Review of Draft ACCC Determination re EnergyAustralia Transmission Projects

MACQUARIE PARK

BERESFIELD

HOMEBUSH

SYDNEY CBD

1 July 2004

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1. Executive Summary

EnergyAustralia has requested that Sinclair Knight Merz review and comment on the draft ACCC determination with respect to historical capital expenditure on a number of EA projects. In undertaking this review, SKM has referred to the GHD assessment of these projects, per the GHD report titled "EnergyAustralia Regulatory Review – Capital Expenditure and Asset Base, Operational Expenditure and Service Standards" dated March 2004.

In particular, EnergyAustralia has requested advice from SKM, as to issues of capital efficiency associated with the following projects:

- Macquarie Park 132/11kV substation,
- Beresfield 132/33kV STS and associated works,
- CBD augmentation associated with Haymarket 330/132kV substation, and
- Homebush 132kV cable replacement.

It is understood that there is general acceptance by ACCC and GHD that the justification for, and the timing of, these projects was appropriate given the magnitude and nature of the various system constraints and overloading that might occur on the EA system under contingency situations. The advice sought by EnergyAustralia from SKM is whether the scope and capital cost of the solutions implemented may reasonably be considered to be "capital efficient" solutions.

It is SKM's findings and conclusions that:

- The Macquarie Park 132/11kV project was selected as the least cost (NPC) option from six alternatives that represented the most likely technically and economically viable scenarios. The final project cost of $20.49M ($12.0M allocated as transmission) was comparable with the original Board Approval of $14.25M (plus 132kV cable cost approved by the EnergyAustralia Board at $M5.3). The transmission component of $12.0M of the final costs compare favourably with the benchmarked industry costs of $16-17M (excludes 11kV feeder works).
- The Beresfield 132/33kV STS project is currently timed for 2005, which is somewhat overdue by all reasonable electricity industry planning standards. The preferred option has been selected as the least cost (NPC) option of the three logical solutions. As each stage of project authorisation has been reached, EnergyAustralia has reviewed the NPC comparisons to validate the preferred option. The extent of concept design information, preliminary designs and estimates, and estimated costs for the various stages of the project are as good as one would expect for this type of project, given the vagaries of public consultation processes. SKM is of the view that the approvals process, and staged authorisations, documentation and

regular review of NPC's of alternatives represents a "Model Case Study for the Corporate Governance of Capital Works Projects".

- The Homebush Bay 132kV overhead transmission line undergrounding was undertaken in 1998 and 1999 at the request of the Olympic Coordination Authority, who contributed most of the $M37 cost of the project, with EnergyAustralia contributing the remaining $M10. It appears this project was not necessary for electrical / network reasons, and delivers little benefit to electricity consumers during the period of the remaining life of the overhead lines that were replaced. Some of these lines were, however, apparently in poor condition and may have required replacement around 2005 anyway, with the others expected to remain serviceable until 2015. It appears reasonable that the (depreciated) cost of the new underground assets be included in EnergyAustralia's regulatory assets from the date when replacement of the old assets would have been necessary.
- The CBD Haymarket / Campbell St project was initiated to add new transmission capacity to the Sydney CBD and inner suburbs required by 2004 to maintain supply reliability and cater for strong load growth. The expected cost of delivering the CBD substation and transmission projects of ~$M94 are significantly above initial estimates and the $M46[1] cost used in the 1999 regulatory test. The overruns are mostly due to underestimating the actual costs ($M34.8), followed by externally imposed scope changes ($M9.3).

  While SKM has not reviewed the design, scope or costs in detail, in general the selected option and project costs appear reasonable for an undertaking of this nature in a dense CBD location. While a formal re-evaluation of project alternatives would have been preferable when the likely cost increases became known, it is likely EnergyAustralia would have experienced similar increases in most of the other options, as the variation has been shown to be overwhelmingly due to systemic underestimating of costs, and externally imposed changes.

  Further to this, and depending on the time during the project that EA became aware that there was likely to be a substantial cost overrun, consideration would have to be given to the impact on the security of supply to the CBD if the project were suspended for re-evaluation of options, and possible implementation of an alternative project strategy.

  The final delivered cost of the project appears reasonable where SKM has a basis for comparison, and it can be expected that the competitive procurement processes that applied to over 80% of costs would deliver efficient market prices for those items.

[1] Slightly different cost estimates are quoted in different source documents, reflecting incremental changes in the design and costing of the project as it was developed.

On balance, SKM considers the costs for Macquarie Park, Beresfield, and the CBD projects are likely to be efficient. In each case the lowest cost option from a suite of alternatives has been chosen, and the costs for project delivery appear to be in line with independent estimates. The prudency of these investments does not appear to have been called into question by ACCC, and SKM has not analysed them.

For Homebush, SKM considers the undergrounding project was not required in 1998 for network reasons, and customers should not fund the costs of undergrounding while the existing assets would have remained serviceable. EnergyAustralia estimates that one of the three tower lines would have required replacement at around 2003 (15% of the total cost), while the remaining two tower lines would have required replacement at around 2015. On this basis, it would appear reasonable that the depreciated value of the replacement assets (less capital contribution) be included in the regulated asset base from the date when they would otherwise be required. This implies 15% of EA's costs should be included now (depreciated by 6 years), with the remaining 85% included from 2015 (depreciated by 17 years).

Finally, SKM notes that while EnergyAustralia has a number of assets that are classified as transmission, their characteristics in terms of planning, function, and utilisation much more closely resemble distribution assets than transmission assets. Variability and uncertainty in local network loads will be significantly higher than those experienced in the backbone transmission network where there is much greater diversity of loads. Individual projects can be expected to vary in cost, timing and scope to a much greater degree than traditional transmission assets, and this should be considered an inherent characteristic of electricity (particularly distribution) networks. As EnergyAustralia's long term strategy of 132kV sub-transmission is gradually realised over the coming decades, and EnergyAustralia's 132kV network becomes increasingly meshed, there will emerge an issue of "classification creep", where significant amounts of assets providing an essentially distribution function will be classified as transmission. This will require either a more flexible approach to transmission regulation, or a definition that better classifies these assets as distribution.

2. Macquarie Park Project

2.1 Background

The Macquarie Park 132/11kV zone substation was established in 2001 to relieve N-1 contingency overloads on Epping and North Ryde zone substations. The timing of the project was advanced from 2005 to accommodate anticipated customer proposals for an additional 10MVA of loading by the end of 2001. Some of the specific customer spot loads did not proceed as expected but general load growth and the promotion of the area as a high technology industrial park necessitated the establishment of a zone substation in the area.

2.2 GHD Assessment of Macquarie Park Project

The GHD report addresses the Macquarie Park project in section 4.6.2 (page 32). GHD conclude that:

1. EnergyAustralia have supplied load details which indicate that the investment was needed to address the load growth in the area. If the assessment could be based on this information and EnergyAustralia's presentation of the project at the interviews, GHD would also conclude that the investment was needed. However, with little information on costings and detailed options analysis, GHD cannot form a conclusion on the efficiency of this investment."

