selected

The option implemented was more expensive than the least cost alternative due to Powerlink's decision to follow the policy of the Electricity Supply Association of Australia (ESAA) of prudently avoiding the location of transmission lines near housing even if, to achieve prudent avoidance, "…reasonable costs [are] incurred". The current prudency test does not specifically provide for policy advice from an industry body to be included as justification.

We were unable to establish what constituted that good industry practice as practices across industry varied. Currently Powerlink has a policy of locating transmission lines at a minimum set distance from houses, but the basis on which these distances were set was not clear.

Most Efficient Option Realised

This project is due to be commissioned in October 2007 slightly over budget at $18.10 million from an original estimate of $18.00 million.

Recommendation

We recommend that the cost of $2.4 million, being the difference between the estimated actual cost at completion and the estimated cost of the most economically efficient option not be included in the opening RAB unless Powerlink provides a more robust justification for not choosing the more economically efficient option. Therefore we recommend that a total of $13.75 million be allowed into the WIP component of the opening RAB and $1.88 million in the forecast capex for the first year of the next regulatory period.

Tarong Substation Refurbishment - CP.01286

Need Identified

The need to increase the circuit breaker fault level ratings was identified when commissioning of a new generator and upgrading of other substations in the vicinity of the Tarong substation occurred.

Most Efficient Option Selected

Although the new generator was the main cause of the increased fault levels, Tarong is a main transmission node and work on neighbouring substations is also contributing to the fault level problem as are new circuits being constructed in the area. Therefore it is not possible to clearly identify the generator as the only trigger for the work.

Powerlink assessed various options including alternative operating arrangements but these would provide only a short term solution. A long term solution is required and in-situ replacement was considered the only viable alternative.

Most Efficient Option Realised

This project is due for completion in 2007 over the original budget of $20.80 million at $23.80 million.

Recommendation

We consider that the requirements of the prudency test were met and recommend that the estimated cost to the end of this current regulatory period of $20.87 million be included in the WIP component of the opening RAB. We further recommend that $2.84 million[10] be included in the forecast capex for the first year of the next regulatory period.

[10] This forecast figure used is taken from the Project Packs is different than the original cost provided in Powerlink's proposal spreadsheet as the Project Pack data is more recent estimate

APPENDIX D
Non-Approved Projects

Please note that all costs in this Appendix **exclude** FDC.

AUGMENTATION PROJECTS

Ross – Yabulu Transmission Reinforcement - CP.01137/B

Need Identified

The requirement for this project has been identified as the capacity of the existing 132 kV system at summer peak will be exceeded by 2008. The demand profile supports this need.

Most Efficient Option Selected

This project is yet to undergo public consultation. We requested a copy of the Application Notice but this is still being prepared.

Recommendation

As the required evidence that a prudent decision has been made is not available we are unable to verify that the most efficient choice has been made. A majority of the cost will be incurred in the next regulatory period. We have insufficient information to make a firm recommendation on the treatment of this project.

Since no approval to commence the project has been given, we recommend that no provision for this project be made in the WIP component of the RAB but instead the total estimated project cost be treated as forecast capex.

Wide Bay Transmission Reinforcement - CP.01198

Need Identified

The need was established through the joint planning process with Ergon Energy, which identified that the thermal capacity of the existing system will be exceeded during a single credible network contingency.

Most Efficient Option Selected

The proposed solution was established through a regulatory test and the business case has been created. The analysis in the business case demonstrated that the most efficient and best ranked option is proposed for implementation.

This project was to have been approved by the board in May 2006 but we understand that this did not occur. The project is programmed for commissioning in October 2007.

Recommendation

We note that, while the project has not been approved by the board, the planned commissioning date is still October 2007. On the basis of information provided by Powerlink on equivalent projects, the commencement and completion of this project within the proposed timescales seems unlikely. For example, the establishment of Alan Sherriff (CP.00510) took over two years from board approval and the establishment of Queensland Rail Mindi substation (CP.01199) took 1½ years from approval.

Since no approval to commence the project had been given at the time of this review, we recommend that no provision for this project be made in the WIP component of the RAB and that the total estimated project cost be treated as forecast capex.

Bowen Transmission Reinforcement - CP.01265

Need Identified

Powerlink and Ergon Energy have identified the project need from 2008 due to supply constraints.

Most Efficient Option Selected

Powerlink commenced public consultation in accordance with the regulatory test in April 2006. Powerlink expected to release the Application Notice in July 2006, but this has not occurred.

The most efficient option has not been identified yet therefore the prudency test cannot be applied. Powerlink estimated that the capex spend this regulatory period would be $5.77 million.

Recommendation

Since no approval to commence the project has been given, we recommend that no provision for this project be made in the WIP component of the RAB and that the total estimated project cost be treated as forecast capex.

CONNECTION PROJECTS

Bundamba 110/11 kV Transformer - CP.01531

Need Identified

Energex has indicated that an additional transformer may be required in the Braemer area from 2009.

Most Efficient Option Selected

Joint planning between Powerlink and Energex was undertaken and the least cost solution has been identified. Currently the business case has not been created so it is not possible to establish what the other options that were considered. This project as not been approved by the board of Powerlink.

Recommendation

Since no approval to commence the project has been given, we recommend that no provision for this project be made in the WIP component of the RAB and that the total estimated project cost be treated as forecast capex. Given that the need is not until 2009 it is not clear why any capex is needed before the end of the current regulatory period.

REPLACEMENT PROJECTS

South Pine 110 kV Substation Refurbishment - CP.01134

Need Identified

The need for this project is based on a condition assessment of the primary and secondary equipment and also the limited fault level rating of the equipment.

Most Efficient Option Selected

The selected option was to rebuild the substation on an adjacent plot of land and transfer the services to the new site and a detailed project scope is still being finalised. The estimated cost to Powerlink is estimated at $33.98 million.

Recommendation

Since no approval to commence the project has been given, we recommend that no provision for this project be made in the WIP component of the RAB and that the total estimated project cost be treated as forecast capex.

Belmont 110 kV Substation Refurbishment - CP.01177

Need Identified

Powerlink has identified the plant condition at this substation to be poor and the equipment is approaching the end of its operational life.

Most Efficient Option Selected

Current there is no business case to support Powerlink's view that the most efficient option is a full refurbishment. Powerlink estimates that the replacement expenditure to be $29.7 million on completion ($28.93m 2005/06). The project is planned to be completed in 2008.

This project has not been approved by the board of Powerlink.

Recommendation

Since no approval to commence the project has been given, we recommend that no provision for this project be made in the WIP component of the RAB and that the total estimated project cost be treated as forecast capex.

OTHER NETWORK PROJECTS

Ross – Chalumbin Optical Fibre Ground Wire Retrofit - CP.01313

Need Identified

Powerlink has introduced a strategy of upgrading the network telecommunications capacity into Far North Queensland as the current data transfer is limited and will not allow the technical capacity required for remote monitoring of equipment and is limited on the remote controlled switching and protection systems now in place.

Most Efficient Option Selected

This work is planned to take place prior to the rebuild of the coastal transmission line which will result in prolonged outages.

At the time of this review, the business case had not been completed and the board had not approved this project. Therefore we are not able to confirm that a prudent choice has been made. The project estimate is $7.8 million.

Recommendation

Since no approval to commence the project had been given at the time of the review, we recommend that no provision for this project be made in the WIP component of the RAB and that the total estimated project cost be treated as forecast capex.

APPENDIX E
Application of Appendix E of the Statement of Regulatory Principles

Question 6 (second visit list)

Advice on dynamically linking forecast capex to forecast demand as per Appendix E of SRP Decision Background Paper given the high sensitivity of capex to demand.

Answer

During the process of developing the capital forecast for the revenue proposal Powerlink considered inclusion of an automatic revenue adjustment mechanism for variations in the forecast demand. Powerlink considered such an adjustment mechanism should have the following characteristics:

1) Be linked to investment drivers – in this case changes in forecast demand. It is important to realise that development of new transmission network elements typically have a 2 year construction cycle. The investment in new assets is therefore approved on forecast demands taking into account future network growth.

2) Provide for revenue adjustments within the regulatory period – this is particularly important for increases in demand which drive increased requirements for additional investment.

Appendix E of the Discussion Paper published with the ACCC's Decision on the Statement of Regulatory Principles (Dec 2004) included a mechanism for adjustment of the capital expenditure allowance on changes in demand. As noted in that appendix, Powerlink suggested such a mechanism may be appropriate for the particular circumstances of Queensland with high demand growth and recent experience of substantial changes (increases) in demand forecasts during the current regulatory period. At the time of the SRP consultation Powerlink undertook some analysis of possible adjustment mechanisms based on capex allowances for capitalisations rather than actual capex. The change from capitalisations to capex (which has been imposed by the AER) may change the possibilities for adjustments to capital allowances and dilute the relationship between capex and demand.

However, there are two important differences between the appropriate characteristics for an adjustment mechanism outlined above and the suggested form of adjustment mechanism outlined in Appendix E of the Discussion Paper.

Although the cost driver is demand, changes in the requirement to invest in additional demand driven network assets is determined by changes in the forecast demand, i.e. differences between the forecast demand on which the revenue determination was made and the forecast demand which occurs during the regulatory period. All network businesses update their demand forecasts annually. Demand driven investments to be commissioned in the following 2 – 3 years are adjusted (additional investments) and committed to. These commitments to invest are based on forecast demand levels and are independent of actual demand when the intervening time has elapsed.

Variation in demand forecasts occur each year, which means that within a 5 year regulatory period there will be five different demand forecasts on which demand driven investments will be determined. It is not appropriate to consider only the difference between the initial forecast (on which the revenue determination was made) and final demand, or even the final demand forecast. There may have been differences during the five year regulatory period which need to be taken into account in determining the appropriate adjustment to the capital allowance or revenue cap. The proposal in Appendix E of the Discussion Paper does not recognise this within-period variation in investment drivers. Therefore it does not meet the first characteristic.

Powerlink also considers that variations to the revenue allowance should be made within the regulatory period. The proposal in Appendix E of the Discussion Paper contemplates an adjustment at the end of the regulatory period to take account of differences between actual and forecast cost driver levels. Such an adjustment at the end of the regulatory period does not meet the second characteristic.

In addition, the SRP is not binding on the AER and the AER has indicated it will depart from the SRP where required or justified by the Code/Rules provisions. Appendix E of the Discussion Paper does not form part of the SRP and its status and application is therefore less certain than the SRP.

In considering capital allowances in conjunction with the scenarios and probabilistic capital expenditure forecasts, PB Associates should give consideration to whether the probability weighted average of the scenarios is the appropriate allowance or whether the allowance should actually be set on a different basis, eg. one standard deviation higher than the average. Powerlink understands that consideration of whether Powerlink's proposal underestimates its requirements forms part of the terms of reference for PB's review.

APPENDIX F
Identification of Project Options

Questions

What process is undertaken to identify the range of network and non-network alternatives for each project?
discussion regarding Powerlink's internal process for identifying project alternatives for constraints.
advice on apparent approach adopted by Powerlink for the construction of high capacity (1250MVA) double circuit transmission lines for all new projects.

Answer

The Queensland transmission system is characterised by:

- heavily loaded network compared to its capabilities
- high growth in demand
- providing electricity supply to a decentralised state over long distances

This results in Queensland having a much greater requirement than any other State in the NEM for the construction of new transmission lines over substantial distances.

The development of the transmission grid involves three major steps, namely:

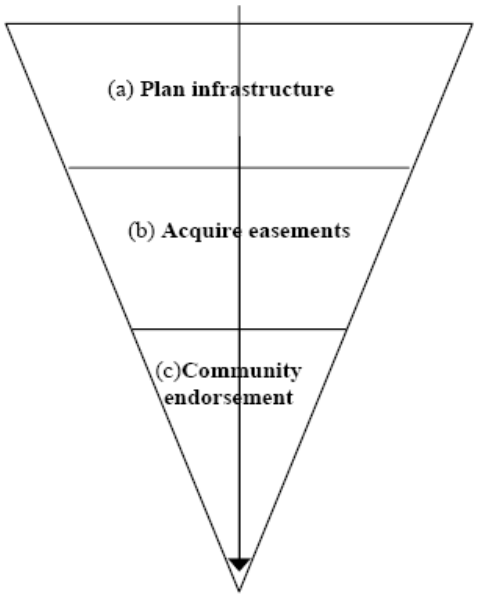
(a) plan the infrastructure needed (eg. lines, substations, cables)

(b) obtain rights to the land for the identified infrastructure ie. acquire easements or land

(c) community endorsement and acceptance of the necessary infrastructure

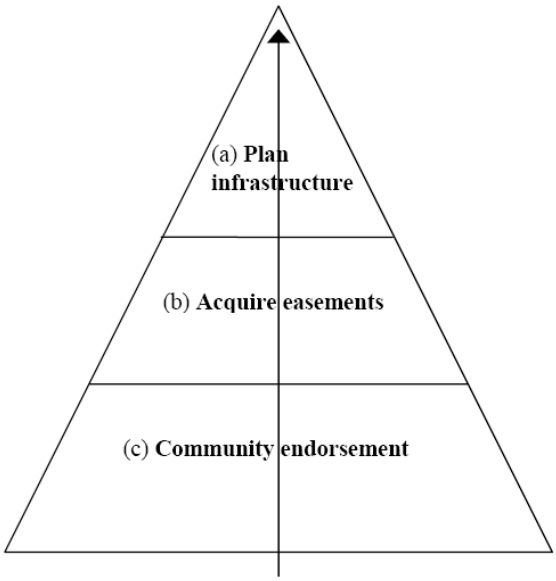
The existing transmission networks have been established, in a community and legal environment that generally accepted and even facilitated the construction of infrastructure including overhead transmission lines and the acquisition of easements for that purpose. Planning of the infrastructure (step (a)) could consider a wide range of options including alternative routes and forms of line construction, that were evaluated without regard for steps (b) and (c) which, in that environment, could be considered after step (a).

The planning sequence at that time was:



The last 10 years has seen a complete turnaround of this planning process, driven by changed community expectations, the prominence of community action groups, new environmental and planning legislation, and political responsiveness to local community and environment matters. Modern society have strong and valid concerns with overhead transmission lines including visual amenity, health issues (including EMF), and devaluation of property.

In most developed countries, community attitudes have changed to the stage that construction of any type of new overhead transmission line on any route is unlikely to receive community endorsement, step (c). In addition, the acquisition of the necessary easement, step (b), will be virtually impractical from a legal viewpoint – or will be too lengthy and too costly to make an overhead option possible. In many of these places, even the construction of new underground cable on an existing transmission line easement is very difficult to accomplish. Where there is still a need for new electricity transmission infrastructure (eg. in Queensland) the planning process must take account of these attitudes. The order of activities to identify and scope options is therefore reversed as follows:



Community endorsement must be earned well in advance by building goodwill with local communities, environmental groups, key stakeholders and planning bodies required to provide approvals (generally local and state Government). New easements take many years to acquire and should be set aside many years in advance so that changing land uses and developments in the vicinity of these easements are approved and implemented in a manner compatible with close proximity to electricity transmission infrastructure.

When the time comes to undertake the planning and design of the infrastructure the options to be considered must be consistent with the outcomes of steps (c) and (b). The reverse order necessarily means that a much more limited range of options can be considered in step (a). A major consideration in determining feasible options is the importance of maximising the utilisation of any easements, either existing easements or those which are intended to be acquired.

In order to construct a transmission line Powerlink must comply with all legislative obligations. A key aspect of this is designation as community infrastructure. Under the *Integrated Planning Act 1997* (IPA) Powerlink, as a Government Owned Corporation, can only develop assets either by complying with local government planning schemes or by having its developments designated for community infrastructure by a Queensland Minister (designation). Designation provides exemption from the local government planning schemes. For Powerlink the designating Minister is normally the Minister for Energy. Designation is a process involving "whole of government" consultation so although the Minister for Energy may make a designation, any decision will be on the basis of the range of government policy considerations.

The site selection and acquisition processes are integrated with the designation process up to the point where notices are issued formally initiating both acquisition and designation. From that point the two processes usually run in parallel until sites are acquired and designated, thus permitting construction to commence.

Powerlink seeks designation in order to avoid complex and non-time constrained approval arrangements associated with a development application (DA) under local government planning schemes. The DA process is not pragmatic for linear infrastructure such as power line developments because of the myriad notifications under IPA, including notification of owners of both the directly affected and the adjoining properties along the entire route, which could number many hundreds. Failure to properly notify even one could invalidate or delay the approval process. Further complications would frequently arise when new lines traverse multiple local government areas. The DA process is considered too risky to meet the timeframes required and designation is therefore the preferred pathway.

Designation can be obtained in a number of ways under IPA. The Queensland Department of Local Government & Planning (DLGP) has approved a specific process to be followed for designation of Powerlink developments, described as the Powerlink Manual, which is publicly available on the DLGP website at (http://www.ipa.qld.gov.au/docs/Forms/CommunityInfrastructure/Powerlink/PowerLinkManual.pdf).

In making a designation, IPA requires the Minister to seek ecological sustainability through balancing ecological processes and natural systems, economic development, and the cultural, economic, physical and social wellbeing of people and communities. The Minister, before designating, must be satisfied that adequate environmental assessment has been carried out; that in doing so there was adequate public consultation; and that adequate account has been taken of issues raised during that consultation. The Powerlink Manual therefore requires comprehensive consultation with a broad range of bodies. Notably that consultation includes all relevant government agencies. This means Powerlink must convince the designating Minister that the requirements of those government agencies have been properly addressed.

Because designation is required and it requires consideration of a broad range of matters associated with ecological sustainability, this broader range of matters needs to be taken into account in identifying and assessing feasible network options for augmentation of the transmission network, particularly options involving transmission line construction. This might include:

- Maximising use of easements to minimise land used for electricity transmission purposes;
- Undergrounding in constrained residential areas to meet the community's reasonable expectations for amenity;
- Prudent avoidance of EMF – i.e. expending additional costs to minimise EMF levels specifically in areas frequented by children (homes, schools, kindergartens, etc.);
- Minimising the social impacts of construction activities on the communities along the transmission line route by undertaking multiple construction activities at the same time;
- Minimising the impact of construction activities on the land (erosion, vegetation, weed control, etc.);

- Minimising the impact of transmission line infrastructure on individual properties by minimising the number of properties impacted, and by minimising the number of small land holdings impacted;
- Including strategies to identify the likely impact on individual properties and managing that impact in a responsible manner.

The Powerlink Manual requires preparation of a preliminary report, usually in the form of a draft Environmental Impact Statement (EIS). The draft EIS is advertised for public comment before being finalised. A notice is then provided to all identified stakeholders and published advising of Powerlink's intention to seek designation on the basis of the final EIS and giving a further opportunity to make a submission to Powerlink on the intended designation. Relevant government agencies are involved with initial development of the draft EIS and approached directly for comment on the draft EIS and designation notice. Powerlink's designation request to the Minister must detail all submissions and the account taken of them. If there are any changes to designation in response to public submissions then Powerlink must give relevant government agencies a further opportunity to comment.

Powerlink's designation process requires that the EIS also proposes ways to manage the anticipated environmental impacts. This is done via an Environmental Management Plan (EMP) attached to the EIS. Powerlink satisfies its environmental duty under the *Environmental Protection Act 1994* by complying with the EMP.

NETWORK OPTION IDENTIFICATION

There are a number of factors which need to be considered in selecting options for network solutions:

1. What is the nature of the limitation – thermal, voltage, transient or dynamic stability
2. What is the demand and overload growth – Queensland has the highest demand growth anywhere in the NEM.
3. How will be the role of the possible solution in the long term development of the transmission network, eg. supply radial load, backbone transmission grid, future generation requirements, etc.
4. Where is the limitation and the possible solution – this includes consideration of terrain, noise levels, etc.
5. What will be the loading on the element at the time it is placed into service
6. What is likely to be able to be constructed and designated in the available time
7. What regulatory and approval processes are needed

Transmission voltage

Transmission voltage for an option is chosen based on a technical assessment of the required capacity of the augmentation, both to meet immediate limitations as well as its effectiveness over time as power flows are expected to change. Standard voltages (based on voltages in the area under consideration) are considered, as cost justification for implementation of a new voltage is not considered routine unless some extenuating circumstance is identified.

Often, options using at least two standard voltages are used in the economic analysis to assess the most appropriate net present value solution.

Transmission line configuration

Once the standard voltage is selected, a choice then needs to be made on the overhead transmission line configuration selected for option analyses.

The nature of the designation process means that, every attempt is made to maximise the capacity utilising standard structure types. This would involve adopting double circuit towers strung with twin conductor per phase. It should be noted that Powerlink has not adopted the absolute maximum

solution (e.g. three or four circuits per tower, or triple or quad conductor bundling), rather the maximum capacity of current construction technology is adopted.

There may be cases where provision of something lesser than maximum capacity is considered prudent, however these cases are relatively rare in Queensland due to high demand growth and incidence of limitations from non thermal limits. Such occurrences could be where demand growth is expected to flatten or decline or where it is considered that easement scarcity is unlikely to exist in the future. Such exceptions would need to be made taking a whole of life transmission line life into account (for 50 years).

Powerlink considers each 275 kV construction option in deciding the appropriate and economic ratings and conductor sizing for transmission lines. These are examined in great detail at the time of the investment decision. In planning the possible network development further in the future (as part of developing the grid plans) Powerlink uses its experience of actual projects and line loadings to target conductor sizes. In a state in which electricity demand has been growing by more than 4% per annum historically and is forecast to continue to grow well into the long term future, choosing minimalist ratings for transmission lines is not seen as prudent or reasonable.

There are also technical and environmental reasons for adopting greater than the minimalist rating for transmission lines. These are summarised on the attached page.

Internal Powerlink Process

Once a trigger is identified and the timing is such that detailed investigation needs to occur to implement the solution in time (generally around three years) a project team is established. Depending on the nature of the project, this would generally include representatives from:

- Regulation, Strategies and Development/Projects (part of the Network Business Unit (NBU)) – to coordinate and manage the investigation and address considerations such as:
  - the development of an appropriate easement strategy;
  - to ensure that sufficient time and appropriate processes are started to enable external consultation (including for identification of non-network options) and implementation of augmentation works to proceed (if necessary);
  - to identify interaction between load and non-load driven projects; and
  - to coordinate and provide input on regulatory requirements/implications, funding and project coordination.

- Grid Planning – to undertake power system analysis and advice on the nature of the reliability of supply limitation, to confirm the trigger for and timing of corrective action and to undertake and supply ongoing planning input. Grid Planning would also provide advice on future needs for replacement projects and fault levels.

- Plant Strategies – to establish the required scope of replacement projects and to ensure network development is consistent with asset management strategies, plant strategies and work strategies for maintenance.

- Technology & Standards – to provide technical advice on options (particularly to identify any technical show stoppers in preliminary options) design advice and cost estimates.

Identification of Possible Options

Options are developed largely by the group which identifies the trigger and targeted to ensure that the limitation or condition which gives rise to the trigger is alleviated by the potential solutions. For load driven projects this is generally Grid Planning (including through the joint planning process with DNSPs or TNSPs) by considering how specific emerging limitations can be addressed. For non-load driven projects this is generally Plant Strategies. Depending on the nature of the limitation and whether small or large scale measures are likely to be required to address the issue, the development of options and analysis undertaken to support these can take between several weeks to several months to complete.

The technical feasibility of the identified options is assessed with advice from Technology & Standards. Initially, these would normally involve the use of existing infrastructure in the vicinity of the limitation. As the options must take account of both immediate and future network requirements (demand, limits and capability), consideration is also given to alternative ways to address the issue. For example, scenarios might include the construction of additional capital works along routes which currently do not exist and the possible establishment of generation and load points in certain areas in the future. Input from Plant Strategies also allows the planners to consider other issues that may impact upon a particular option, such as plant condition and fault levels. In the case of projects involving new transmission lines the feasibility of either obtaining a new easement or constructing something on an existing easement must be assessed as per the discussion above. The likelihood of being able to obtain a new easement and the configuration of what can legitimately be constructed on an easement must also be assessed, ie. environmental impact; cultural and heritage; community attitudes; likelihood of obtaining designation; double circuit/single circuit; voltage level; towers/poles/underground; emf/radio interference levels; future development; etc. This assessment is carried out in conjunction with the Transmission Environment group who are responsible for identifying and obtaining new easements and the legal right to construct on new and existing easements.

For all technically feasible options, cost estimates are requested from the estimating team. The estimates allow the project team to eliminate some of the technically feasible options on the basis of cost and high-level technical assessment and to enable the selection of a preferred option.

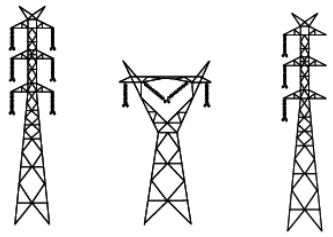
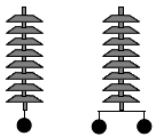
NON-NETWORK OPTION IDENTIFICATION

In accordance with its obligations and the regulatory test requirements, Powerlink evaluates non-network alternatives to establishment of new network assets. The regulatory test establishes that alternative options evaluated under the "reliability limb" must be technically feasible and have a clearly identifiable proponent. Powerlink has a lot of experience in assessing and using non-network alternatives to network investment as it is the largest acquirer of non-network solutions in any of the NEM jurisdictions.

Powerlink uses its well established consultation process for evaluation of regulatory test to identify non-network alternatives which meet the requirements of the regulatory test. The limitations are first identified in the Annual Planning Report. This provides advance notice of forecast limitations to potential non-network solution providers and allows them time to get their proposals to the required level of commitment to be considered a technically feasible solution.

Once the limitation is closer (generally close to the time that would be required to evaluate and construct the network solution) Powerlink issues a "Request for Information" (RFI) document. This document describes the network limitation in detail and outlines the required characteristics for non-network solutions – eg. size, location, operating characteristics, extent of commitment, requirement for contract, etc. The RFI is an added step to the consultation process that Powerlink voluntarily undertakes and which is specifically aimed at seeking submissions from potential non-network solution providers.

This approach has been very successful in identifying potential non-network solutions for further consideration. In the most recent consultation associated with reinforcement of supply to north and far north Queensland 15 submissions were received and 9 of these contained potential non-network solutions. These potential solutions were evaluated for their likely ability to provide a solution. As part of the evaluation and assessment process Powerlink issued all potential non-network solution providers with an Information Paper outlining the timeframe and criteria for assessment of their solutions. The evaluation of options resulted in contracts for provision of grid support from 2 non-network solution providers.

Issue	Comments
Single Circuit versus Double Circuit 	Due to easement scarcity, Powerlink is unlikely to adopt single circuit structures except for circumstances where a second line is unlikely to be required in the 50 year life. An option which is considered with a view to minimising cost is provision of double circuit towers with one side strung initially. Where the second side is required within about 6 years after the first, stringing both sides initially can generally be shown to be economic. Provision of double circuit with only one side strung is only economic if the second side can in fact be strung at a later date. Powerlink does not consider it appropriate to rely on Electrical Safety Act and Workplace Health and Safety legislation allowing the second side to be strung with the first side live. Therefore such an option is only viable where sufficient windows for outages can be relied upon for dead stringing. Powerlink has adopted single circuit configurations in recent times as a special circumstance, viz: • Broadsound to Lilyvale as a single circuit line; • Stanwell to Broadsound as a double circuit line with one side strung.
Single Conductor versus Bundled Conductor 	Twin bundled conductor is generally selected because: • Single conductor has proven troublesome from an EMF and RFI point of view. Single conductor would only be used in areas isolated from residential development (now or in the future); • Twin conductor provides for a significantly lower reactance (approximately 38% reduction). In terms of actual conductor size, either Sulphur or Phosphorous would generally be selected depending on expected future thermal loading. Because there is a cost difference between the two conductor sizes (around 10%), Powerlink has chosen the reduced conductor diameter at times, viz • Greenbank to Belmont using twin Phosphorous; • Broadsound to Lilyvale, single Sulphur was used due to remoteness.

APPENDIX G
Generation Planting Review

Generation Planting and Retirements

The generation capacity connected to the Queensland transmission network (including all embedded scheduled units) prior to summer 2006/07 is shown in Table G.1.

Table G.1: Existing Queensland generation capacity (MW - summer based rating)

Combustion Turbines		Hydro		Coal Fired	
Barcaldine GT	48	Barron Gorge	60	Callide B	700
Mackay GT	30	Kareeya	88	Callide PP	900
Mt Stuart GT	288	Wivenhoe	500	Collinsville	187
Oakey GT	276			Gladstone	1,680
Roma GT	54			Millmerran	860
Townsville GT	230			Stanwell	1,440
Braemar	453			Swanbank B	480
Swanbank E	355			Tarong	1,400
				Tarong North	443
Sub-totals	1734		648		8,090
Total					**10,472**

Source: PB Associates, Powerlink data

Table G.2 shows the new generation planting program developed by ROAM Consulting and assumed by Powerlink over the regulatory period for each of the scenarios identified. It also shows generation retirement assumptions.

Table G.2 highlights that the net generation planted in each of the major load growth theme sets was consistent, except for the low growth scenarios (1-8) where scenario 7 had 1300 MW more generation planted compared to scenarios 1 and 5 for the same load growth. In general however, there was a tendency to install slightly more generation in each theme set such that the reserve margin at the end of the review period was slightly higher than it was at the start. These results indicate a generally consistent approach to generation planting that should not bias the resulting deterministic transmission plans in any way.

Table G.2: Capacity of Generation Planted/Retired in each Scenario (MW)

Scenario	Total[1]	2007/08	2008/09	2009/10	2010/11		2011/12	
	Net	New	New	New	New	Retire	New	Retire
1	912	750	32	130	0	0	500	-500
2	1043	750	138	242	882	-672	1383	-1680
3	**1840**	750	32	130	1200	-172	400	-500
4	**1268**	750	138	242	1507	-672	983	-1680
5	912	750	32	130	0	0	500	-500
6	1061	750	138	242	900	-672	1383	-1680
7	**2240**	750	32	130	1200	-172	800	-500
8	**1211**	750	138	242	1450	-672	983	-1680
9	1952	1250	592	130	480	0	0	-500
10	1868	750	138	242	957	-672	2133	-1680
11	**2012**	750	32	130	1200	0	400	-500
12	1968	750	138	242	1507	-672	1683	-1680
13	1952	1250	592	130	480	0	0	-500
14	**2368**	750	138	242	957	-672	2633	-1680
15	**2012**	750	32	130	1200	0	400	-500
16	**2418**	750	138	242	1407	-672	2233	-1680
17	**2102**	1250	592	130	630	0	0	-500
18	**2348**	750	138	242	1437	-672	2133	-1680
19	**2162**	750	32	530	950	0	400	-500
20	**2168**	750	138	242	1657	-672	1733	-1680
21	**2502**	1250	592	130	630	0	400	-500
22	**2842**	750	132	242	1437	-672	2633	-1680
23	**2162**	750	32	530	950	0	400	-500
24	**2668**	750	138	242	1657	-672	2233	-1680
25	**3222**	1250	592	580	850	0	450	-500
26	**3038**	750	138	642	2077	-672	1783	-1680
27	**3282**	750	32	580	1570	0	850	-500
28	**3188**	750	138	642	1877	-672	2133	-1680
29	**3222**	1250	592	580	850	0	450	-500
30	**3138**	750	138	642	2077	-672	1883	-1680
31	**3282**	750	32	580	1570	0	850	-500
32	**3288**	750	138	642	1877	-672	2233	-1680
33	**3289**	1250	592	130	1367	0	450	-500
34	**3308**	1250	698	242	1337	-672	2133	-1680
35	**4089**	1250	592	130	1767	0	850	-500
36	**3958**	1250	698	242	1987	-672	2133	-1680
37	**3289**	1250	592	130	1367	0	450	-500
38	**3308**	1250	698	242	1337	-672	2133	-1680
39	**4089**	1250	592	130	1767	0	850	-500
40	**3958**	1250	698	242	1987	-672	2133	-1680

Source: PB Associates
Note 1: Red coloured totals show generation planting greater than 5 times the average annual load growth.

Table G.3 shows the generation planting common in all scenarios is approximately 1,380 MW.

Table G.3: Common Generation Projects in all Scenarios

Project	Location	Action	Capacity MW	Timing	Technology
Breamar A1-A3	SWQ	New Plant	450	2006/07	OCGT
German Creek CSM 1	NQ	New Plant	32	2006/07	CCGT
Isis Mill 1	Wide Bay	New Plant	25	2006/07	Biomass
Kogan Creek 1	SWQ	New Plant	750	2007/08	Coal
Oakey CSM 1	SWQ	New Plant	20	2008/09	CCGT
Dalby CSM 1	SWQ	New Plant	12	2008/09	CCGT
Chinchilla 1	SWQ	New Plant	57	2009/10	CCGT
Mungi CSM 1	NQ	New Plant	43	2009/10	OCGT
North Goonyella CSM	NQ	New Plant	30	2009/10	CCGT
Gibson Island A1	Moreton S	New Plant	60	2008/09-2012/13	CCGT
Swanbank F	Moreton N[1]	New Plant	400	2010/11-2012/13	CCGT
Swanbank B	Moreton S	Retirement	-500	2010/11-2011/12	Coal

Source: PB Associates
Note 1: The actual connection point of the proposed Swanbank F power station was in Moreton South.

Conclusion on generation planting

We believe the approach adopted by ROAM Consulting to locate, size and then plant new generation of various technologies, as well as retire existing stations, has provided a reasonable basis for Powerlink's probabilistic based transmission planning, given information contained in NEMMCO's Statement of Opportunities and other information available in the public domain.