It is understood that as a result of GHD failing to form a conclusion on the matter, the ACCC in its draft determination proposes:

> *... to disallow any return on EnergyAustralia's investment in the Macquarie Park substation during the period of construction for the draft decision. This amount to a $3million dollar reduction or 26 per cent reduction to the carried forward value of this project. See section 3.20 for a discussion on how the ACCC determined this reduction.*

2.3 SKM Assessment of Macquarie Park Project

SKM previously undertook an assessment of the Macquarie Park project, which was reported on in the document "Major Projects (99/00 to 03/04), Prudence Assessment, March 2003". In that report it was noted that:

"An energy at risk analysis shows that the value of energy at risk by 2002/03 justifies the capital investment".

2.4 SKM Review of Project Documentation

As further verification, SKM has recently reviewed a number of EnergyAustralia documents relating to this project, including:

- Letter from Thiess Construction dated 19/8/2002 requesting 3.2MVA of HV supply to Macquarie Park station.
- EA Network Planning memo SNP245 defining approval required for establishment of temporary works at Macquarie Park zone substation.
- EA Network Planning memo SNP246 defining 132kV feeder connections to Macquarie Park zone substation.
- EA Network Planning memo SNP247 defining the scope of works for establishment of a permanent 132/11kV zone substation at Macquarie Park.
- Summary of IPART submission showing $10M capital provision for Macquarie Park, over the period 00/01 to 04/05. [*This project was considered to be classified as distribution at the time of the 1999 distribution submission to IPART*]
- Copy of Request for Proposal (RFP) titled "Implementation of Demand Management Initiatives to Reduce Peak Summer Load in North Ryde and Epping".
- EA Project Brief (29 pages) for Macquarie Park project dated 13/9/2000.
- EA document titled "Macquarie Park Options" outlining the background to the project and evaluating three (3) basically different options for implementing the Macquarie Park substation (33/11kV, 66/11kV and 132/11kV) and a further three options/scenarios for deferring the major project work through various levels of 11kV system augmentation. A summary of the Nett Present Costs (NPC) of the various options is as follows:

Option	Description	NPC ($M)
1*	New 66/11kV sub (2001)	25.2
2*	New 33/11kV sub (2001)	28.8
3*	New 132/11kV sub (2001)	11.6
4A	Defer 132/11kV sub to 2002 (w/o Exodus and PRL loads)	15.7
4B	Defer 132/11kV sub to 2002 (with Exodus and PRL loads)	21.7
4C	11kV sensitivity analysis (w/o Exodus and PRL loads)	15.5

* Note: All options exclude common 11kV distribution costs.

SKM has separately and independently estimated the capital cost of Macquarie Park 132/11kV zone substation, based on generally accepted electricity industry costs and has arrived at a project estimate of $16.69M, excluding 11kV feeder costs (see Appendix A)..

2.5 Summary – Macquarie Park 132/11kV Substation

The SKM Project Reconciliation Summary for Macquarie Park is attached at Appendix C. This provides a summaried history of the project costs from inception to completion (on the current date). From this summary the following key findings emerge:

- The 132/11kV supply option was selected as offering the lowest NPC cost from a range of options including deferment through 11kV augmentation.
- The optimum timing of the project was disrupted by a number of large customer loads which did not eventuate.
- SKM's independent cost estimate for Macquarie Park substation (transmission component) is comparable with the original Board approval and higher than the proposed transmission allocation of $12M.

3. Beresfield 132/33kV STS and Associated Works

3.1 Background

The areas of East Maitland and Tarro, and parts of surrounding rural areas are supplied from the Kurri 132/33kV subtransmission substation (STS) and Tomago 132/33kV STS. The area has experienced high summer load growth rates (up to 9% pa) since 1993, with N-1 contingency overloading at East Maitland and Tarro zone substations, as well as Kurri STS and Tomago STS, and parts of the 33kV subtransmission system. The preferred method of augmentation is to construct a new 132/33kV subtransmission substation at Beresfield and associated works, over the period from 2005 through to about 2011.

3.2 GHD Assessment of Beresfield 132/33kV STS

The GHD report addresses the Beresfield project in Section 4.6.3 (page 33) and again in Section 5.2.2 (page 40).

In section 4.6.3, GHD note that:

- "The documentation supplied to GHD by EnergyAustralia does not clearly detail the scope of work nor the basis on which the estimates have been prepared.
- The rationale covered by the planning reports seems to be appropriately based on the load and rating information supplied. Without a clear understanding of the scope of work and appropriateness of the expenditure GHD are unable to form an opinion on whether the expenditure is prudent."

Further, in Section 5.2.2, GHD comment:

"The documentation supplied to GHD by EnergyAustralia does not clearly detail the scope of work or the basis on which the estimates have been prepared.

The rationale covered by the planning reports seems to be sensible based on the loading and rating information supplied. Without a clear understanding of the scope of work and appropriateness of the proposed expenditure GHD is unable to form a firm opinion on whether the expenditure of prudent."

The reasons GHD has not been able to form an opinion on this project can be summarised as follows:

- Although the various Planning reports have identified a large number of options and arrived at recommended capital projects that overcome short and long-term limitations in handling increased loads in the area, there is a lack of rigour in the cost estimates.
- The documentation to support the overall capital cost estimates has not been provided.
- GHD would have expected to see some working papers and Board submissions prior to this project being included in the ACCC application. No such papers have been provided.
- There is no evidence that any of the new capital governance process as summarised in Section 3.8 above has been formally followed on this project. Based on the information provided the project is at the Justify and Plan stage and certainly has passed through the Develop Feasible Options stage. At this point there should be some evidence of Approval by the Manager, Asset and Investment Management or Board Sub committee. No such approval has been provided.
- GHD would expect at least to see preliminary designs and estimates and some form of engineering scope documentation. The 2002 Planning Reports and the Outline Business Case dated 24/12/2003 is the only documentation provided to GHD."

3.3 SKM Assessment of Beresfield STS Project

SKM previously undertook an assessment of the Beresfield 132/33kV STS, which was reported on in the document "Major Projects (99/00 to 03/04) Prudence Assessment, March 2003". In that report it was noted that.

"A significant value of energy at risk and contribution to system unreliability (SAIDI) by 2004/05 has been identified."

A summary of the energy at risk at East Maitland zone substation, and Kurri STS, are attached at Appendix B (line items 32 and 6). This summary does not reflect the full energy at risk for contingencies such as feeder outages, as this would require complex load flow studies. The energy at risk assessment is based on energy at risk for substation contingencies only, and is therefore conservative, and if anything understates the true situation.

Nevertheless, the energy at risk for East Maitland in 2005 is valued at $590k, compared with an annualised project cost of $680k, and for Kurri STS in 2005, energy at risk is valued at $26.1M, compared with annualised project costs of just $1.3M.

Clearly on this basis, the Beresfield 132/33kV STS project and associated works is not only prudent and efficient , but is overdue by all reasonable electricity industry planning standards.