APPENDIX H
Review of Forecast Demand Driven Projects

Strathmore to Ross 275 kV Double Circuit Transmission Line – CP.01101

This project has been identified in 8 of the 40 scenarios (the cumulative probability is 28%) with an estimated cost within the regulatory period of $137.56 million. The timing of the project is identified as either 31/10/2009 (high growth) or 31/10/2010 (medium growth).

The project involves the construction of approximately 190 km of 275 kV double circuit transmission line from Strathmore to Ross with each line capable of transferring around 1150 MVA continuously over the summer period. Substation works are required at either end to allow the new lines to be switched, monitored and protected from faults. Five new 275 kV circuit breakers are required.

Powerlink has presented detailed information regarding the constraint, plus a Final Report entitled "Final Recommendation to Address Forecast Reliability of Supply Requirements in 2007-2010 – North and Far North Queensland", dated 29 November 2005 to support the project.

The need for the project is primarily driven by Powerlink's mandated reliability obligations to supply all demand under a critical transmission outage with limited generation availability in the Ross and Far North zones. Supply in this region is at risk due to:

- the limited thermal capability (530 MVA each) of the 275 kV Strathmore-Ross circuits;
- the limited thermal capability of the 132 kV Strathmore-Clare, Strathmore-Collinsville-Clare and the Clare-Townsville South circuits;
- Voltage or transient stability for loss of the largest generator (Townsville at 230 MW) in Ross or the Far North zone; and
- Voltage or transient stability for loss of a Strathmore-Ross circuit.

The 2007/08 10 % and 50% PoE demand forecasts in the area are around 980 MW and 890 MW, respectively and there is approximately 670 MW of generation in the area. The output of this generation is subject to considerable uncertainty due to the age, mix, fuel source and water availability for operation of the plant. To address this uncertainty, Powerlink engaged an independent consultant Energy Market Services (EMS) to review generation assumptions to be used when planning the transmission supply to north Queensland. EMS concluded that almost all the generating capacity in the region has greater than usual uncertainties about availability and capacity. EMS also identified strong linkages between the risks at most power stations resulting in a high probability of simultaneous capacity limitations at several of them, plus a significant risk that limitations at one power station could result in limitations occurring at other power stations. As a result, Powerlink adopted the recommendation from EMS to use 6 sub-scenarios to test the ability of the local generators and transmission capacity to provide reliable power supply under various demand conditions.

As a result of our detailed review, we were satisfied of the need for the project in 2010/11 under 4 of the 24 medium growth scenarios even though Powerlink highlighted that, under some of the sub-scenarios considered, the transmission constraint occurred as early as 2008/09. However, we were not satisfied that the project was necessary under any of the high growth scenarios as it appeared that a new generator would be planted in the following year removing any further benefits of the line until outside the next regulatory period. In our opinion, it is not prudent or efficient for such a large capital project to be constructed to avoid one year of potential and marginal overloads (averaging 107% in the six sub-scenarios and ranging from 101% to 119%). Should the high growth scenario be realised, we consider this to be an example of a situation in which Powerlink could:

- negotiate with one of its connected parties for a temporary lesser supply standard (as is permitted under its Transmission Authority);

- implement a control scheme to trip load after a forced transmission outage if the generator assumed to be unavailable in the N-G-1 criteria actually failed or was expected to be unavailable; or

- consider various small scale demand side responses.

We note that Powerlink has advised it has consulted on supply arrangements for this area many times, seeking DSM and other grid support solutions and that it has not yet identified any options to alleviate transmission loading.

As part of Powerlink's grid planning, the only alternative that was identified to the proposed solution was construction of a line at a higher AC voltage or a DC link. However, because the preferred solution was consistent with the strategy already approved[1] and underway it was concluded that the high capacity 275 kV lines should progress.

Powerlink's proposed solution increases the estimated N-1 thermal transfer capability from Strathmore-Ross from around 650 MVA to around 2,100 MVA. Upon questioning the validity and scale of the project for the given constraint, which at first impression appeared quite disproportionate; Powerlink identified a number of voltage and transient stability limits close behind the thermal limit which supported the need for high capacity lines and their low impedance. It also identified the greater reduction in transmission losses that would be realised with the higher capacity, lower resistance lines and significant reductions in potential grid support requirements. While we agree with Powerlink on these principles, we still question whether a cheaper, lower capacity line would ensure that Powerlink's reliability requirements are met, especially given that the constraint was not identified in 32 of the 40 scenarios assessed.

Powerlink also provided economic studies to support the decision to use double circuit high capacity lines. However, we still consider that such an approach is not justified in the short term and that the use of a double circuit tower with a single low capacity circuit strung on it would be a more efficient solution. This should be coupled with some additional shunt capacitor compensation, and if Powerlink still considers it needs the second circuit, these could be strung on the new towers in the 2012-17 regulatory period. We consider there should be reasonable opportunity to do this at times of low demand without unduly risking reliability of supply. The recommended option would increase the estimated N-1 thermal transfer capacity to around 1100 MVA and the impact on Powerlink's forecast capex is shown in Table H.1.

Table H.1: Strathmore-Ross project review ($m, 06/07)

Item	Probability	2007/08	2008/09	2009/10	2010/11	2011/12	Total
Powerlink proposal[1]	28.1%	-	12.01	119.81	5.75	-	137.57
Weighted		-	3.37	33.67	1.62	-	38.66
Recommended Proposal[2]	21.8%[3]	-	8.73	87.10	4.17	-	100.00
Weighted		-	1.90	18.99	0.91	-	21.80
Change		-	-1.47	-14.68	-0.71	-	-16.86

Source: PB Associates
Note 1: Based on the median date
Note 2: Based on DCST 2xPhosphorous, strung one side only and a 120 MVAr, 275 kV capacitor bank
Note 3: Reduced after removing the High scenarios

[1] The Strathmore-Ross line would be stage 3 in Powerlink's overall project to support Ross and the Far North zone, subsequent to Broadsound-Nebo (Stage 1) and Nebo-Strathmore (Stage 2).

Larcom Creek 275/132 kV Substation Establishment – CP.01958

This project has been identified in 32 of the 40 scenarios (the cumulative probability is 89%) with an estimated cost within the regulatory review period of $47.79 million. The timing of the project is identified as 31/07/2009.

The project involves the construction of a new substation designed with a full breaker and half layout across eight switch bays with eight 275 kV circuit breakers in total, supplied by cutting into feeder 811 (Bauldercombe-Gladstone) and supplying two 275/132 kV 375 MVA transformers, then a remote 132 kV switchyard via 8 km of line designed for 275 kV but operating at 132 kV.

Powerlink has presented detailed information regarding the constraint and a Final Report entitled "Proposed New Large Network Assets Gladstone Area", published on 7 November 2005 to support the project.

The need for the project is driven by Powerlink's mandated reliability obligations to supply all demand under N-1 transmission conditions within the Gladstone zone which is at risk due to:

- the limited thermal capability of Ergon Energy's 132 kV lines from Gladstone to Boat Creek;
- 132 kV fault level limitations at Gladstone;
- the thermal capability of 275/132 kV transformer capability at Gladstone; and
- the thermal capability of 275/132 kV transformer capability at Calvale.

The project is required in all of the scenarios (except those in the M50++ theme), and the project timing has been triggered by a new committed 40 MW coal terminal at Wiggins Island, which is expected to be operational by 2009.

As a result of our detailed review, we are satisfied of the need of the project but would appreciate further assurances at to why it is specifically required in July 2009. Unless Powerlink can justify this timing, we recommend the project be deferred three months to October 2009 – this has a material impact on the annual payments, as shown below.

We are satisfied that Powerlink has considered a number of network alternatives to the development of Larcom Creek, including 132 kV supplies from existing switchyards and alternative sites for the 275/132 kV switchyard and that none of these options provide the same level of flexibility and strategic benefits. Fault level constraints impose restrictions on the ability to develop new plant in a meshed arrangement, dictating the need for the new radial supply.

We are also satisfied that Powerlink has sufficiently considered grid support and demand side initiatives through its recent consultation process for supply to the Gladstone area.

The Larcom Creek substation forms the basis of supplying major industrial load in the Gladstone area under the M50++ load theme scenario and it is central to the Gladstone State Development Area. This area is a special government owned area aimed at attracting energy intensive industry and has a potential load growth of as much as 2,500 MW over the next 15 to 20 years. To account for this, Powerlink has accounted for three key strategic aspects in its design of Larcom Creek Substation:

1. It is developing the 7.7 km of transmission to the remote 132 kV site as double circuit 275 kV, but operating it at 132 kV, until it builds another 132 kV line when the capacity is required for a 275 kV line;

2. It is building Larcom Creek across eight switch bays to allow for ease of future augmentation when additional 275 kV lies are constructed to it; and

3. It is installing high capacity 375 MVA transformers for a radially supplied load that could range from 40 MW-200 MW.

While each of these strategic decisions reflects good consideration of future requirements, we consider the likelihood of the other projects proceeding in the next regulatory period is low and that only some aspects of Powerlink's proposed scope are efficient at this point in time.

We recommend an allowance based on a 132 kV transmission line designed for 132 kV operation, that the 275 kV switchyard be developed with only three switch bays and seven circuit breakers in total, similar to that for Larapinta (refer SAE File No.10/1195/1), and the transformer capacity be reduced to 200 MVA rather then 375 MVA, as per Table H.2. We have not made any adjustments for removal of the 275 kV easement acquisition and inclusion of a 132 kV line easement.

We consider Powerlink could readily accommodate the extension of the 275 kV switchyard, as required when and if the new lines are established to Larcom Creek, and that the 200 MVA transformers would provide sufficient headroom for local load growth and the reasonable connection of some new customers to this new radial network.

Table H.2: Larcom Creek project review ($m, 06/07)

Item	Probability	2007/08	2008/09	2009/10	2010/11	2011/12	Total
Powerlink proposal	89%	11.80	35.47	0.52	-	-	47.79
Weighted		10.50	31.57	0.46	-	-	42.53
Recommended Proposal[1]	89%	6.83	29.48	4.58	-	-	40.89
Weighted		6.08	26.24	4.07	-	-	36.39
Change		-4.43	-5.33	3.61	-	-	-6.14

Source: PB Associates
Note 1: Savings are in $05/06 (consistent with the original project costing) and are estimated at $1 million for using 132 kV line, $1.5 million for reduced transformer ratings and $3.8 million for the reduced civil and installation works compared with the original scope.

Larapinta 275/132 kV Substation Establishment – CP.01195/A

This project has been identified in all of the 40 scenarios with an estimated cost within the regulatory review period of $55.1 million. The timing of the project is identified as either 31/10/2008 (high growth), 31/10/2010 (medium growth) or 31/10/20011 (low growth).

The project involves the construction of a new substation designed with a full breaker and half layout across three switch bays with seven 275 kV circuit breakers in total, supplied by cutting into the Belmont-Blackwall 275 kV line and supplying two 275/110 kV 375 MVA transformers, two 110/33 kV 100 MVA transformers, and a 6 km high capacity line out of Larapinta.

This project has resulted from a joint planning exercise with Energex. Powerlink has presented detailed information regarding the constraint.

The need for the project is driven by a combination of Powerlink's mandated reliability obligations to supply all demand under N-1 transmission conditions and Energex's distribution system planning requirements in the Moreton South zone. The project is driven by the following technical limitations associated with the existing infrastructure:

- 110 kV network limitations on the Rocklea-Richlands-Algester-Runcorn-Belmont circuits by 2009/10;
- 110 kV network limitations on the Loganlea-Browns Plains circuits by 2015/16;
- 275/110 kV transformer capacity limitations in the south Brisbane area;
- 275 transmission capacity limitations on the Karana Downs-Rocklea circuits;
- Energex 33 kV network limits by summer 2010/11; and
- Brisbane area fault level management requirements.

The project timing has been triggered by general load growth in the fast developing southern Brisbane area. We are satisfied of the need and timing of the project, especially given the technical complexity of the meshed network, the various constraints and the nature of the load growth in the area.

We are also satisfied that Powerlink has considered a number of network alternatives to the development of Larapinta, including 110 kV supplies from existing switchyards and alternative sites for the 275/132 kV transformer developments and that none of these options provide the same level flexibility and strategic benefits. Detailed NPV calculations for a number of alternatives have been considered given the timing of various anticipated projects and these support the decision on the preferred alternative.

We are also satisfied that Powerlink has sufficiently considered grid support and demand side initiatives which are not likely to influence the scope or timing of the preferred option.

In general, we are satisfied that the scope of works is an effective and efficient approach to the forthcoming reliability constraints. However, we consider the costs allocated to the 6 km of 110 kV double circuit transmission section out of Larapinta appear to be unnecessarily high at over $14m. This cost estimate includes an allowance for underground cable based on technical risks associated with the route and the substation line entries. Based on our review and the limited information Powerlink has used to support its decision, we do not consider there is sufficient evidence of the need for all the undergrounding proposed. and recommend the estimate be based a reduced cable length and more overhead construction. We also recommend that the BPO for the 110 kV line be reduced by 13% to bring it in line with our estimate of a reasonable cost for a high capacity double circuit 110 kV line[2]. The impacts of this recommendation are presented in Table H.3.

Table H.3: Larapinta Substation project review ($m, 06/07)

Item	2007/08	2008/09	2009/10	2010/11	2011/12	Total
Powerlink proposal	-	9.16	39.71	6.23	-	55.10
Recommended Proposal	-	8.15	35.31	5.54	-	49.00
Change	-	-1.01	-4.40	-0.69	-	-6.10

Source: PB Associates

[2] Approximately 82% of this reduction is due to the reduced length of underground cable with the balance due to the reduced cost estimate for the overhead line section.

275 kV Double Circuit line into Larapinta – CP.01771/B

This project has been identified in 32 of the 40 scenarios (the cumulative probability is 76%) with an estimated cost within the regulatory period of $87.47 million. The timing of the project is identified as either 30/09/2008 (high growth) or 30/09/2012 (medium growth).

The project involves the construction of a new 275 kV double circuit line into Larapinta with some sections of underground cable with each circuit capable of transferring around 1,150 MVA continuously during summer. Both of the new circuits will operate at 275 kV and another existing (lower capacity) 275 kV line will be converted to operation as a 110 kV circuit to supply Carol Park. Substation works are required at either end to allow the new lines to be switched, monitored and protected from faults. Three new 275 kV and two new 110 kV circuit breakers are required.

Powerlink supplemented the information contained in its Grid Plan with detailed information regarding the constraint and the various contingencies.

The need for the project is driven by Powerlink's mandated reliability obligations to supply all demand under N-1 transmission conditions in the Moreton South zone which is at risk due to:

- the limited thermal capability of Blackwall-Larapinta 275 kV circuit in 2011/12;
- the limited capability of Swanbank-Goodna 275 kV circuit in 2014/15; and
- the limited capability of Greenbank-Loganlea 275 kV circuit in 2016/17.

Importantly, there are a number of contingencies that can overload the Blackwall-Larapinta circuit, namely outage of the Swanbank-Goodna, Greenbank-Belmont and Greenbank-Loganlea circuits, with the latter being the most critical.

The project timing has been triggered by general load growth in the fast developing southern Brisbane area.

While we note this project is particularly sensitive to demand forecasts and that the likelihood of it being required for September 2008 is very low, we are generally satisfied of the need and timing of the project, especially given the multiple contingencies leading to constraints and the nature of the load growth in the area even under the medium scenario. We also highlight that practical deferral of the project timing by one year through the operational transfer of load through the 110 kV network has been achieved. However, given the relatively low potential overload forecast in summer 2011/12 of 102.6%, we consider there may be further opportunity to defer the project by one year. This could be achieved through Powerlink negotiating with one of its connected parties for a temporary lesser supply standard (as is permitted under its Transmission Authority), or it could opt for various small scale demand side responses.

This single year deferral will have the impact of pushing the majority of the required capex into the 2012-17 regulatory period. On the basis that the risk to Powerlink of deferring the project by one year will not be significant, we recommend that the allowance for this project in the regulatory period be halved, in accordance with Table H.4.

We are satisfied that Powerlink has considered a number of network alternatives to the development of high capacity double circuit lines to Larapinta, including uprating and restringing the existing lines and options to lay the second underground cables at a later date to defer the initial capital outlay. The growth rate in the Brisbane area supplied out of the major connection points of Goodna, Belmont and Loganlea is such that the second circuit would be required by 2018. It also defers the need for additional 110 kV transmission to Carol Park West until 2021. Detailed NPV calculations for a number of

alternatives have been considered given the timing of various anticipated projects and these support the decision on the preferred alternative.

We are satisfied the scope of works and the project costs represent an effective and efficient approach to the forthcoming reliability constraints. We have also considered Powerlink's adoption of underground transmission for this project as prudent and reasonable.

Table H.4: 275 kV Double Circuit Line into Larapinta project review ($m, 06/07)

Item	Probability	2007/08	2008/09	2009/10	2010/11	2011/12	Total
Powerlink proposal	76%	-	-	-	9.63	77.84	87.47
Weighted		-	-	-	7.32	59.16	66.48
Recommended Proposal	76%	-	-	-	-	44.00	44.00
Weighted		-	-	-	-	33.44	33.44
Change		-	-	-	-7.32	-25.72	-33.04

Source: PB Associates

Molendinar 275/110 kV Transformer Augmentation – CP.01528/A

This project has been identified in all of the 40 scenarios with an estimated cost within the regulatory period of $17.77 million. The timing of the project is identified as either 31/03/2008 (high growth), 31/03/2010 (medium growth) or 31/03/2012 (low growth).

The project involves the purchase and installation of one 275/110 kV 375 MVA transformer identical to the two existing units, and establishment of three switch bays at Molendinar with eight new 275 kV circuit breakers to allow the new and existing transformers and the lines supplying Molendinar from Greenbank to be switched, monitored and protected from faults. It also requires the appropriate 110 kV switchyard works to connect the new transformer.

Powerlink has presented detailed information regarding the constraint in addition to the information contained in its Grid Plan regarding the system normal and contingent power flows through the Molendinar and Mudgeeraba transformers.

The need for the project is driven by Powerlink's mandated reliability obligations to supply all demand under N-1 transmission conditions in the Gold-Coast/Tweed zone and the risk is associated with the limited thermal capability of the Molendinar and Mudgeeraba 275/110 kV transformers.

The critical contingency is the loss of either of the Molendinar transformers which results in the greatest imbalance of power flows across the remaining four transformers.

The project timing has been triggered by general load growth in the highly developing Gold Coast/Tweed area. The specific project timing of March in each of the commissioning years is driven by the high load growth scenario only and the identified need to install the third transformer during the shoulder periods when demand is low to pre-empt the Greenbank-Mudgeeraba line rebuild, which would increase the risk of losing the Mudgeeraba substation.

We are satisfied of the need and the general timing of the project, but consider it would be more efficient if the specific project timing was deferred by seven months in each of the scenarios so that the timing is aligned with 32 of the 40 scenarios rather than the 8 high load growth scenarios. We therefore recommend the project is commissioned by 31 October rather than 31 March in each year it is needed, and this adjustment be made as per Table H.5.

Table H.5: Molendinar Transformer project review ($m, 06/07)

Item	2007/08	2008/09	2009/10	2010/11	2011/12	Total
Powerlink proposal	2.77	14.22	0.79	0	0	17.77
Recommended Proposal	0.00	3.60	13.69	0.56	0.00	17.84[1]
Change	-2.77	-10.62	12.90	0.56	0.00	0.07

Source: PB Associates
Note 1: The deferral results in a higher overall allowance due to the impact of escalation factors

We are satisfied that Powerlink has considered a number of network alternatives to the development of Molendinar, including staged replacement of transformers at Mudgeeraba, different switchyard arrangements at Molendinar and the strategic placement of reactive compensation to maximise the power flows through the critical transformers. The preferred option provides for improved operational flexibility and also allows for the efficient future installation of reactive support. It also adheres to Powerlink's commendable new policy on the selection of busbar configuration for new substations, which was developed by an internal working group in August 2004. While there has been limited evidence to indicate that Powerlink has exhausted all options to optimise the power balance between the Molendinar and Mudgeeraba transformers under outage conditions, we consider such analysis would not have a significant impact on deferring the need for transformer augmentation.

We are also satisfied that Powerlink has sufficiently considered grid support and demand side initiatives which are not likely to influence the scope or timing of the preferred solution significantly given the inherent load growth in the Gold Coast/Tweed area. Powerlink's assessment evidences the consideration of grid support through the joint planning it undertakes with TransGrid concerning the operation of DirectLink.

We are satisfied the scope of works and its costs represent an effective and efficient approach to the forthcoming reliability constraints.

South Pine to Sandgate 275 kV Double Circuit Transmission Line (operating at 110 kV) – CP.01189/B

This project has been identified in all of the 40 scenarios with an estimated cost within the regulatory period of $32.7 million. The timing of the project is identified as either 31/07/2008 (high growth), 31/07/2009 (medium growth) or 31/07/2013 (low growth).

The project involves the construction of a new high capacity 275 kV double circuit line from South Pine to Sandgate, which includes some underground cable. The line will initially be operated at 110 kV. Voltage and substation works are required at either end to allow the new lines to be switched, monitored and protected from faults. Four new 110 kV circuit breakers are required.

This project has resulted from a joint planning exercise with Energex. Powerlink has presented some information regarding the constraint in addition to that included in its Grid Plan.

The need for the project is driven by a combination of Powerlink's mandated reliability obligations to supply all demand under N-1 transmission conditions and Energex's distribution system planning requirements in the Moreton North zone. The project is driven by a number of complex and inter-related thermal constraints associated with the existing infrastructure:

- South Pine – Sandgate 110 kV (N-1) thermal capacity exceeded summer 2009/10,

- South Pine East 275/110 kV transformer capacity exceeded summer 2013/14 (and subsequently summer 2017/18 if Caboolture is transferred to Palmwoods),
- CBD East Ring 110 kV (N-1) thermal capacity exceeded summer 2013/14 (and subsequently summer 2017/18 if Wellington Road is alternatively supplied),
- CBD West Ring 110 kV (N-1) thermal capacity exceeded summer 2014/15,
- Rocklea 275/110 kV (N-1) transformer capacity exceeded summer 2014/15,
- Nudgee – Meeandah 110 kV (N-1) capacity exceeded summer 2014/15,
- Sandgate – Nudgee 110 kV (N-1) capacity exceeded summer 2017/18,
- Murarrie 275/100 kV transformer capacity exceeded summer 2017/18, and
- 33 kV network limitations requiring a new Hendra 110/33 kV substation by summer 2021/22.

The project timing has been triggered by general load growth in the highly developing northern Brisbane area. We are satisfied of the need and timing of the project, especially given the technical complexity of the meshed network, the various constraints and the nature of the load growth in the area. We do highlight that if the high load growth scenario was to arise, in our opinion the ability to meet N-1 reliability standards during summer 2007/08 and 2008/09 would be difficult.

We are also satisfied that Powerlink has considered a number of network alternatives to the development of the 275 kV circuits, including 110 kV supplies from existing switchyards and alternative sites for the 275/132 kV transformer developments and that none of these options provide the same level flexibility and strategic benefits. Detailed NPV calculations for a number of alternatives have been considered given the timing of various anticipated projects and, although in three of the options considered the final NPV's were within 5% of one another, the analysis supports the decision to proceed with the selected alternative.

We are also satisfied that Powerlink has sufficiently considered grid support and demand side initiatives which are not likely to influence the scope or timing of the preferred option.

In general, we are satisfied the scope of works is an effective and efficient approach to the forthcoming reliability constraints. Use of the 275 kV circuits operating at 110 kV in the short to medium term appears to be reasonable given the strategic significance of this line with respect to the northern suburbs of Brisbane and the need to maximise the use of limited easements in this area. We also note that conversion of the circuits to operation at 275 kV is expected within the 15 year planning horizon (2017/18) given the medium growth scenario. We also consider the adoption of some undergrounding to be reasonable given the established areas through which the project is proposed. We recommend the entire Powerlink proposed allowance is included, as presented in Table H.6.

Table H.6: South Pine - Sandgate project review ($m, 06/07)

Item	2007/08	2008/09	2009/10	2010/11	2011/12	Total
Powerlink proposal	4.92	27.61	0.17	-	-	32.70
Recommended Proposal	4.92	27.61	0.17	-	-	32.70
Change	-	-	-	-	-	-

Source: PB Associates

Establish Halys 275 kV substation and second Calvale to Halys 275 kV Double Circuit Transmission Line – CP.00369/A

This project has been identified in 21 of the 40 scenarios (the cumulative probability is 25%) with an estimated cost within the regulatory review period of $217.53 million. The timing of the project is identified as 30/09/2009.

The project involves the construction of approximately 316 km of overhead 275 kV double circuit transmission line between Calvale and Halys with only one circuit strung, and establishment of a new Greenfield substation at Halys comprised of 5 breaker and a half bays. The switchyard will contain 14 new 275 kV circuit breakers to allow the new line, the Tarong to Calvale and the Tarong to Braemar lines to be switched, monitored and protected from faults.

This project is discussed in some detail in the Grid Plan and Powerlink provided supplementary information regarding forecast power flows. This project forms an integral part of a package of projects to improve the transfer capability from Central Queensland to Southern Queensland ('CQ-SQ limit'). The package of projects, which are not mutually exclusive, are staggered in timing and application across the scenarios assessed. The overall likelihood and forecast expenditure based on the median timing of each project is presented in Table H.7.

Table H.7: CQ-SQ transfer augmentation projects ($m, 06/07)

Item	Prob	2007/08	2008/09	2009/10	2010/11	2011/12	Total
Establish Halys 275 kV Substation and Calvale to Halys 2nd 275 kV Double Circuit 1st Stage (single circuit strung)	25%	18.97	189.46	9.10	-	-	217.53
Establish Halys 275 kV Substation and Calvale to Halys 2nd 275 kV Double Circuit 1st Stage (both circuit strung)	19%	22.11	220.55	10.58	-	-	253.23
Gin Gin 250 MVAr SVC	43%	8.73	-	-	-	-	8.73
Auburn River Switching Station (3 switched circuits)	2%	-	-	3.14	9.43	0.14	12.71
Auburn River Switching Station (4 switched circuits)	4%	-	-	6.15	20.92	0.71	27.78
Auburn River Switching Station (2 switched circuits)	3%	-	-	4.75	12.53	-	17.28
Easement Acquisition for Calvale to Halys 2nd 275 kV Double Circuit Line (TE)	52%	0.89	-	-	-	-	0.89
Easement Acquisition for Calvale to Halys 2nd 275 kV Double Circuit Line (Compensation)	52%	3.32	0.17	-	-	-	3.49
Project value		54.02	410.18	33.72	42.88	0.85	541.64
Weighted project value		14.89	89.36	4.74	1.40	0.03	110.41

Source: PB Associates

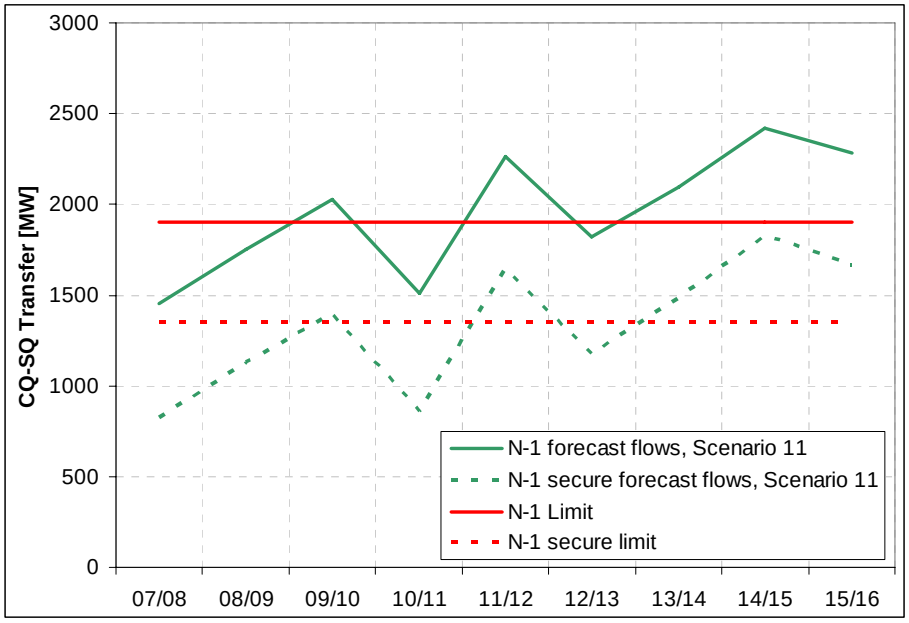
While the likelihood of many of the projects is relatively low, the costs associated with the line projects are significant given the long distances involved. Halys is a planned substation that is in close proximity to the existing Tarong substation. It is a Greenfield site that has been strategically earmarked for development of 500 kV transmission lines. Auburn is a similar strategic Greenfield site which is at the mid-point of the existing 330 km Calvale-Tarong 275 kV double circuit line.

The CQ-SQ transmission capability is designed to ensure the shortfall of load in southern Queensland is met under N-G-1 credible contingency conditions, allowing for maximum power flows into Queensland from NSW via QNI while giving due consideration to the impact of power flows via DirectLink from/to NSW. The transfer capability is discussed in detail in the Grid Plan, and the CQ-SQ limit equations are published in Powerlink's APR.

The CQ-SQ limit is defined by voltage and/or transient stability limits predominantly after loss of one of the long Calvale-Tarong lines and is it is measured as the aggregate transfer across the Wurdong-Gin Gin, the two Gladstone-Gin Gin, and the two Cavale-Tarong 275 kV lines. The N-1 limit is nominally 1,900 MW and the forecast peak summer demand flows for Scenario 11[3] are presented in Figure H.1.

Figure H.1 also shows the 'N-1 secure limit' which represents the transfer capability that can be maintained immediately after the initial event has occurred (i.e. NEMMCO as the system operator has half an hour to secure the system in expectation of a subsequent outage; this includes allowances for re-dispatch of generation or run back of DirectLink as necessary). The relevance of presenting the N-1 secure limit is that any augmentation option considered must be capable of improving both the N-1 and the N-1 secure limits.

Figure H.1: CQ-SQ transfer augmentation projects



Source: PB Associates

The most important characteristics of Figure H.1 are:

- the considerable growth in the forecast flows. On average over the period, it appears this is approximately 150 MW per year, with year on year changes up to +750 and -500 MW. Between 2007/08 and 2009/10 the forecast flow increases by over 30% - from 1500 MW to 2000 MW)
- the considerable notching in the forecast, which is representative of the impact of new generation (in South West Queensland) on the transfer requirements.
- the tendency for the constraint to be there in one year but not in the next.

These characteristics make it very difficult to arrive at a definitive position on the preferred option and its timing. Nevertheless they indicate to us that there is a genuine need for a project. In fact, unlike the majority of Powerlink's other forecast capex projects, it does

[3] Scenario 11 is the second highest ranking scenario - weighted at over 10% likelihood of proceeding.

not arrive at a definitive project solution for this constraint – different scenarios have different preferred solutions. In its assessment, Powerlink has considered a number of options to address the constraint. Each project has a different impact on both the N-1 and N-1 secure limitations. We note that the Auburn switching station options do not improve the N-1 secure limit as they do not mitigate the possibility of severing Calvale from Tarong when in an N-1 configuration.

While it included all of the scenarios with different outcomes in its weighted probabilistic assessment, it is unclear how and when Powerlink will actually make a decision on the preferred augmentation for the CQ-SQ constraint.

During our discussions on this project, Powerlink identified that it had undertaken a review of the underlying assumptions it had made regarding the power flows across QNI and DirectLink when assessing the CQ-SQ transfer limits. The outcome of its review was not only a net reduction in forecast capex of $41.03 million, as shown in Table H.8, but also considerable deferral of capex from early in the regulatory period to later years. This review has accounted for some flow on effects to other projects. However Powerlink has highlighted there may be some further fine tuning required. We have included this reduction in our forward capex recommendations.

Table H.8: Revised Forecast Capex Accounting for CQ-SQ Review ($m, 06/07)

Item	2007/08	2008/09	2009/10	2010/11	2011/12	Total in Reg. Period
Original total capex	546.31	543.02	456.10	466.49	437.32	2,449.24
Original augmentation capex	374.86	385.64	187.86	198.74	167.08	
Revised total capex	524.95	482.36	462.10	499.91	438.89	2408.21
Revised augmentation capex	354.36	321.05	193.72	236.31	169.05	
Change in total capex	-21.36	-60.66	6.00	33.42	1.57	-41.03
Change in augmentation capex	-20.50	-64.59	5.86	37.57	1.97	0

Source: PB Associates

Our review of this adjustment has been at a high level, and and we have had limited opportunity to analyse the modified project program in detail. We have therefore accepted Powerlink's advice on the reduction in the forecast capex, given the detailed analysis that it undertook. It is suggested that Powerlink provide updated information templates (or sections thereof) to the AER to evidence specific changes to projects impacted by this review.

Halys to Blackwall 500 kV Double Circuit Transmission Line (operating at 275 kV) – CP.01875

This project has been identified in 12 of the 40 scenarios (the cumulative probability is 19%) with an estimated cost within the regulatory review period of $193.22 million. The timing of the project is identified as either 31/10/2010 (high growth) or 31/10/2013 (medium growth).

The project involves the construction of approximately 153 km of 500 kV double circuit quad conductor transmission line from Halys to Blackwall via Springdale, initially operating at 275 kV and switched by four new circuit breakers at each end to allow the new lines to be switched, monitored and protected from faults.