3.4 SKM Review of Project Documentation

As further verification, SKM has recently reviewed a number of EnergyAustralia documents relating to this project, including:

- EA subcommittee report for capital investment and utilisation meeting 10/04/04 – dated 23/06/04 "Beresfield 33kV Feeders, Stage 1".
- EA subcommittee report for capital investment and utilisation meeting 10/04/04 – dated 23/06/04 "Thornton Zone Substation".
- EA Business Case Summary dated 31/03/03.
- EA Hunter Planning Report 41C-99 – dated 13/12/02 "East Maitland/Thornton/Tarro Area".
- EA summary paper "Development of Electricity Supply to East Maitland/Thornton/Tarro", including a preliminary application of ACCC regulatory test.

These documents outline the options and scenarios available to overcome the numerous system constraints that exist on the existing Kurri and Tomago subtransmission systems. The documents also present a logical sequence of lower cost staged reinforcements such as transformer upgrades, capacitor banks, and temporary substation works, prior to the commitment of the major project expenditure on Beresfield STS.

The sequence of authorisations sought for the various project elements that go to make up the Beresfield STS project were:

- March 2003 – Authorisation sought for Beresfield 132/33kV substation works: $20.6M
- March 2004 – Authorisation sought for Thornton 33/11kV substation works: $9.2M
- June 2004 – Authorisation sought for Beresfield 33kV feeder works – Stage 1: $8.1M
- Future – Authorisation to be sought for Beresfield 33kV feeder works – Stage 2: $5.6M (initial estimate)

SKM notes that EnergyAustralia conducted a Nett Present Cost assessment of augmentation options, and reviewed this assessment at each stage of authorisation, with the following results:

Augmentation Option	Initial 1999 NPC	2003 NPC Review	2004 NPC Review
1. 132/33kV @ Beresfield (preferred option)	$20.087M	$24.32M	$32.042M
2. 132/11kV @ Beresfield	$27.477M	$32.159M	$46.615M
3. 132/66kV @ Beresfield	$23.701M	$30.174M	$47.244M

SKM also notes that a major "external variable" that is impacting on the likely final scope and cost of this project is the public and community consultation process that must be gone through in finalising the 33kV feeder routes and configurations (extent of undergrounding required). This is not unusual for this sort of project, and tends to impact on feeder costs more than substation costs (although these too can be impacted by site selection, visual impact, and noise mitigation). Feeder

costs can be drastically affected by major diversions of overhead routes, average spanning, and undergrounding costs.

It is notable that while the original cost of 33kV feeder works for this project (in 2002/03) was estimated at between $4.5M to $8.2M, it is now estimated at $8.1M for Stage 1, and $5.6M for Stage 2.

This factor highlights the difficulty in being "too specific" about project cost estimates within the "5 to 7 year ahead window" required of ACCC submissions.

3.5 Summary – Beresfield 132/33kV STS Project

The SKM Projecct Reconciliation Summary for Beresfield 13/33kV STS is attached at Appendix D. This provides a summarised history of the project costs from inception to completion (on the current date for incomplete projects). From this summary the following key findings emerge:

- EnergyAustralia have considered a range of viable options likely to represent the minimum NPC cost of augmenting the Kurri and Tomago STS systems.
- EnergyAustralia have followed a logical and timely sequence of preparation of planning reports (Dec 2002) and Board Subcommittee Authorisations (March 2003, March 2004 and June 2004), consistent with the timing requirements of the project, and the availability of concept designs, initial estimates, and progress with public consultation processes.
- EnergyAustralia have consistently reviewed the "minimum NPC cost" of the preferred option, and a range of other feasible options at key milestones in the development of the project.
- The degree of detail in project scoping, conceptual designs (as distinct from engineering designs) and initial project estimates is consistent with SKM's experience with the project planning timetables of other electricity distributors in Australia. As a practical and very recent example of the volatility of project costs, SKM has recently and directly been involved in a substation tendering process where the utility client advised that substation civil costs had escalated by 30% in the past two years as a result of the upsurge in activity in the building and construction industry.
- Contrary to GHD's stated expectations, SKM would not expect to see any more in the way of "preliminary designs and estimates, and some form of engineering scope documentation" (p41), in relation to the Beresfield 132/33kV project.

4. Homebush

4.1 Background

A number of EnergyAustralia 132kV overhead steel tower transmission lines running through Homebush Bay were undergrounded in 1998 and 1999 by EnergyAustralia under an arrangement with the Olympic Coordination Authority. This work was necessary to release land constrained by transmission easements that was required for Olympic facilities including hockey and tennis venues, and the Olympic Village.

The age of the assets ranged from 25 to 38 years, compared to NSW Treasury guideline service lives of 60 years. EnergyAustralia's assessment of the condition of the lines indicated they were unlikely to remain serviceable for their full life, with replacement expected to be required at around 45 years.

Of the $M37 cost of undergrounding these transmission lines, $M27 was provided by OCA (essentially a capital contribution to EnergyAustralia), with the remaining ~$M10 funded by EnergyAustralia. EnergyAustralia became the official Olympic Energy Partner, with part of the undergrounding costs borne by EnergyAustralia notionally forming an in-kind contribution to SOCOG (along with energy and other costs) to secure Olympic Partner rights.

4.2 GHD Assessment of Homebush Project

GHD was not requested to comment on this project, and its report makes no specific mention of it.

4.3 ACCC draft decision regarding Homebush Project

The ACCC draft decision is to exclude the $M10 cost of Homebush on the basis that:

- EnergyAustralia has not demonstrated OCA had statutory authority to direct it to underground the cables
- EnergyAustralia has not provided a VM study or other consideration of alternative options
- EnergyAustralia has not adequately explained why it contributed $M10 to the project

On this basis, ACCC considers EnergyAustralia has not demonstrated a need for this project.

4.4 SKM Assessment of Homebush Undergrounding Project

Initial estimates by SKM indicate the $M37 cost of undergrounding 19.4km of 132kV XLPE cable is reasonable. SKM has previously (Dec 2003) valued the underground portion of these feeders at $M41.85. On this basis, the cost of carrying out the undergrounding project would appear reasonably efficient.

SKM considers that there was not a compelling network need to replace the existing overhead lines in 1998/1999, given their remaining service life and the possibility for life extension. The underground cables do, however, have a higher value both by virtue of their lower age and higher cost per unit length.

Issues to be considered in determining the appropriate treatment for these costs include:

- The remaining life of the existing overhead lines.
- Whether the existing lines could have been replaced with equivalent overhead lines at the end of their service life. It is becoming difficult to secure planning approval for new overhead transmission lines in urban areas, though replacing an existing line may have been feasible.
- Whether EnergyAustralia received benefits in kind (Olympic partner status) in return for its $M10 cash contribution from the project. If this is the case, then the $M10 could be considered an "in kind" capital contribution (less any other cash or in-kind contributions EnergyAustralia made to OCA or SOCOG).
- The increased life and cost of the underground cables.
- Additional benefits to electricity users and the community of underground cables (improved reliability, increased visual amenity, community access to land).