Powerlink provided detailed information on this project, including information regarding forecast power flows.

The need for the project is related to the need to increase the transfer capacity across the Tarong limit, which is defined as the flow across the following seven 275 kV circuits the Tarong-South Pine, the two Tarong-Mt England, the two Tarong-Blackwall and the two Middle Ridge-Greenbank circuits, plus the Middle Ridge-Postman's Ridge 110 kV circuit. The limit is based on (i) voltage stability after loss of one of the seven 275 kV circuits or a 275 kV circuit between CQ-SQ and (ii) thermal limits on the parallel circuit for loss of a Millmerran-Middle Ridge[4] circuit or Middle Ridge-Greenbank circuit. It is much less sensitive to generation compared with the CQ-SQ limit but it is dependant on generation dispatch within SWQ.

At this point in time, the Tarong limit as defined above is an approximate limit since the new Middle-Ridge to Greenbank lines are not expected to be operational until October 2007, but it has been determined in accordance with the methodology used to develop the operational limit advice Powerlink provides to NEMMCO.

After reviewing the forecast flows across the Tarong grid section for two of the twelve scenarios in which the project was triggered, we are satisfied of the need for augmentation, especially given the various contingencies that can result in thermal overloads. Powerlink only explicitly considered the 500 kV development option and compared this to a limited number of alternative projects, namely against series capacitors installed on the five Tarong-SEQ 275 kV circuits and uprating the Middle Ridge-Ebenezer line from 275 to 330 kV operation. Powerlink states that the approval to obtain two 500 kV double circuit easement from Halys to Springvale was granted in 1999/2000 and that 500 kV circuits must be built on these last available easements. While we understand this reasoning, we consider that it is not sufficient to justify construction at 500 kV transmission lines without further technical or economic justification. In our opinion, the level of assessment undertaken does not support this considerable investment decision. Other options such as construction at 275 kV or 330 kV, or even construction of a 500 kV double circuit line with only a single circuit strung may provide considerable reprieve from further constraints.

Given the likely growth of the forecast constraint, we recommend that pending further detailed studies including the identification of the need for a fourth circuit and the reduction in transmission losses that a more efficient project alternative is a 275 kV twin sulphur double circuit line, and that Powerlink's forecast capital allowance be adjusted in accordance with Table H.9. We consider Powerlink would need to make greater efforts to identify the long term benefits of any proposed 500 kV line given that there are two easements and that at some later time a 500 kV double circuit line could still be built.

Table H.9: Halys to Blackwall project review ($m, 06/07)

Item	Probability	2007/08	2008/09	2009/10	2010/11	2011/12	Total
Powerlink proposal	19%	-	-	16.87	168.28	8.07	193.41
weighted		-	-	3.21	31.97	1.53	36.75
Recommended Proposal	19%	-	-	12.76	127.27	6.10	146.28
weighted		-	-	2.42	24.18	1.16	27.79
Change		-	-	-0.78	-7.79	-0.37	-8.95

Source: PB Associates

[4] This could be caused by outage of either of the two Middle-Ridge transformers, as they are connected in series with the lines.

Woolooga to North Coast 275 kV Double Circuit Transmission Line and 275/132 kV transformer – CP.01264/A

This project has been identified in 32 of the 40 scenarios (the cumulative probability is 76%) with an estimated cost within the regulatory review period of $66.54 million. The timing of the project is identified as either 31/10/2009 (high growth) or 31/10/2011 (medium growth).

This project involves the construction of approximately 70 km of 275 kV double circuit transmission line from Woolooga to North Coast to be operated as a single paralleled circuit, with a 300 MVA 275/132 kV transformer direct connected at North Coast. The development requires one 275 kV circuit breaker at Woolooga to allow the new line to be switched, monitored and protected from faults, and connection to an existing 132 kV switchyard at North Coast.

This is a joint planning project with Energex. As part of our review it was identified that while the project costs had been incorporated into the information templates, the project report had not been completed for inclusion in the final version of Powerlink's Grid Plan. Powerlink subsequently provided a written report outlining the background, need and planning consideration undertaken by itself and Energex.[5]

The need for the project is related to load growth in the northern area of the Sunshine Coast and loading on Energex's Woolooga-Gympie 132 kV lines. Outage of one of these 209 MVA circuit overloads the parallel circuit by 102 per cent under summer medium growth 2011/12 peak demand conditions. Powerlink has estimated the overload to grow by over 4 per cent per annum and that there is no expectation of generation planting on the demand side of the constraint to mitigate this. This confirms the need for the project.

The constraining lines form a parallel path to the strong 275 kV connection between Woolooga and Palmwoods/Southpine. Powerlink highlights that the forecast constraints are subsequent to considerable capex by Energex to uprate the 132 kV lines to higher capacity and after the installation of additional reactive plant.

Powerlink and Energex have considered four network alternatives including operating the line at 132 kV, or development at 132 kV and have presented considerable supporting evidence for the development of a high capacity 275 kV line. While Powerlink and Energex could have presented the economic NPV analysis in a more transparent and detailed manner, we consider the approach taken was reasonable.

Regarding the assessment outcome, we note that Powerlink and Energex are proposing to establish 275 kV lines all the way to North Coast (70 km) where it appears that development to Gympie (~30 km) would sufficiently resolve the forecast reliability constraints. While we appreciate that North Coast is a more central and strategic injection point to the region, the development at this location does not appear efficient in the short term and based on the particular constraint that triggers the project need. On this basis we recommend Powerlink's proposed capex be adjusted, as per Table H.10 to accommodate the development of a 275 kV double circuit line to Gympie rather then North Coast, and installation of the transformer at this site. This staged approach to development would allow the remaining section of 275 kV line between Gympie and North Coast to be developed later, as economically and technically required.

[5] Powerlink also identified another 15 projects - with an aggregate unweighted project value of over $168 million – for which it had not completed and included documentation in the Grid Plan when it was published. Powerlink has confirmed that information on such projects could be made available upon request.

Table H.10: Woolooga to North Coast Project Review ($m, 06/07)

Item	Probability	2007/08	2008/09	2009/10	2010/11	2011/12	Total
Powerlink proposal	76%	-	-	5.81	57.96	2.78	67.30
weighted		-	-	4.41	44.05	2.11	51.15
Recommended Proposal	76%	-	-	3.74	37.29	1.79	43.30
weighted		-	-	2.84	28.34	1.36	32.91
Change		-	-	- 1.57	- 15.71	- 0.75	- 18.24

Source: PB Associates

Moreton West 120 MVAr No.3 275 kV Capacitor Bank – CP.01882 & Rocklea 50 MVAr No.4 110 kV Capacitor Bank – CP.01316

The Moreton West capacitor bank project has been identified in 39 of the 40 scenarios (the cumulative probability is 99.7%) with an estimated cost within the regulatory review period of $2.54 million. The timing of the project is identified as either 31/10/2008 (high growth) or 31/10/2011 (medium growth).

The Rocklea capacitor bank project has been identified in all of the 40 scenarios (the cumulative probability is 100%) with an estimated cost within the regulatory review period of $1.89 million. The timing of the project is identified as 31/07/2009.

These two capacitor bank projects are part of a suite of 47 shunt capacitor bank and five static VAr compensator (SVC) projects forecast over the next regulatory period. It is noted that not all capacitor bank or SVC projects are required in every scenario. This program of investment has been established through a systematic process of testing for unstable voltages following critical contingencies in accordance with the following process:

- Load flow models were created with connection point load power factors that met the requirements of Schedule 5.3 of the NER. This involved the planting of speculative capacitive compensation by Powerlink to reflect DNSPs obligations at their connection points. Powerlink explicitly identified the list of reactive planting for this purpose and has correctly not sought to include any of it in its forecast capex proposal.
- Using this load flow model, Powerlink assessed and augmented the network with the most likely project (using engineering judgment) to resolve thermal limitations.
- Powerlink subsequently undertook another round of contingency analysis at times of peak demand to establish the level of adjustable capacitive bus shunts required to satisfy all reactive power margins as prescribed by its planning criteria and the NER. This process included advanced load flow processing using Optimal Power Flow (OPF) objective functions. This process included an assessment for each contingency and bus and the adjustable capacitive bus shunts were grouped by electrical proximity into 6 main groups, for which the Greater Brisbane area was broken down into a five sub-groups.
- Powerlink then processed the adjustable capacitive bus shunt results to derive a discrete schedule of capacitor bank requirements. The discrete banks were checked to ensure that the magnitude was representative of the system needs for the worst case contingency/reactive margin combination.
- Powerlink then undertook a final check to determine how well the system wide voltage stability was maintained by determining the maximum power transfer above which the required reactive power margins were no longer maintained.

While we did not review the final transfer capacity to ensure that it was only slightly above the forecast demand levels, we consider the approach adopted by Powerlink in establishing its reactive planning requirements to be robust, appropriate and established within good electricity practice. The outcome of the process also appears reasonable considering our assessment of the reactive program for one deterministic scenario (medium growth, scenario 9) where it was evident that 27 out of the total of 47 capacitor banks were required with, on average, about four being installed each year. The mix of 275 kV and 110 kV capacitor banks appeared reasonable, as were the cost estimates.

Given that shunt reactive compensation is generally a cost effective method of maintaining transfer capabilities and that Powerlink has established its program after having already taken into account thermal constraint based augmentations, we recommend no change to either the Moreton West 120 MVAr No.3 275 kV or Rocklea 50 MVAr No.4 110 kV capacitor bank projects. While we consider there may be some opportunities for Powerlink to install fewer but larger (and therefore cheaper) capacitor banks in large load centres like Brisbane where it is proposing to install a large number of smaller units, in general we consider Powerlink's entire capacitor bank program to be an efficient and effective capex investment.

Bolingbroke Queensland Rail Supply – CP.01285

This project has been identified in all 40 scenarios (the cumulative probability is 100%) with an estimated cost within the regulatory review period of $15.83 million. The timing of the project is identified as either 30/08/2008 (high and medium growth) or 31/08/2010 (low growth).

The project is categorised as a connection project and alone makes up over 22% of the entire forecast capex on connections. As part of Powerlink's proposal, it has indicated connection projects include those between itself and DNSPs. We note that this project has been driven by a request from Queensland Rail, not a DNSP. All of the assets included in this project are defined as 'exit assets' in accordance with the NER as they are fully dedicated to the supply of a single transmission customer connected at a single point within the transmission network.

In accordance with Schedule 6.2 of the NER, all exit assets are to be recovered from the user who benefits from them, and while it is envisaged that all exit assets will be plant within a substation, including transformers, discretion is provided to TNSPs to require users to meet all the network charges for radial transmission lines. As Powerlink has provided evidence that Queensland Rail has committed to finance the required easement acquisition, we believe this project has reasonable certainty of progressing. Since the cost of this project, which is also reasonable given the scope of works, will be recovered from Queensland Rail through annual charges if it were to be realised, we think this project should be included into Powerlink's' forecast capex without amendment.

CQ No.1 132/33 kV Transformer – CP.01985

The project has been identified in 8 of the 40 scenarios (the cumulative probability is 7%) with an estimated cost within the regulatory review period of $8.68 million. The timing of the project is identified as 31/07/2012 (high growth).

This project is categorised as a connection project and as part of a package of eleven generic projects[6] that have been identified in joint planning studies with Ergon and Energex. They have been specifically scoped to support the high growth scenarios. The aggregate value of the capital cost of the eleven projects is just under $90 million (not all of this is incurred in the next regulatory period though). However, none of these projects

[6] Projects CP.01982, CP.01981, CP.01980, CP.01979, CP.01978, CP.01977, CP.01976, CP.01986, CP.01984, CP.01983, and CP.01985, of which six are connections and five are augmentations.

has been associated with a specific trigger, constraint or need – they have been developed based on trending techniques using similar projects from the medium growth scenario. While we appreciate Powerlink's and the DNSP's attempts to capture risks associated with the high load growth scenario, we do not think there is sufficient supporting evidence on either the need or timing of the projects nor the efficiency of this approach. We recommend that none of these eleven generic projects be retained in Powerlink's forecast capex requirements, and that it be adjusted in accordance with Table H.11.

Table H.11: Generic High growth scenario projects ($m, 06/07)

Item	Probability	2007/08	2008/09	2009/10	2010/11	2011/12	Total
Aggregate Powerlink proposal	7%	-	-	5.33	26.10	33.93	65.36
weighted		-	-	0.39	1.90	2.47	4.76
Recommended Proposal	0%	-	-	0	0	0	0
weighted		-	-	0	0	0	0
Change		-	-	-0.39	-1.90	-2.47	-4.76

Source: PB Associates

North Goonyella Update – CP.01821

This project has been identified in all 40 scenarios (the cumulative probability is 100%) with an estimated cost within the regulatory review period of $7.66 million. The timing of the project is identified as 31/05/2011.

The project is categorised as a connection type project and alone makes up over 11% of the entire forecast capex on connections. All of the assets included in this project are defined as 'exit assets' in accordance with the NER as they are fully dedicated to the supply of a single transmission customer (at the moment[7]) connected at a single point within the transmission network.

In accordance with Schedule 6.2 of the NER, all exit assets are recovered from the user who benefits from them, and while it is envisaged that all exit assets will be plant within a substation, including transformers, discretion is provided to TNSPs to require users to meet all the network charges for radial transmission lines. Given this arrangement, and since the cost of this project, which is also reasonable given the scope of works, will be recovered from the user if it were to be realised, we think this project should be included into Powerlink's' forecast capex without amendment.

South Coast 500 kV Double Circuit Easement Acquisition Transmission Environment (TE) and Compensation – CP.01865 / A / B

Each of these projects has been identified in all 40 scenarios (the cumulative probability is 100%) with an aggregated estimated cost within the regulatory review period of $15.59 million. The timing of the acquisition project is identified as 31/10/2011, and for the Compensation it is 31/10/2012.

This is a strategic easement acquisition to extend the width of an existing easement into the Moreton South zone to assist with future support in the Gold Coast, Coomera and Beenleigh areas.

[7] We note that Powerlink envisages Queensland Rail may take supply from the newly established 132 kV bus.

The easement has been classified as a 'BE' type by Powerlink using its categorisation system, representing it as a 'medium developed and intensive agricultural area (acreage and lifestyle properties) and urban fringe' and that it is a project on an existing easement. The easement widening is 50m and the length assumed 35 km. The vast majority of the overall cost is the compensation component, followed by the environmental impact assessment study.

We note that Powerlink has escalated its easement acquisition costs by the long term appreciation trend of Australian grazing property index for non-urban properties, which has been 5% per annum real over the past 25 years for Qld. For urban properties, Powerlink has used 10 year average growth in Brisbane and Townsville local government areas of 8.61% per annum nominal. These approaches to the different types of land appear to be reasonable.

Our primary concern with this project is the timing and its proximity to the end of the regulatory period. Given the strategic nature of this project, we consider it is prudent to defer it by one year such that more accurate information can be used at the time of Powerlink's next revenue review. This will have the influence of deferring the most expensive easement project out of the last year of the review period and provide for a much more even easement expenditure profile over the entire review period. We recommend the changes to the Powerlink's easement capex in accordance with Table H.12. We consider this recommendation will have minimum effect on changing the risk profile faced by Powerlink in acquiring what we agree to be a strategic easement.

Table H.12: South Coast easement project review ($m, 06/07)

Item	2007/08	2008/09	2009/10	2010/11	2011/12	Total
Aggregate Powerlink proposal	-	-	1.79	2.24	11.56	15.59
Aggregate Recommended Proposal	-	-	-	1.79	2.24	4.03
Change	-	-	-1.79	-0.45	-9.32	-11.56

Source: PB Associates

Logan-South Coast Rebuild easement acquisition and compensation – CP.01690 / A / B

Each of these projects has been identified in 32 of the 40 scenarios (the cumulative probability is 76%) with an aggregated estimated cost within the regulatory review period of $11.89 million. The timing of the acquisition project is identified as 30/09/2007 (high growth) or 30/09/2010 (medium growth), and for the compensation it is 30/09/2008 (high growth) or 30/09/2011 (medium growth).

Each of these easement projects are related to a specific construction related augmentation, and is timed to precede the construction by one year. While we note some general inconsistency with respect to the timing of each project, and attribute this to typing errors, the timing in the information templates appears reasonable. However, we note that under the high demand growth scenario, the easement is required in just over a year from now. Considering the scope of work estimated, we consider the land designations and distances are appropriate, and that therefore so are the resultant costs. We recommend the entire proposed project cost be included in Powerlink's forecast capex.

APPENDIX I
REVIEW OF FORECAST REPLACEMENT PROJECTS

Far North Queensland 132 kV Line Replacement

The objective of this project is to replace the Kareeya-Innisfail-Edmonton (Cairns) and Tully-Cardwell-Ingham-Yabulu (Townsville) 132 kV lines. These lines are now over 50 years old. They are installed in a tropical environment and Powerlink has an independent assessment, undertaken in 2000 by engineering consultants Sinclair Knight Merz that recommends replacement of these lines by 2006. In April 2006, Cyclone Larry caused the failure of towers on the Innisfail-Edmonton and Kareeya-Innisfail lines, causing a complete loss of supply to Innisfail for some days. While Powerlink was able to repair the Innisfail-Edmonton line, as of early June it had not been able to get access to repair the towers on the Kareeya-Innisfail line, which are located in the world heritage tropical wetlands reserve that covers much of Far North Queensland, due to its inability to get access to the towers in the tropical wet season.

The forecast capex for the replacement of these lines included in Powerlink's Proposal is shown in Table I.1. Capex for the Kareeya-Innisfail line is committed, and the classification for each of the remaining projects under Powerlink's risk matrix is in the third risk level 'HIGH' of the four level system.

Table I.1: Components of the Far North Queensland Line Replacement ($m, 06/07)

Item	2007/08	2008/09	2009/10	2010/11	2011/12	Total
(Townsville) Yabulu-Ingham		5.59	41.64	27.03		74.26
Ingham-Cardwell			3.31	31.82	6.62	41.75
Cardwell-Tully				10.94	35.82	46.76
Kareeya-Innisfail Replacement	19.14	18.60				37.74
Innisfail-Edmonton (Cairns)		6.82	50.41	0.58		57.81
Total	**19.14**	**31.01**	**95.36**	**70.37**	**42.44**	**258.32**

Source: PB Associates
Note 1: In addition $9.91 million is budgeted for this project for the two year period 2005-7.

The replacement of these Far North Queensland lines represents about 32% of Powerlink's total forecast replacement capex and about 75% of Powerlink's total forecast capex requirement for line replacements. The Kareeya-Innisfail replacement line will actually be built between Tully and Innisfail on a new alignment that avoids the world heritage tropical wetlands.[8]

The planned replacement is a hybrid line with a 275 kV circuit on one side and 132 kV on the other. The 275 kV circuit will provide a third 275 kV circuit into Cairns (from Kareeya, where the existing two are from Chalumbin) while the 132 kV circuit will supply the various coastal towns between Townsville and Cairns. Under this proposal the Kareeya-Innisfail line through the world heritage park and the Kareeya-Tully line would both be dismantled, with the replacement lines following the coast all the way between Townsville and Cairns. This line will bypass the Kareeya power station[9], and generally avoids the designated world heritage wetland area.

The hybrid 275/132 kV coastal line between Townsville was chosen following a comprehensive economic planning study undertaken in 2004. This plan evaluated four options, all of which replaced the existing line between Kareeya and Innisfail with a new

[8] Powerlink has been seeking an easement between Tully and Innisfail since 1998, in order to be able to construct the Kareeya-Innisfail replacement line on the new alignment. However the proposal required Federal Government approval under the Environment Protection and Biodiversity Conservation Act. Conditional approval was granted in March 2005 and final approval in July 2006.

[9] The Kareeya power station remains connected to the 275 kV network at Challumbin.

line between Tully and Innisfail, thereby avoiding use of the existing route through the world heritage park. One of the options limited the voltage of the replacement lines to 132 kV while the other three options utilised different hybrid 275/132 kV line combinations. The economic analysis considered the growth in electricity demand in Far North Queensland through to 2024 and undertook the analysis over a 25 year period.

Given the fact that it now seems most unlikely that Powerlink will be able to find another line route into Cairns additional to those already available, and given the size of the project, the economic analysis was robust and most probably gave the same outcome as would have been indicated had the full consultation requirements of the regulatory test been applied. We agree that the replacement of the lines is required and support the implementation of Powerlink's selected project option, including the decision to make provision for a third 275 kV supply into Cairns.

However the 275 kV circuit is not immediately required and it could potentially be possible to defer a significant component of the total project cost by not stringing this circuit until reinforcement is necessary. This was the plan when this project was initially formulated in 2000 but the possibility was not explored in the 2004 business case. Powerlink advised that this was because the coastal communities between Townsville and Cairns would be dependent on a single circuit for significant periods while construction proceeded. We accept this but note the single circuit providing supply would be relatively new. We would have liked to have seen a more detailed analysis and risk assessment of the staged construction alternative that was originally proposed in 2000 and of the reasons for its rejection.

We also consider that, given that the installation of a 275 kV circuit will provide a third high capacity circuit into Cairns and significantly increase the power transfer capability in the area, the project should have been classified as a large transmission system augmentation and been subjected to the formal consultation and regulatory test requirements in the clause 5.6.6 of the NER.

Powerlink acknowledged in its economic planning study that the decision to treat the project as an asset replacement was a regulatory risk. However it considered that the augmentation component of the project was only $7.7 million, assessed as the difference between the total project cost and the cost of replacing existing 132 kV lines between Townsville, Kareeya and Cairns without any change in configuration or voltage change but with higher capacity conductor. On this basis it considered that any augmentation component could be classified as small and that notification in the APR was sufficient.

In making this assessment Powerlink included the cost of replacing the Kareeya-Tully line in its base case analysis even though this line is to be removed and not replaced. Furthermore, the analysis did not include the cost of acquiring the easement for the new section of line between Tully and Innisfail even though acquisition of this easement is only now being finalised. Had the cost of the Kareeya-Tully replacement been ignored, and the new easement cost included, the cost of the augmentation component of the project would have been well above the $10 million regulatory test threshold.

It is clear that the main driver for the asset replacement was the need to replace the existing 132 kV lines. However, given that the replacement of the Kareeya-Innisfail line on its existing alignment was not an option, and that the lines were no longer required to evacuate power from the Kareeya power station, like-for-like replacement of the existing configuration was not an optimal solution. It is arguable whether Powerlink should have used a like-for-like replacement of the existing arrangement, or a least cost reconfiguration that would have provided the existing level of secure power transfer into the affected coastal towns, as the basis for determining the asset replacement component of the project.

We note that many asset replacement projects include an augmentation component and we believe that the NER should be more specific as to when such projects must be

subjected to the consultation and regulatory test requirements for network augmentations.

These detailed project reviews have supported our conclusions and recommendations in Section 4.5.1.

Wurdong to South Pine Earth Wire Replacement

This project involves the replacement of the twin galvanised steel earth wires on one of the two 275 kV single circuit lines between Wurdong (near Gladstone) and South Pine (north of Brisbane). The total line length is 458 km and the estimated cost is $39.74 million. The project will be implemented progressively over the regulatory period as shown in Table I.2.

Table I.2: Cost Estimate for Wurdong – South Pine Earth Wire Replacement ($m, 06/07)

Item	2007/08	2008/09	2009/10	2010/11	2011/12	Total
Wurdong – South Pine Earth wire Replacement	1.41	6.66	11.58	4.69	15.39	39.74

Source: PB Associates

The need for this earth wire replacement was identified during routine helicopter maintenance patrols where a high level of corrosion and some broken strands were noted. The broken strands are thought to be partly due to vibration damage resulting from over-tensioning during construction. This has been exacerbated by using rigid clamps over part of the line, which means that there is no provision for the earth wire to move at the attachments to the supporting structures. If the earth wires are allowed to deteriorate further, breakages are likely to become a continuing problem, with each breakage causing a line outage after the broken earth wire comes into contact with a live conductor. Fallen earth wires also present a safety hazard due to the risk of the earth wire voltage rising to hazardous levels during a line fault. A risk assessment has classified the need for the replacement as B4 or very high.

The lines affected were constructed during the early 1970s and are now about 70% through their expected life. Powerlink expects that they will continue to be required and will be used to supply new 275 kV substations that are expected to be needed to supply continuing load growth in the coastal areas between Brisbane and Gladstone.

The project proposed for the next regulatory period will only address the problem on the first of the two lines. The earth wires on the second are in slightly better condition as the vibration damage is less due to an improved clamp design. It is intended that these earth wires will be replaced over the 2012-17 regulatory period.

On the basis of the information provided for this review we are of the opinion that Powerlink's decision to replace these earth wires is prudent. It is relevant to note that on Monday 12 June 2006, while this review was underway, a broken earth wire caused a transmission fault that resulted in a large part of the Auckland metropolitan area, including the CBD, being without power for up to ten hours.

Swanbank B Substation Rebuild

Swanbank B Substation is located in Ipswich in South West Brisbane and forms a major node of the 275 kV network supplying Brisbane and the Gold Coast. It was constructed in 1969 in conjunction with the construction of the Swanbank B Power Station. It is also a major point of supply feeding the 110 kV network supplying the 110 kV substations in the Brisbane area and is used to feed power generated by the Swanbank B power station into the 275 kV grid. The existing substation accommodates twelve 275 kV points of injection and is arranged in a double bus, breaker-and-a half configuration.

While the circuit breakers at the substation were replaced in the 1990s and have adequate fault rating, the fault rating of the remaining switching equipment is limited and this is limiting the operating flexibility of this part of the network. To address this issue Powerlink plans to extend the switchyard to accommodate one new switchyard "diameter"[10] and then progressively move the existing circuits up one diameter to allow each diameter to be progressively rebuilt. The estimated cost of the project is $37.81 million and construction is planned in accordance with Table I.3. The existing circuit breakers will be retained.

Table I.3: Cost Estimate for Swanbank B Substation Replacement ($m, 06/07)

Item	2007/08	2008/09	2009/10	2010/11	2011/12	Total
Swanbank B Rebuild	-	-	2.43	9.40	25.97	37.80

Source: PB Associates

In order to provide further support for the need for the project, Powerlink engaged Transfield Services Ltd to undertake a condition assessment of the site. The assessment was limited to a visual inspection. Using Powerlink's standard substation condition assessment scoring system the site rated 72% for serviceability and 64% for compliance, although it did identify some equipment, particularly the Siemens pantograph isolators and associated earth switches, which required replacement within three years. This result indicated that, while the design does not comply with Powerlink's existing standards, the substation will remain serviceable for the short to medium term without major refurbishment.

Nevertheless, we accept Powerlink's argument that Swanbank B is a major switching station located in a critical part of the network and that the current fault level limitations of much of the primary equipment limit operating flexibility. We also accept that, given the overall age and condition of much of the equipment and the fact that it no longer complies with Powerlink's design standards, a major rebuild could be warranted in conjunction with the fault level upgrade.

We note however that the Swanbank B power station, which is owned by CS Energy, is now nearing the end of its useful life. While no firm decisions on its future have been made, a likely scenario for the future of the site is the decommissioning of Swanbank B and the construction of a new combined cycle gas turbine power station, Swanbank F at an adjoining location. In itself, the decommissioning of Swanbank B should reduce the required fault levels, although this may be offset if Swanbank F proceeds or if there is further development of the 275 kV network in the area. We have seen no analysis of the impact of such scenarios on fault levels.

However, if Swanbank B is decommissioned four existing points of injection will no longer be required and the size of the substation could be reduced by up to a third. This could potentially reduce the asset replacement cost by 20% or more meaning a savings of around $7.5 million. In our view Powerlink should not make a firm decision to proceed

[10] A switchyard diameter can accommodate two incoming circuits, one on each end.

with this project until the long term generation requirements are known but at this stage it seems unlikely that the full forecast $37.5 million will be required. On this basis it would be reasonable to provide only $30 million in the next regulatory period. If Swanbank B is not decommissioned, and more funds are required to complete the work, then the balance of the cost can be provided in the first year of the 2012-17 regulatory period.

Tarong Secondary Systems Replacement

Tarong is a large substation that is the grid injection point for the Tarong and Tarong North Power stations. The substation includes nine 275 kV switch bays, two 275/132 kV transformers and two 275/66 kV transformers and small 132 kV and 66 kV structures. Powerlink is proposing a complete replacement of all 275 kV and 132 kV secondary systems at the substation at an estimated cost of $26.53 million as shown in Table I.4. Since there is little spare room in the existing control building, it is proposed to move the 132 kV panels into a new relocatable building to be positioned on the site. The project also includes minor work on other substations that are supplied from Tarong.

Table I.4: Cost Estimate for Tarong Secondary Systems Replacement ($m, 06/07)

Item	2007/08	2008/09	2009/10	2010/11	2011/12	Total
Tarong Secondary Systems Replacement	-	-	4.74	20.23	1.56	26.53

Source: PB Associates

In order to justify the project Powerlink undertook its own condition assessment in January 2006. We did not find this report convincing. It rated the overall condition of the plant as 21.8 out of a maximum of 40, which, using Powerlink's own scoring system, indicates that only minor refurbishment is required. While the report notes that some equipment needs to be replaced it also indicates that many of the relays are relatively new, having been replaced in the last five years, presumably under operational refurbishment programs.

Powerlink has assessed the risks from not implementing this project as B4 (very high) due to safety, obsolescence, operational, and reliability concerns. The main driver for the "very high" risk rating appears to be the safety hazard inherent in the original panels which contain exposed studs energised at low voltage. If this safety hazard did not exist the risk would likely have been downgraded to high. While we acknowledge the safety risk and accept that the panels do not meet the requirements of the Electrical Safety Act 2002, the problem is related to the design rather than the condition of the panels, and furthermore does not affect all panels. The hazard can be mitigated (but not eliminated) and has been present, and known about, ever since the panels were first installed.

Powerlink's forecast project capex requirement for the rebuild is higher than the estimated cost at completion for the rebuild of the Tarong substation outdoor switchyard[11] and 70% of the cost of rebuilding the outdoor switchyard at Swanbank B. It is based on an estimate that appears to provide for a complete replacement of all secondary systems with new equipment. In our view Powerlink's condition assessment has established that there are some systems within the station that will need replacing within the next regulatory period but it has not established that the complete replacement of all secondary systems is necessary.

Even allowing for the five year period that will elapse before the proposed project is implemented, and the further deterioration that will occur over that time we think an ongoing targeted replacement of individual systems could suffice. Even if, for operational reasons, it is necessary to systematically relocate the existing systems, as proposed by

[11] This project will be work in progress at the beginning of the next regulatory period and has an estimated cost at completion of $23.8 million.

Powerlink, many of the individual equipment items could be reused. On this basis we conclude the forecast capex requirement is excessive. However, on the basis of the information made available for this review, any estimate of the amount by which the required capex has been overstated would only be speculation.

Eagle Heights – Mudgeeraba Microwave Radio Replacement

Dedicated and secure communications links are required for the protection, control and operation of the network. This project is one of a number of microwave radio links serving the Brisbane metropolitan area that will be replaced in the next regulatory period, as shown in Table I.5.

Table I.5: Forecast Microwave Radio Replacements in Brisbane Metropolitan Area ($m, 06/07)

Item	2007/08	2008/09	2009/10	2010/11	2011/12	Total
Eagle Heights to Mudgeeraba Microwave Radio Replacement	0.22	0.17	-	-	-	0.40
Virginia to Mt Gravatt Microwave Radio Replacement	-	-	0.26	0.20	-	0.46
Wilkes Knob to Mt Glorious Microwave Radio Replacement	-	-	-	0.51	0.05	0.56
Metropolitan Communications Systems Replacement – Stage 2	-	-	-	0.20	0.15	0.35

Source: PB Associates

The above projects are all consistent with a documented telecommunications regional plan for Metropolitan Brisbane. The plan relies on the increased use of Optical Fibre Ground Wire (OPGW) as a communications link but still requires some links to remain microwave. While microwave radio links are not high cost items compared to other primary and secondary equipment, we accept that they do have a comparatively short life and that the capital expenditure forecast should include a provision for the ongoing replacement of existing equipment.