4.5 Summary – Homebush Undergrounding

The SKM Projecct Reconciliation Summary for Homebush undergrounding project is attached at Appendix E. This provides a summarised history of the project costs from inception to completion (on the current date for incomplete projects). From this summary the following key findings emerge:

- The $M37 cost of undergrounding the 6 x 132kV feeders (3 x double circuit steel tower lines) appears reasonable, and is lower than SKM's valuation of these assets at $M41.85.
- EnergyAustralia assessed the remaining life of one of the tower lines at 5 years in 1998 (ie needing replacement around 2003), with the other two tower lines expected to require replacement in 2015. SKM has not reviewed these estimates.

On balance, SKM considers it is reasonable that the cost of undergrounding is excluded from the regulatory asset base for the period prior to the existing overhead circuits requiring replacement. Electricity users have not derived any material benefit from the replacement of otherwise serviceable assets.

From the date the existing circuits would have required replacement (EnergyAustralia estimates 2003 for circuits 200 and 201 [approx 15% of the total cost], and 2015 for the remaining circuits), electricity users would have otherwise been required to fund the replacement of these lines. Capital contributions are normally excluded from the regulatory asset base of regulated utilities, and on this

basis the cost borne by electricity consumers should only be the amount funded by EnergyAustralia (users will enjoy the benefit of more expensive assets, by virtue of the fact that OCA was willing to contribute to the cost of undergrounding on the basis of its needs and the other benefits it received from freeing up the land).

On this basis, it would appear reasonable that 15% of the costs borne by EnergyAustralia be included in the regulated asset base from 2003 (less depreciation of those assets during the intervening period), and the remaining assets be recognised (at depreciated value) from 2015.

It may also be appropriate to consider whether new overhead lines were likely to be a viable and lower cost option, and whether OCA effectively contributed more than $27M for this project through other benefits conferred on EnergyAustralia (Olympic Partner status less other in-kind contributions from EnergyAustralia).

5. Sydney CBD

5.1 Background

EnergyAustralia and TransGrid have undertaken significant works in the Sydney CBD over the period 2001 – 2004 to increase supply capacity and reliability. The capacity of the existing transmission network into the CBD and inner suburbs was fully utilised, requiring major transmission works and the establishment of a new transmission substation in the area to provide additional capacity and redundancy.

The CBD transmission projects included the establishment of 330kV supply and 330/132kV substation at Haymarket (Transgrid), establishment of a 132/11kV zone substation at Campbell St (also a transmission exit point) and 132kV connections between Haymarket, City South and Campbell St (EnergyAustralia).

EnergyAustralia and TransGrid conducted a regulatory test under the National Electricity Code in 2000, with an expected total project cost to EnergyAustralia of $M41.2 ($M46.3 in 2003/04 $). EnergyAustralia's current estimate of the final cost is $M93.5 (2003/04$), an increase of 100% on the original project.

EnergyAustralia's 1999 ACCC Transmission submission included only $M25 for CBD Transmission connections, the CBD solution adopted does, however, replace budgeted zone substations at Taylor Square and Broadway (included in EnergyAustralia's 1999 IPART distribution submission, but now classified as transmission) that brings EA's expected total cost for CBD augmentations to $M72.3 (or $M81.3 in 2003/04 $).

5.2 GHD Assessment of CBD Project

The GHD report addresses the CBD project in section 4.6.1 (page 30-31). GHD conclude that:

> *This project was subject to the Regulatory Test which has been comprehensively documented. The scope of the project has evolved from both the concept assumed for the test as well as the 1999 submissions and can be summarised as follows:*
>
> - *A new zone substation at Campbell Street at Surry Hills which took the place of the Taylor Square and Broadway zone substations, including the purchase of the land;*
> - *The connection of the new zone substation to the Haymarket supply point.*
>
> *The written information available to support and trace the increase in expenditure is lacking and what has been provided to GHD for review for this report has been prepared specifically in response to GHD's request for a detailed cost reconciliation.*
>
> *This response attributed the main reasons for the increase in cost to:*

- *The change to the Campbell St site resulting in land cost;*
- *Two additional feeder bays due to revised network configurations;*
- *The construction issues of using ducts under the city streets and the subsequent installation of the cable tunnel.*

…

GHD have requested information that would allow them to review the movement in the budget from $28M to the Regulatory Test figure of $46M, thence to the $68M spent.

…

Unfortunately, the [information provided does] not contain the detailed scope of work, detailed engineering estimates, associated board approvals, and other original working papers (i.e. not specifically prepared in response to GHD's request) that would allow GHD to conduct a proper review of the cost increase.

5.3 ACCC draft decision regarding CBD project

In its draft decision, the ACCC proposes with regard to EnergyAustralia's CBD project expenditures:

EnergyAustralia has not reconciled the actual cost to the estimate used in the regulatory test however the ACCC has a high level understanding of what these costs were. The ACCC considers that EnergyAustralia has not shown that its decision to spend more than the regulatory test forecast was prudent. EnergyAustralia has not explained on what basis this increased expenditure was made or what it did to minimise the actual costs.

Consistent with the draft TransGrid revenue cap decision (chapter 4, section 4.6.1), the ACCC will disallow any return on EnergyAustralia's investment in the CBD upgrade NSW & ACT transmission network revenue caps – EnergyAustralia: Draft decision 27 during the period of construction for the draft decision. Adopting this approach would mean reducing the carried forward value of this project by $8.7 million or 14 per cent.

5.4 SKM Assessment of CBD Project

SKM has not reviewed in detail the costing or design changes that give rise to the increase in CBD project costs. SKM notes that ACCC and its consultants appear to be satisfied with the prudency (ie need for and timing) of the CBD project, and has not reviewed these issues. In assessing the efficiency of the project costs incurred by EnergyAustralia, SKM has asked three fundamental questions:

- Was the project scope and design efficient (ie the right solution)?
- What were the reasons for the cost increases?
- Are the final costs considered reasonable for what was delivered?

Project scope and design

SKM has reviewed the options considered in the EA/TG regulatory test and options study, though has not revisited the selection, design or costing of options considered. The 330kV Haymarket / 132kV Surry Hills option implemented was the least cost option based on these 1999 estimates.

By 2001 EnergyAustralia was aware that the project costs would be substantially higher than its 1999 estimates, but did not conduct another regulatory test. While this is arguably not an ideal capital governance process (and SKM understands EnergyAustralia has significantly reformed its processes since then), this does not in itself mean the implemented option was not still optimal.

Much of the cost increases (see next section) were in items that were common to most of the options (at least for EnergyAustralia), as regardless of where the capacity came from, it still needed to be delivered into the Sydney CBD and Surry Hills / Broadway areas. The increased cable tunnel costs, alternate substation site at Campbell St, and higher than expected 132kV cable costs are likely to have had similar impacts on other options. Generation options would be expected to have a bigger impact on Transgrid's than EnergyAustralia's component of the overall CBD upgrade.