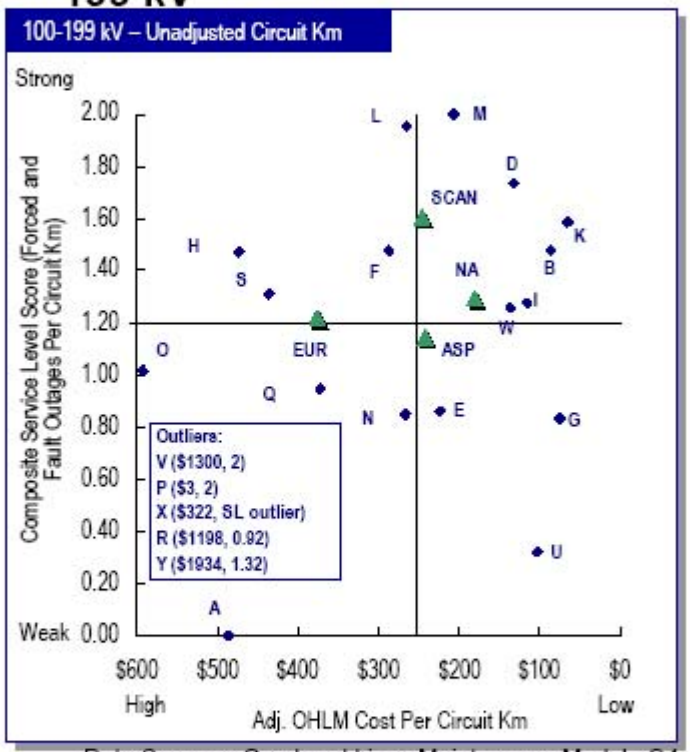
APPENDIX J
UMS benchmarking scatter plots

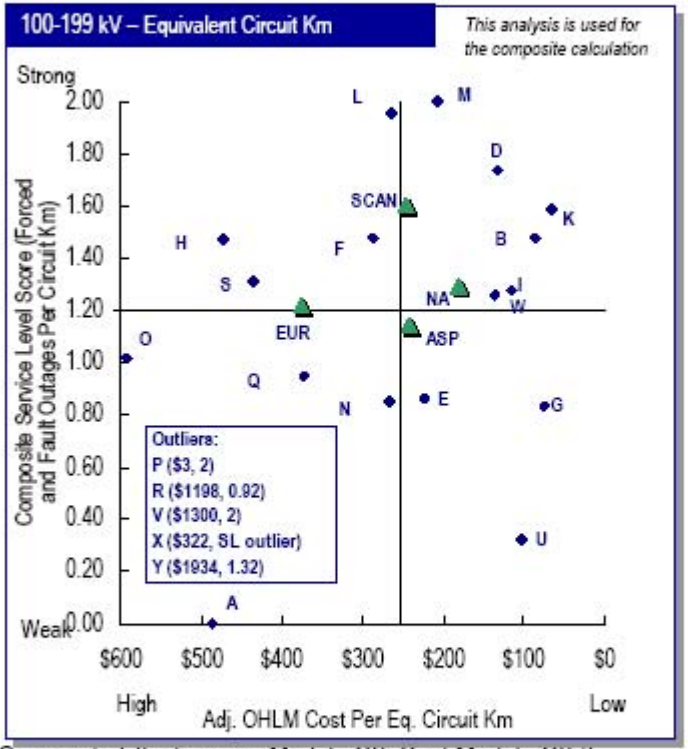
Overhead Line Maintenance – ITOMS 2005 Report

Report Revision 5: 28 April 2006

Validated Data

Performance Benchmark – Overhead Line Maintenance 100-199 kV*





Data Sources: Overhead Lines Maintenance Module Q4; Composite Effectiveness Module Q2; Cost Module Q2-6

2 = strong service level, 0 = weak service level

* Equipment normalizer has no impact on subfunctional results

Average lines indicate the average of the peer group

Companies: C, T – No 100-199kV Data

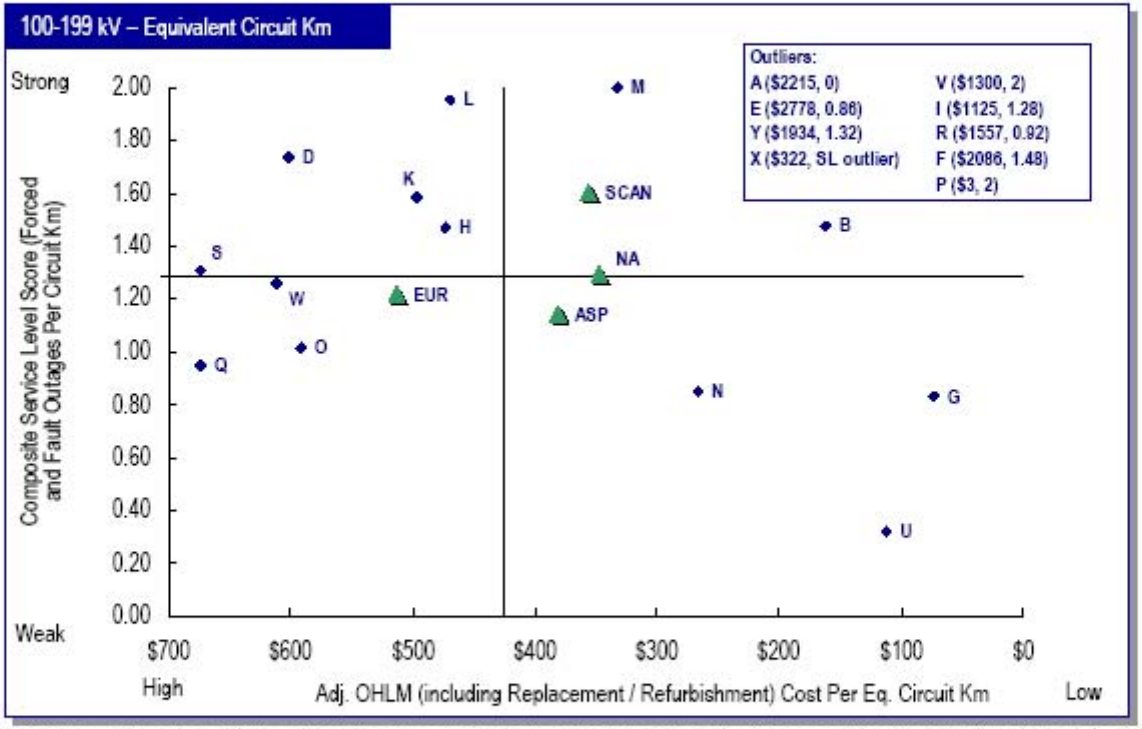
Data Revision Date: 3/14/2006

Overhead Line Maintenance – ITOMS 2005 Report

Report Revision 5: 28 April 2006

Validated Data

Performance Benchmark - Overhead Line Maintenance 100-199 kV* Including Replacement / Refurbishment Costs



Data Sources: Overhead Lines Maintenance Module Q4; Composite Effectiveness Module Q2; Cost Module Q2-7

2 = strong service level, 0 = weak service level

Average lines indicate the average of the peer group

Companies: C, T – No 100-199kV Data

* Equipment normalizer has no impact on subfunctional results

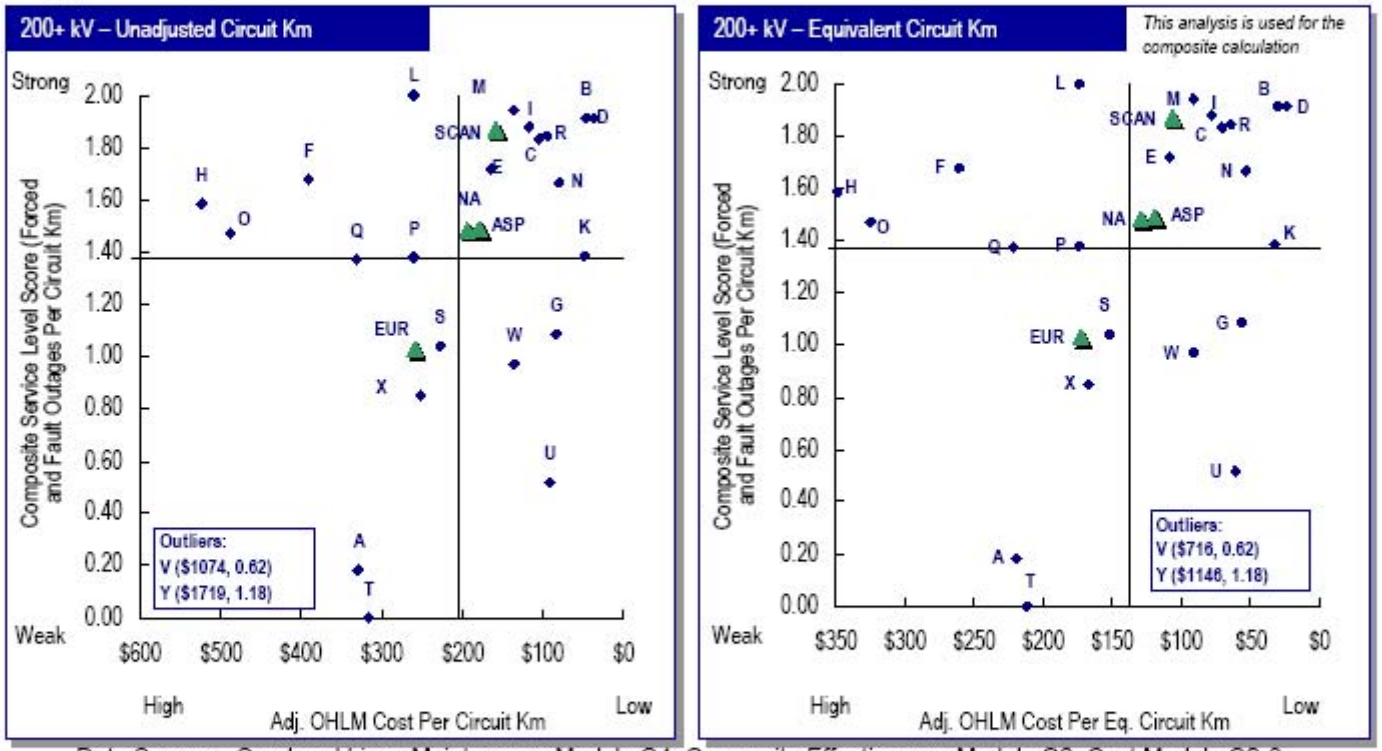
Data Revision Date: 3/14/2006

Overhead Line Maintenance – ITOMS 2005 Report

OHL Maint Analysis Revision Date: 3/14/2006 | OHL Maint Charting Revision Date: 4/28/2006

7

Performance Benchmark - Overhead Line Maintenance 200+ kV*



Data Sources: Overhead Lines Maintenance Module Q4; Composite Effectiveness Module Q2; Cost Module Q2-6

2 = strong service level, 0 = weak service level

* Equipment normalizer has no impact on subfunctional results

Average lines indicate the average of the peer group

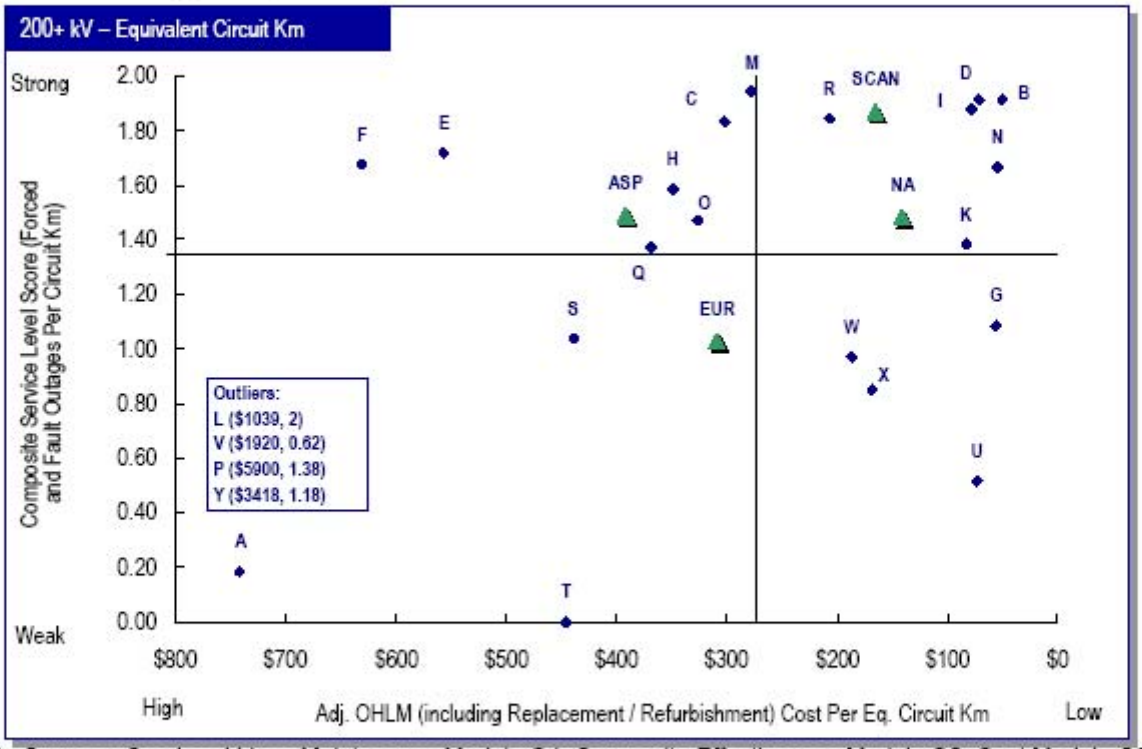
Data Revision Date: 3/14/2006

Overhead Line Maintenance – ITOMS 2005 Report

Report Revision 5: 28 April 2006

Validated Data

Performance Benchmark - Overhead Line Maintenance 200+ kV* Including Replacement / Refurbishment Costs



Data Sources: Overhead Lines Maintenance Module Q4; Composite Effectiveness Module Q2; Cost Module Q2-7

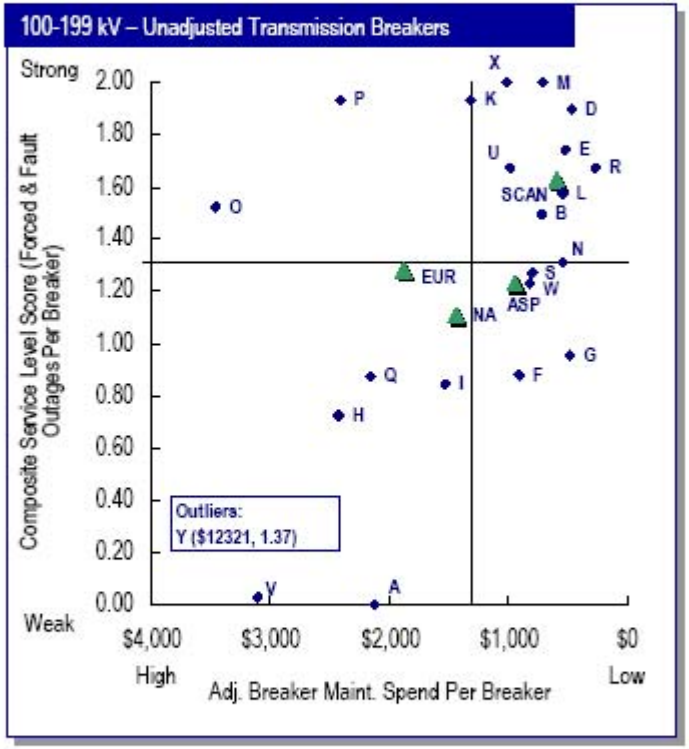
2 = strong service level, 0 = weak service level

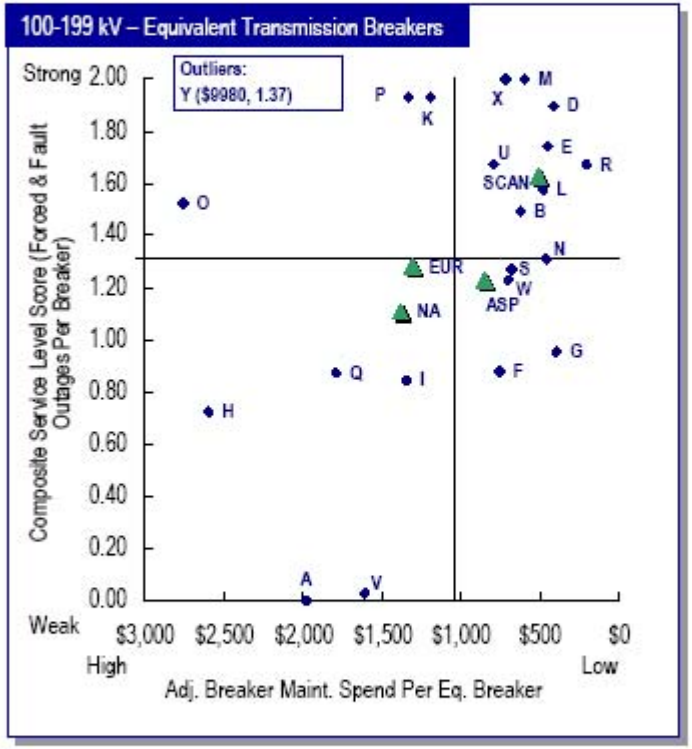
Average lines indicate the average of the peer group

* Equipment normalizer has no impact on subfunctional results

Data Revision Date: 3/14/2006

Performance Benchmark – Transmission Breaker Maintenance 100-199 kV





Data Sources: Trans. Breakrs & Cir. Switch. Maint. Module Q2; Composite Effectiveness Module Q2; Cost Module Q2-6