The (stand alone) DSM options are the exception to this. SKM has not reviewed the assumptions, available capacity or costs of these options. It notes, however, that DSM options of the size proposed have not been implemented previously in Australia, and there was considerable uncertainty regarding both the size and timing of DSM capacity, as well as the cost. SKM understands that consent conditions for the CBD project required EnergyAustralia and Transgrid to jointly establish a $M10 / 3 year project to assess the potential for DSM in the CBD and inner suburbs. Given that the *assessment* of DSM is expected to take 3 years, it appears very ambitious that delivery of hundreds of MW of DSM reductions within a similar timeframe would be achievable.

Given the impending risk of CBD outages if additional capacity was not available by 2004, it appears prudent that the untried DSM options were not selected for implementation in the immediate "critical path" first phase of CBD supply enhancements, but were deferred to the second phase when there would be more time available to both utilise the learning from the DM Project and assess the success of DSM implementation in time to take corrective action without compromising CBD reliability.

Reasons for cost increases

SKM has analysed and reconciled initial cost estimates to as built costs, and broken down these differences into three driver categories:

- Externally imposed scope changes (eg changed regulatory environment)

- Internally imposed scope changes (eg EA decision to increase capacity or functionality)
- Estimating errors
- Other factors

The summary results are shown in the following tables. Detailed breakdowns appear in the table on the following page.

Project	Reg. test estimate		Final project estimate	Variation Amount	Reason for variation		
	(1999$)	(03-04$)	(nominal$)		Ext scope	Int scope	Costs + other
Campbell St Zone sub	**$ 24.2**	**$ 27.1**	**$ 36.2**	**$ 9.1**	**$ 5.7**	**$ 0.7**	**$ 2.7**
					63%	8%	30%
Transgrid tunnel	$ 2.4	$ 2.7	$ 5.4	$ 2.7			$ 2.7
EA tunnel and cables	$ 14.7	$ 16.5	$ 51.8	$ 35.3	$ 3.6	$ 2.4	$ 29.4
Total 132kV connections	**$ 17.1**	**$ 19.2**	**$ 57.2**	**$ 38.0**	**$ 3.6**	**$ 2.4**	**$ 32.1**
					9%	6%	84%
Total CBD upgrade costs	**$ 41.2**	**$ 46.3**	**$ 93.5**	**$ 47.2**	**$ 9.3**	**$ 3.1**	**$ 34.8**
Transmission component	$ 33.9	$ 38.1	$ 67.5	$ 29.5	$ 7.5	$ 1.9	$ 20.1
					20%	6%	74%

From the above results, SKM concludes that the project was significantly above the original estimates, though generally in line with EnergyAustralia's expectations at the commencement of the project in 2001. Most of the variation is due to underestimating costs (74%), followed by externally imposed scope changes (moving the site, and additional environmental requirements – 20%). Internally imposed scope changes (additional 132kV bays and connection to Surry Hills) were a minor component of the variation (6%).

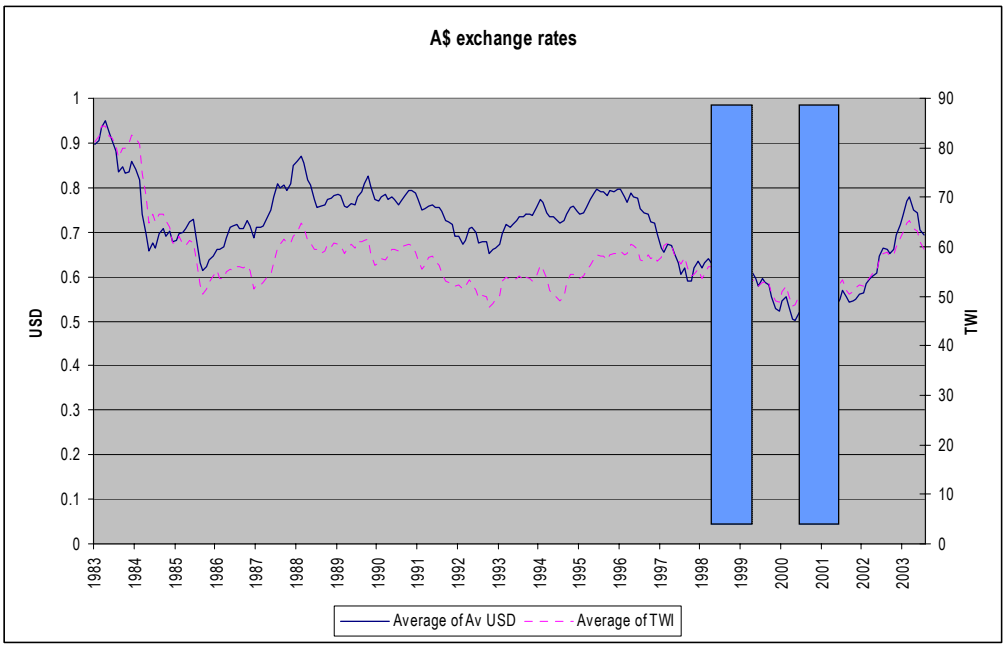
The most significant cost variation items are:

- Cost of the EA tunnel (the final cost is in line with estimates from an independent GHD report)
- Land acquisition for Campbell St zone (due to site change for planning consent reasons)
- 132kV cable and connection costs
- Transgrid cable tunnel costs

Whilst SKM has not reviewed the final costs in detail, they appear to be reasonable, and it is likely the major reason for the variation is underestimating costs at the options / regulatory test phase.

	Reg. test estimate		Final project estimate	Variation		Reason for variation			Breakdown by expense type		
	(1999$)	(03-04$)	(nominal$)	Amount	%	Ext scope	Int scope	Costs + other	Internal EA wages	External Materials	External Contr. Servc
Surry Hills (Campbell St) Zone Substation				100%	allocated to transmission						
Building	$ 10.0	$ 11.3	$ 13.5	$ 2.2	19%			$ 2.2	$ 1.0	$ -	$ 12.6
Design	$ 1.5	$ 1.7	$ 2.8	$ 1.1	64%	$ 0.7		$ 0.4	$ 2.2	$ -	$ 0.6
Equiping	$ 9.9	$ 11.1	$ 10.8	-$ 0.3	-3%			-$ 1.0	$ 2.7	$ 8.0	$ -
GIS				$ -			$ 0.7				
Project management			$ 1.1	$ 1.1	100%			$ 1.1	$ 1.0	$ 0.1	$ 0.1
Land	$ 2.8	$ 3.0	$ 8.0	$ 5.0	167%	$ 5.0					
Total Surry Hills Zone sub	**$ 24.2**	**$ 27.1**	**$ 36.2**	**$ 9.1**	**34%**	**$ 5.7**	**$ 0.7**	**$ 2.7**			
Transgrid cable tunnel				100%	allocated to transmission						
Civils (ducts / tunnel)	$ 2.4	$ 2.7	$ 5.4	$ 2.7	100%			$ 2.7			$ 5.4
Remaining CBD 132kV cable connections				50%	Allocated to transmission						
Cable + inst - HM to Wattle	$ 2.0	$ 2.2	$ 7.1	$ 4.9	224%			$ 4.9	$ 4.1	$ 11.9	$ 6.2
Cable + inst - Haymarket	$ 2.5	$ 2.8	$ 10.3	$ 7.5	266%			$ 7.5	$ -	$ -	$ -
Cable + inst - Campbell St	$ 1.1	$ 1.2	$ 3.6	$ 2.4	197%		$ 2.4		$ -	$ -	$ -
EA cable tunnel	$ 7.6	$ 8.6	$ 24.7	$ 16.1	187%	$ 2.4		$ 13.7	$ 2.1	$ -	$ 21.4
EIS		$ -	$ 1.5	$ 1.5	100%	$ 1.2		$ 0.3			$ 1.5
Project mgt and design	$ 1.5	$ 1.7	$ 4.8	$ 3.1	181%			$ 3.1	$ 1.4	$ 0.0	$ 3.3
Subtotal - remaining 132kV	*$ 14.7*	*$ 16.5*	*$ 51.8*	*$ 35.3*	*214%*	*$ 3.6*	*$ 2.4*	*$ 29.4*	*$ 7.6*	*$ 11.9*	*$ 32.3*
Total 132kV connection	**$ 17.1**	**$ 19.2**	**$ 57.2**	**$ 38.0**	**198%**	**$ 3.6**	**$ 2.4**	**$ 32.1**			
Total CBD upgrade costs	**$ 41.2**	**$ 46.3**	**$ 93.5**	**$ 47.2**	**102%**	**$ 9.3**	**$ 3.1**	**$ 34.8**			
Transmission component	$ 33.9	$ 38.1	$ 67.5	$ 29.5	77%	$ 7.5	$ 1.9	$ 20.1	$ 10.7	$ 14.1	$ 34.7
Distribution component	$ 7.3	$ 8.3	$ 25.9	$ 17.7	214%	$ 1.8	$ 1.2	$ 14.7	$ 3.8	$ 6.0	$ 16.2

SKM also notes that the average AUD/USD exchange rate fell by some 17% between 1998/9 when the initial cost estimates were undertaken for the project, and 2001/2 when the major contracts for equipment were executed. The TWI fell by 11% over the same period. Initial estimates by SKM indicate that around a third of project costs were potentially affected by exchange rate variations, and this may have been a factor in some of the underestimating of actual project costs. Historical exchange rates are shown in the following chart.



Reasonable construction costs

SKM has not conducted a separate valuation or cost estimate for the CBD assets, due to the limited time available for this review, and difficulty in estimating costs for high density CBD locations where site specific variations can be significant.

In order to assess the reasonableness of costs SKM has analysed the proportion of costs that have been competitively procured (and can be considered to be efficient costs) versus costs borne internally by EnergyAustralia and not subject to competitive procurement. The results are shown in the table below, indicating that 83% of CBD project costs were competitively procured:

Project	Internal (EA)	External (Materials)	External (Contr Serv)
Campbell St Zone	$ 6.9	$ 8.1	$ 13.2
132kV connections	$ 7.6	$ 11.9	$ 37.7
Total CBD upgrade	**$ 14.5**	**$ 20.0**	**$ 50.9**
	17%	**23%**	**60%**

From the above results, SKM concludes that the majority of costs (over 80%) were externally and competitively sourced, and should be considered efficient. Approximately 17% of the project costs were internal to EnergyAustralia and not exposed to competitive processes.

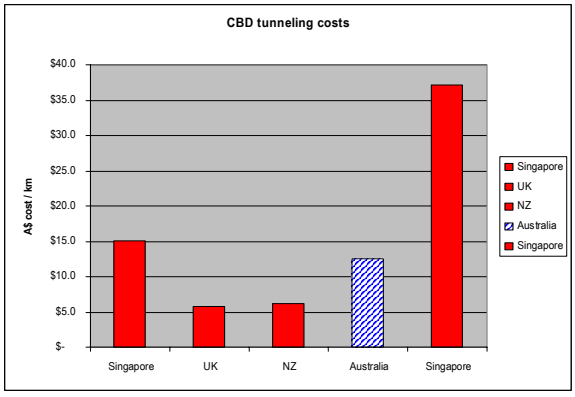
The cost of the cable tunnels is one of the most significant costs to the project, both in absolute terms, and also the variation from original estimates. SKM has reviewed an independent report by GHD consultants that identifies a tunnel as the optimum solution (it also considered pit and duct systems, direct drilling, and direct buried cables), and estimates the total cost of a tunnel at ~$M28 + cable installation (excavation and civils $M15, + $M13 for interfaces, contingency, design, etc.)

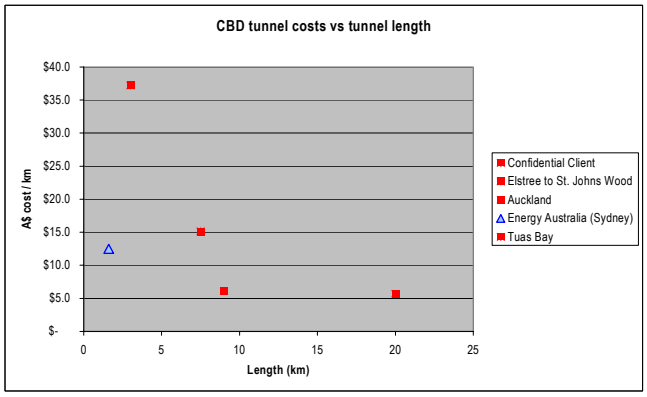
EnergyAustralia's estimated final cost of its cable tunnel is around $M24.7. This is significantly higher than EnergyAustralia's initial estimate ($M8.6), the cost is in line with GHD's estimate tunnel costs, GHD's estimate of of pit and duct costs, and EnergyAustralia's recent CBD pit and duct costs. On this basis, the cable tunnel costs appear reasonable.

SKM also recently undertook a comparison of CBD tunnelling costs in a number of countries, including the EA cable tunnel. While caution must be used in comparing results because of the strong influence of site specific factors, tunnel specification, length etc, this comparison shows the EA cable tunnel to be within a reasonable range. Note that due to high fixed costs, costs for short tunnels are typically higher per km.