2 = strong service level, 0 = weak service level

Average lines indicate the average of the peer group

Companies: C, T – No 100-199kV Data

Data Revision Date: 3/14/2006

Transmission Breakers – ITOMS 2005 Report

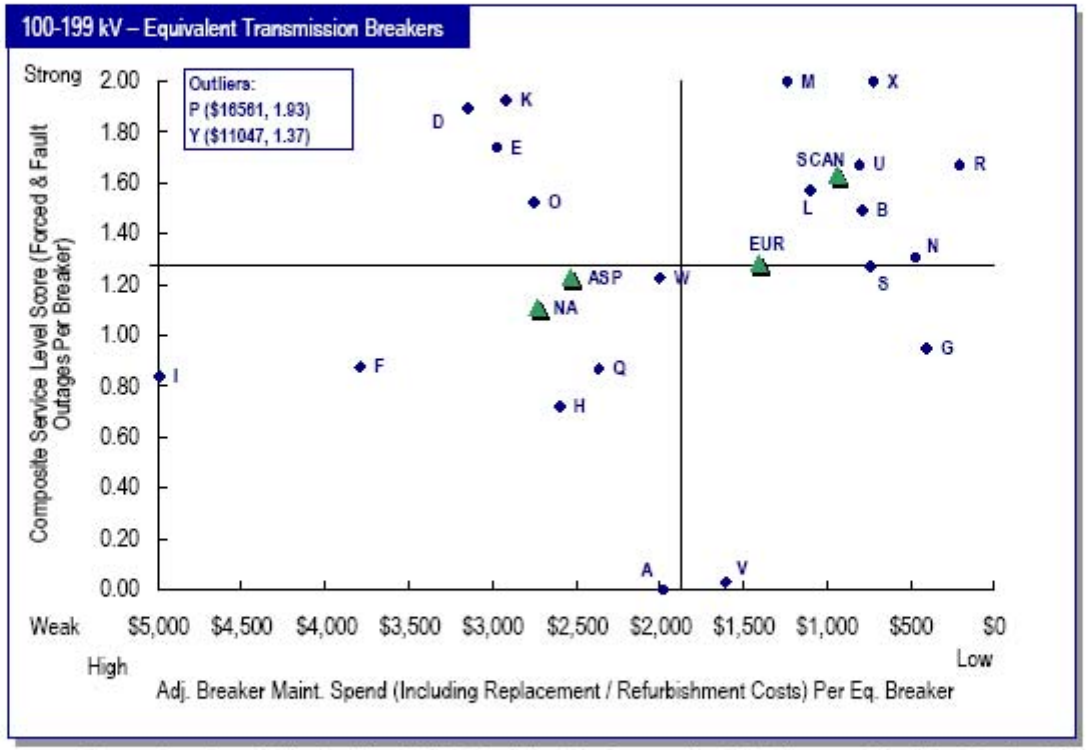
Breakers Analysis Revision Date: 3/15/2006 | Breakers Charting Revision Date: 4/28/2006

5

Transmission Breaker Maintenance – ITOMS 2005 Report

Report Revision 5: 28 April 2006
Validated Data

Performance Benchmark (Including Replacement / Refurbishment Costs) – Transmission Breaker Maintenance 100-199 kV



Data Sources: Trans. Breakrs & Cir. Switch. Maint. Module Q2; Composite Effectiveness Module Q2; Cost Module Q2-7

2 = strong service level, 0 = weak service level

Average lines indicate the average of the peer group

Companies: C, T – No 100-199kV Data

Data Revision Date: 3/14/2006

Transmission Breakers – ITOMS 2005 Report

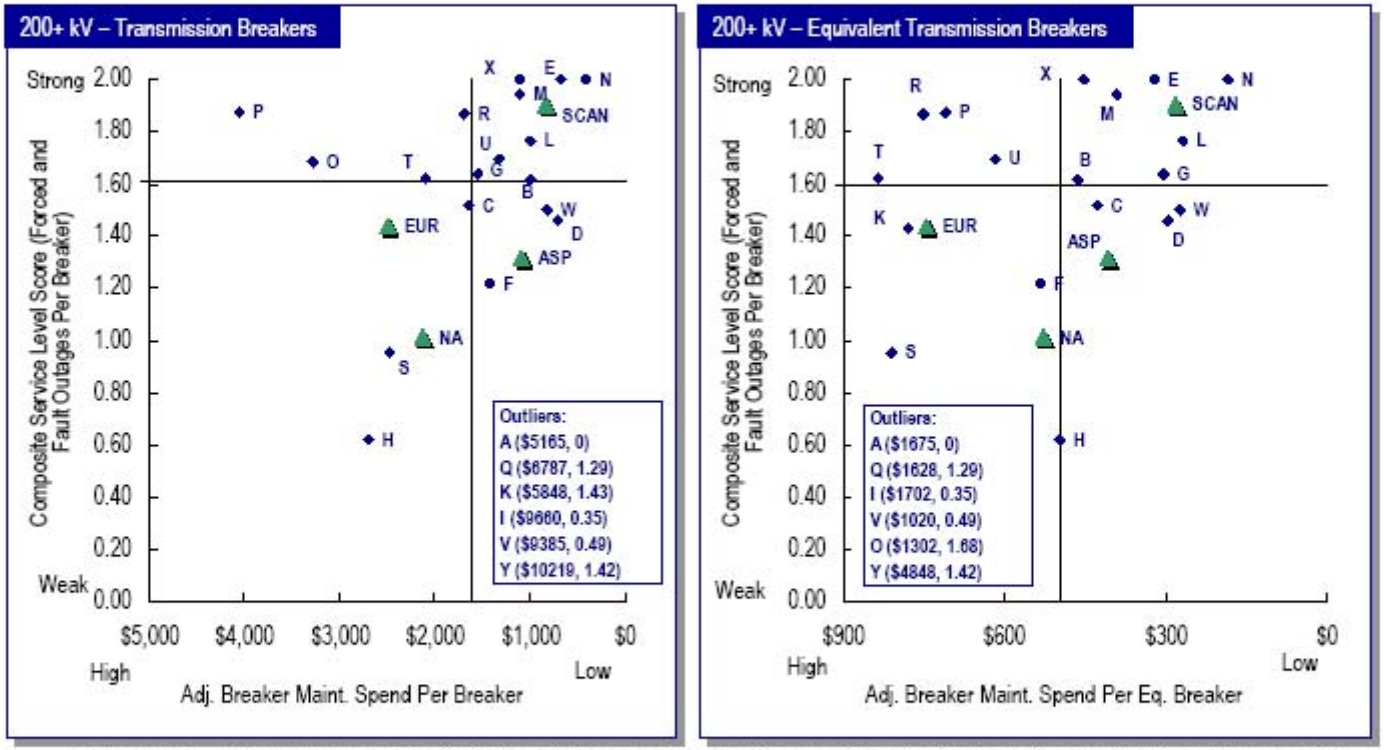
Breakers Analysis Revision Date: 3/15/2006 | Breakers Charting Revision Date: 4/28/2006

6

Transmission Breaker Maintenance – ITOMS 2005 Report

Report Revision 5: 28 April 2006
Validated Data

Performance Benchmark – Transmission Breaker Maintenance 200+ kV



Data Sources: Trans. Breakrs & Cir. Switch. Maint. Module Q2; Composite Effectiveness Module Q2; Cost Module Q2-6

2 = strong service level, 0 = weak service level
Average lines indicate the average of the peer group

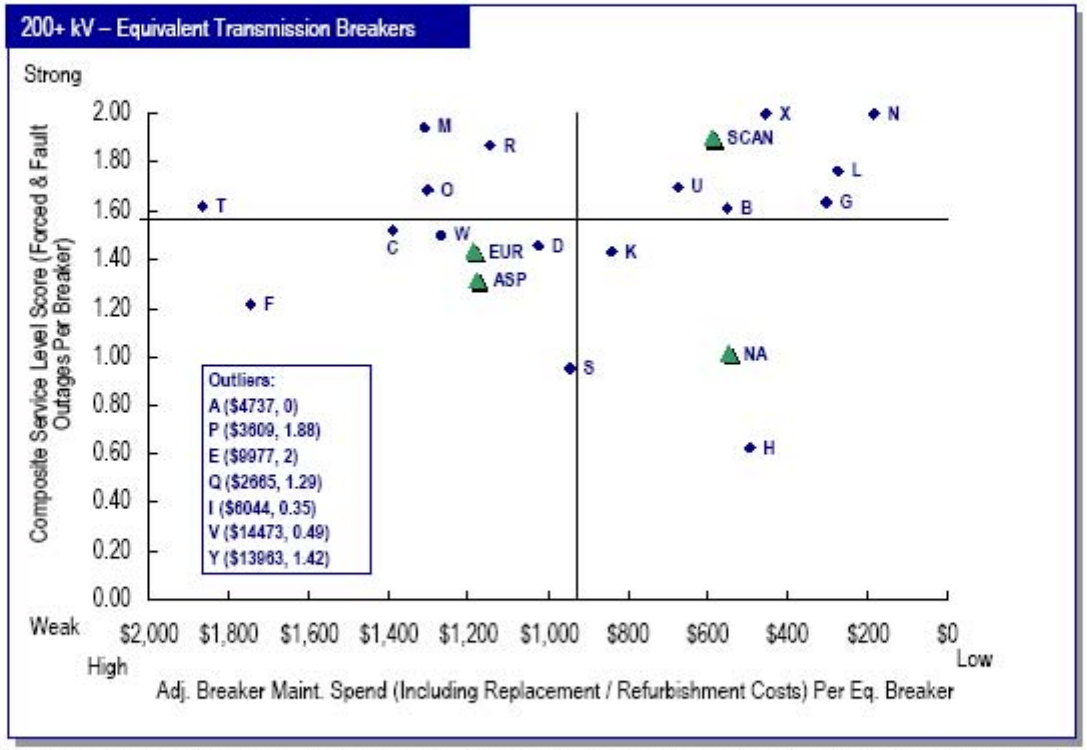
Data Revision Date: 3/14/2006

Transmission Breakers – ITOMS 2005 Report

Breakers Analysis Revision Date: 3/15/2006 **Breakers Charting Revision Date:** 4/28/2006

7

Performance Benchmark (Including Replacement / Refurbishment Costs) – Transmission Breaker Maintenance 200+ kV



Data Sources: Trans. Breakrs & Cir. Switch. Maint. Module Q2; Composite Effectiveness Module Q2; Cost Module Q2-7

2 = strong service level, 0 = weak service level

Average lines indicate the average of the peer group

Data Revision Date:	3/14/2006

Transmission Breakers – ITOMS 2005 Report

Breakers Analysis Revision Date:	3/15/2006	Breakers Charting Revision Date:	4/28/2006

8

APPENDIX K
Projects Recommended For Transfer to Capex

Table K.1: Operational Refurbishment Projects of a Capital Nature ($, nominal)

Project Description	Project Number	2007/08	2008/09	2009/10	2010/11	2011/12
I T Replacement		0.340	0.340	0.480	0.680	0.850
Surge Arrester Replacement		0.100	0.250	0.350	0.500	0.650
Replacement of 9 Woolooga Circuit Breakers	OR.00597	1.500	0.900			
Isolators Type Defects		0.110	0.110	0.250	0.250	0.250
Circuit Breaker Refurbishment		0.350	0.350	0.550	0.800	1.000
Plant Ratings-Equip Replacement		0.320	0.320	0.320	0.320	0.320
Air Conditioning		0.600	0.400	0.200	0.400	0.600
Secondary Systems Functional Improvements			0.500	0.500	0.500	0.500
GPS Clock Replacement		0.120	0.120	0.120	0.120	0.120
IED Replacements		0.150	0.150	0.300	0.600	0.600
SUN Workstation Replacement - Stage 1	OR.00887	0.500	0.500			
SUN Workstation Replacement - Stage 2	OR.01795		0.600	0.600		
SUN Workstation Replacement - Stage 3	OR.01796				0.600	0.600
Replace Quad4/JR1 meter/recorders (all power stations)	OR.00653	0.593				
EMS Component Replacement		0.200	0.400	0.400	0.400	0.400
NQ RTU Replacement		0.200	0.200	0.200	0.200	
Power Stations RTU Replacement		0.200	0.200	0.200	0.200	0.200
Hathaway Event Recorder Replacement	OR.00914	0.200				
SVC Control System Replacements		0.050	0.250	0.250		
Relay Replacements		0.400	0.400	0.400	0.400	0.400
Supply Point Refurbishment		0.250	0.250	0.250	0.250	0.250
CB Fail relay replacement		0.200	0.200	0.200	0.200	
Protection Signalling replacements		0.320	0.320	0.320	0.560	0.560
Battery Replacement Program		0.120	0.405	0.405	0.405	0.405
Diesel Generator Replacement		0.150	0.150	0.150	0.150	0.150
Gladstone - Gin Gin Fdr 814 Tension Insulator Replacement	OR.00911		0.446	0.626	0.446	0.626
Fdr 858 Ross Chalumbin Reinsulation	OR.01717	0.540	0.540	0.560	0.540	0.560
F805 BS 1018 Suspension Insulator Replacement	OR.01705		0.300	0.330		
BS 1019,F806 Insulator Replacement	OR.01706			0.900	0.900	0.900
BS 1449 F9908 Polymer Insulator Replacement	OR.01710			0.900	0.900	0.900
BS1410,F7247_7246 Polymer Insulator Replacement	OR.01711			0.700	0.700	0.700
F815 BS 1024 Suspension Insulator Replacement	OR.01712				0.600	0.600
Feeder 858 Ross Chalumbin Suspension Tower Replacement	OR.01717		0.890	0.890	0.890	
Totals		7.513	9.491	11.351	12.511	12.141

APPENDIX L
Service Performance Measure Definitions

Measure 1 Transmission circuit availability	
Sub-measures	Transmission circuit availability (critical circuits) Transmission circuit availability (non-critical circuits) Transmission circuit availability (peak periods)
Unit of measure	Percentage of total possible hours available.
Source of data	TNSP outage reports and system for circuit availability Agreed Schedule of Critical Circuits and plant Peak period - 7:00 am to 10:00 pm weekdays, excluding public holidays* Off peak period - all other times
Definition/formula	Formula: $\frac{\text{No. hours per annum defined (critical / non – critical) circuits are available}}{\text{Total possible number of defined circuit hours}} \times 100$ Definition: The actual circuit hours available for defined (critical/non critical) transmission circuits divided by the total possible defined circuit hours available Critical circuits are elements of the 330 kV network, the 275 kV interconnected network that forms the backbone of the transmission system and interconnections to other jurisdictions. All other circuits are non-critical* Note that there shall be an annual review of the nominated list of critical circuits/system components
Exclusions	Unregulated transmission assets (e.g. some connection assets) Any outages shown to be caused by a fault or other event on a '3rd party system' e.g. intertrip signal, generator outage, customer installation Force majeure events per Service Standards Guidelines Any outage not affecting the TNSP's primary transmission equipment*
Inclusions	'Circuits' includes overhead lines, underground cables, power transformers, phase shifting transformers, static VAr compensators, capacitor banks, and any other primary transmission equipment essential for the successful operation of the transmission system Outages from all causes including planned, forced and emergency events, including extreme events

Notes: Items marked * were not included in original definitions of Service Standards Guidelines, 2003

Measure 2 Loss of supply event frequency index	
Sub-measures	Number of events greater than 0.2 system minutes per annum Number of events greater than 1.0 system minutes per annum
Unit of measure	Number of significant events per annum
Source of data	TNSP outage reports and system for circuit availability
Definition/formula	Formula: $\text{System minute} = \frac{\text{Customer outage duration (minutes)} * \text{load lost (MW)}}{\text{System maximum demand (MW)}}$ Definition: A count of the number of events in a year that have an impact of more than 0.2 or 1.0 system minutes as appropriate. A system minute for an event is the customer outage duration (in minutes) times the load lost (in megawatts) divided by the highest system maximum demand (in megawatts) that has occurred prior to the time of the event*
Exclusions	Unregulated transmission assets (e.g. some connection assets) Outages shown to be caused by a fault or other event on a 'third party system' e.g. intertrip signal, generator outage, customer installation Planned outages Force majeure events per Service Standards Guidelines
Inclusions	All unplanned outages exceeding the specified impact (that is, 0.2 system minutes and 1.0 system minutes) All parts of the regulated transmission system Extreme events

Notes: Items marked * were not included in original definitions of Service Standards Guidelines, 2003

Measure 3 Average outage duration	
Unit of measure	Minutes
Source of data	TNSP Outage Reporting System
Definition/formula	Formula: $\frac{\text{Aggregate minutes duration of all unplanned outages}}{\text{Number of events}}$ Definition: The cumulative summation of the outage duration time for the period, divided by the number of outage events during the period The start of each outage event is the time of the interruption of the first circuit element. The end of each outage event is the time that the last circuit element was restored to service* The impact of each event is capped at 7 days (see note 2)
Exclusions	Planned outages Momentary interruptions (duration of less than one minute) Force majeure events per Service Standards Guidelines
Inclusions	Faults on all parts of the transmission system (connection assets, interconnected system assets) All forced and fault outages whether or not loss of supply occurs

Notes: 1. Items marked * were not included in original definitions of Service Standards Guidelines, 2003.
2. The 7 day cap applied to Powerlink was based on SKM's original recommendations but was not included in the standard definitions.