Table 1: Comparison of CBD tunnelling costs

Project	Country	Circuits	Tunnel Size	Tunnel Length	Tunnel Cost/km (local Currency)	Tunnel Cost (A$/m)
Confidential Client	Singapore	N/A	3.5-3.7m dia	5-10km	SG$16-20 million	A$15.1
Elstree to St. Johns Wood	UK	2 x 400kV	3.05m	20km	UK£2.16 million	A$5.7
Auckland	NZ	N/A	N/A	9km	NZ$6.7 million	A$6.1
Energy Australia (Sydney)	Australia	8 x 132kV	3.2m dia	1.6km	AUD$12.5 million	A$12.5
Confidential	Singapore	7 x 400kV 3 x 230kV	11.5m dia 4.3m	2.1km (water) 0.9km (land)	SG$44.3 million	A$37.2





5.5 SKM Review of Project Documentation

As further verification, SKM has recently reviewed a number of EnergyAustralia documents relating to this project, including:

- Minutes of EA/TG joint planning meetings
- GHD report on cable access options – feasibility study (cable tunnel costs)
- Campbell St project delivery report
- Information supplied to ACCC/GHD by EnergyAustralia
- CBD project cost estimates and project reconciliations produced by EnergyAustralia.
- Campbell St project implementation plan
- Joint EA/TG document titled "Electricity supply to Sydney's CBD and inner suburbs Final Report" Feb 2000 outlining the background to the project and evaluating thirteen options for supplying the CBD. A summary of the Nett Present Costs (NPC) of the various options is as follows:

Option	Description	NPC ($M)	Rank
1	132kV connection to CBD	238	11
2	Zetland 330kV	176	6
3	Sydney South – Haymarket 330kV	167	3
3a	330kV via Kurnell	178	7
4	Beaconsfield upgrade	169	4
5	95MW cogen + 255MW OCGT at Botany	231	10
6	250MW GT at Haymarket	173	5
7	420MW cogen at Kurnell + 132kV Kurnell – B'rong	345	13
8	420MW cogen at Kurnell + 132kV Kurnell – B'rong + DSM	310	12
9	95MW cogen + 255MW OCGT @ Botany + DSM	196	9
10	Sydney South – Haymarket 330kV + DSM	134	1
11	DSM	124	
12	33kV CBD cable + Botany 350MW	140	2
13	33kV CBD cable + Kurnell 420MW	180	8

5.6 Summary – CBD projects

The SKM Projecct Reconciliation Summary for the CBD Augmentation Project is attached at Appendix F. This provides a summarised history of the project costs from inception to completion (or the current date for incomplete projects). From this summary the following key findings emerge:

SKM's review of the CBD project can be summarised as follows:

- The project costs were significantly underestimated at the regulatory test stage. This contributed to 30% of Campbell St cost overruns, 85% of 132kV connection cost overruns, and 74% of total CBD project cost overruns.
- Externally imposed scope changes that were reasonably beyond EnergyAustralia's control were the next most significant reason for overruns, contributing 63%, 9% and 20% respectively to project variations.
- Internally imposed scope changes were a relatively minor factor, responsible for 6-8% of project variations.
- SKM has not reviewed the other identified options in detail, but it is likely that most would have suffered similar cost increases. On this basis, it is unlikely the chosen option is no longer the most cost effective option (by any significant amount at least[2]).
- Over 80% of CBD project costs were competitively sourced.
- Overall project costs appear reasonable for a project of this size, and considering the difficulties inherent in high density CBD areas.

[2] DSM options would not be affected by the same reasons for cost increases as network options, but the cost estimates were likely to be at the low end of the likely range, and also subject to considerable uncertainty and risk.

Appendix A Macquarie Park, Benchmarked Industry Costs

Appendix B Assessed Value of Energy at Risk, Kurri and East Maitland

Appendix C Project Reconciliation Summary – Macquarie Park

Appendix D Project Reconciliation Summary – Beresfield

Appendix E Project Reconciliation Summary – Homebush Bay

Appendix F Project Reconciliation Summary – Sydney CBD

Macquarie Park Substation

	Unit	Qty	Unit rate	Total
Transmission (132kV)				
800mm², XLPE, Stainless Steel Sheath (Double Circuit)	km	1.3	$2,589,000	$3,365,700
Terminations	No	12	$19,500	$234,000
T-off Structure	No	1	$100,000	$100,000
Feeder Breakers	No	2	$674,120	$1,348,240
Bus Section Breakers	No	2	$380,650	$761,300
Bus Section Breakers (No CB)	No		$220,210	$0
Transformer Breakers	No	2	$527,500	$1,055,000
Transformers (50 MVA, 132/11kV)	No	2	$1,164,680	$2,329,360
Metering	No	1	$24,000	$24,000
Sub-Total: Transmission (132kV)				**$9,217,600**
Distribution (11kV)				
Transformer Breakers	No	4	$119,310	$477,240
Bus Section Breakers	No	2	$90,900	$181,800
Feeder Breakers	No	20	$82,950	$1,659,000
Capacitor Bank	No	2	$184,000	$368,000
Cable Work	km	1	$129,200	$129,200
Sub-Total: Distribution (11kV)				**$2,815,240**
Establishment				
Major Indoor Substation				$4,658,730
Total Estimate: Macquarie Park				**$16,691,570**

Appendix B - Assessed Value of Energy at Risk, Kurri and East Maitland

Item	Substation	Assessed Value of Energy at Risk							Augmentation Project	Augmentation Capital Budget
		2003	2004	2005	2006	2007	2008	2009		
1	Awaba STS	$10,000.00	$20,000.00	$690,000.00	$5,290,000.00	$16,020,000.00	$33,730,000.00	$65,250,000.00	Argenton Substation Development	M$26.00
2	Merewether STS				$180.00	$1,780.00	$5,890.00	$11,810.00		
3	Waratah STS	$10,000.00	$2,990,000.00	$4,210,000.00	$19,380,000.00	$34,850,000.00	$58,810,000.00	$63,540,000.00		
4	**Total**	**$20,000.00**	**$3,010,000.00**	**$4,900,000.00**	**$24,670,180.00**	**$50,871,780.00**	**$92,545,890.00**	**$128,801,810.00**		
5	*Capital Financing Cost Est*	*$21,958.92*	*$109,794.62*	*$219,589.25*	*$1,537,124.75*	*$2,854,660.24*	*$2,854,660.24*	*$2,854,660.24*		
6	Kurri STS	$2,060,000.00	$10,490,000.00	$26,120,000.00	$50,780,000.00	$80,270,000.00	$129,940,000.00	$195,360,000.00	Rothbury Supply Development	M$12.00
7	Branxton	$940.00	$2,810.00	$5,950.00	$10,420.00	$18,230.00	$28,970.00	$45,200.00	Nulkaba Substation Development	M$11.10
8	Cessnock	$80,000.00	$100,000.00	$240,000.00	$1,380,000.00	$3,930,000.00	$7,640,000.00	$13,400,000.00		
9	**Total**	**$2,140,940.00**	**$10,592,810.00**	**$26,365,950.00**	**$52,170,420.00**	**$84,218,230.00**	**$137,608,970.00**	**$208,805,200.00**		**M$23.10**
10	*Capital Financing Cost Est*	*$164,691.94*	*$1,032,069.47*	*$1,306,556.03*	*$1,855,529.16*	*$2,404,502.28*	*$2,514,296.91*	*$2,514,296.91*		
11	Scone Zone Substation	$1,400.00	$3,290.00	$5,340.00	$8,570.00	$13,270.00	$20,910.00	$30,120.00	Scone Zone Substation Development	M$5.00
12	**Total**	**$1,400.00**	**$3,290.00**	**$5,340.00**	**$8,570.00**	**$13,270.00**	**$20,910.00**	**$30,120.00**		
13	*Capital Financing Cost Est*	*$0.00*	*$0.00*	*$219,589.25*	*$548,973.12*	*$548,973.12*	*$548,973.12*	*$548,973.12*		
14	Nelson Bay Zone Substation				$20.59	$272.11	$867.90	$1,837.02	Tomaree Supply Development	M$23.40
15	**Total**	**$0.00**	**$0.00**	**$0.00**	**$20.59**	**$272.11**	**$867.90**	**$1,837.02**		**M$23.40**
16	*Capital Financing Cost Est*	*$0.00*	*$0.00*	*$0.00*	*$43,917.85*	*$1,251,658.72*	*$2,569,194.22*	*$2,569,194.22*		
17	City Main	$190,790.00	$219,080.00	$239,020.00	$259,510.00	$280,540.00	$302,060.00	$324,140.00	Newcastle CBD Supply Development	M$21.93
18	**Total**	**$190,790.00**	**$219,080.00**	**$239,020.00**	**$259,510.00**	**$280,540.00**	**$302,060.00**	**$324,140.00**		
19	*Capital Financing Cost Est*	*$102,109.00*	*$705,979.44*	*$1,309,849.87*	*$1,419,644.50*	*$1,529,439.12*	*$1,968,617.62*	*$2,407,796.12*		
20	MT Hutton Zone Substation	$1,840.00	$3,570.00	$6,630.00	$11,880.00	$19,920.00	$35,080.00	$663,020.00	Croudace Bay Substation Dev.	M$10.80
21	**Total**	**$1,840.00**	**$3,570.00**	**$6,630.00**	**$11,880.00**	**$19,920.00**	**$35,080.00**	**$663,020.00**		
22	*Capital Financing Cost Est*	*$164,691.94*	*$274,486.56*	*$823,459.69*	*$1,152,843.56*	*$1,152,843.56*	*$1,152,843.56*	*$1,152,843.56*		
23	Raymond Terrace Substation	$1,320,000.00	$3,540,000.00	$7,080,000.00	$12,580,000.00	$20,580,000.00	$30,440,000.00	$45,300,000.00	Raymond Terrace Supply Dev.	M$8.00
24	**Total**	**$1,320,000.00**	**$3,540,000.00**	**$7,080,000.00**	**$12,580,000.00**	**$20,580,000.00**	**$30,440,000.00**	**$45,300,000.00**		
25	*Capital Financing Cost Est*	*$32,938.39*	*$197,630.32*	*$658,767.75*	*$878,357.00*	*$878,357.00*	*$878,357.00*	*$878,357.00*		
26	Salt Ash Zone Substation	$8,770.00	$12,530.00	$17,310.00	$21,540.00	$26,890.00	$31,580.00	$36,500.00	Mallabula Zone Substation & 33kV Development	M$9.50
27	**Total**	**$8,770.00**	**$12,530.00**	**$17,310.00**	**$21,540.00**	**$26,890.00**	**$31,580.00**	**$36,500.00**		
28	*Capital Financing Cost Est*	*$109,794.62*	*$658,767.75*	*$1,043,048.93*	*$1,043,048.93*	*$1,043,048.93*	*$1,043,048.93*	*$1,043,048.93*		
29	Williamtown Zone Substation	$18,247.00	$39,840.00	$51,898.00	$142,561.00	$1,098,968.00	$1,960,766.00	$5,556,091.00	RAAF Williamtown and Medowie Dev	M$3.00
30	**Total**	**$18,247.00**	**$39,840.00**	**$51,898.00**	**$142,561.00**	**$1,098,968.00**	**$1,960,766.00**	**$5,556,091.00**		
31	*Capital Financing Cost Est*	*$32,938.39*	*$142,733.01*	*$329,383.87*	*$329,383.87*	*$329,383.87*	*$329,383.87*	*$329,383.87*		
32	East Maitland	$10,000.00	$30,000.00	$590,000.00	$1,640,000.00	$3,540,000.00	$6,180,000.00	$9,960,000.00	Thornton Zone Subst Dev.	M$7.20
33	**Total**	**$10,000.00**	**$30,000.00**	**$590,000.00**	**$1,640,000.00**	**$3,540,000.00**	**$6,180,000.00**	**$9,960,000.00**		
34	*Capital Financing Cost Est*	*$21,958.92*	*$131,753.55*	*$680,726.67*	*$790,521.30*	*$790,521.30*	*$790,521.30*	*$790,521.30*		

$128,801,810.00	**Argenton Substation Development**
$208,805,200.00	**Rothbury Supply Development**
$30,120.00	**Scone Zone Substation Development**
$1,837.02	**Tomaree Supply Development**
$324,140.00	**Newcastle CBD Supply Development**
$663,020.00	**Croudace Bay Substation Dev.**
$45,300,000.00	**Raymond Terrace Supply Dev.**

2009 Cost of load @risk		**Priority**	**Aggregated Financing by 2009**
208,805,200	Rothbury Supply Development	1	2,514,296
208,805,200	Nulkaba Substation Development	1	2,514,296
128,801,810	Argenton Substation Development	2	2,854,660
45,300,000	Raymond Terrace Supply Dev.	3	878,357
9,960,000	Thornton Zone Subst Dev.	4	790,521
5,560,000	RAAF Williamtown and Medowie Dev.	5	329,383
663,020	Croudace Bay Substation Dev.	6	1,152,843
324,140	Newcastle CBD Supply Development	7	2,407,796
36,500	Mallabula Zone Substation & 33kV	8	1,043,048
30,120	Scone Zone Substation Development	9	548,973
1,837	Tomaree Supply Development	10	2,569,194

Appendix B - Assessed Value of Energy at Risk, Kurri and East Maitland

Argenton Sub Dev.

Input values shown in green

interest rate	**7%**															
No of years	**15** years															
	2003	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
actual capex forecast	200000	800000	1000000	12000000	12000000										
calculated finance payments	($21,958.92)	($21,958.92)	($21,958.92)	($21,958.92)	($21,958.92)	($21,958.92)	($21,958.92)	($21,958.92)	($21,958.92)	($21,958.92)	($21,958.92)	($21,958.92)	($21,958.92)	($21,958.92)	($21,958.92)	($21,958.92)
		($87,835.70)	($87,835.70)	($87,835.70)	($87,835.70)	($87,835.70)	($87,835.70)	($87,835.70)	($87,835.70)	($87,835.70)	($87,835.70)	($87,835.70)	($87,835.70)	($87,835.70)	($87,835.70)	($87,835.70)
			($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)
				($1,317,535.50)	($1,317,535.50)	($1,317,535.50)	($1,317,535.50)	($1,317,535.50)	($1,317,535.50)	($1,317,535.50)	($1,317,535.50)	($1,317,535.50)	($1,317,535.50)	($1,317,535.50)	($1,317,535.50)	($1,317,535.50)
					($1,317,535.50)	($1,317,535.50)	($1,317,535.50)	($1,317,535.50)	($1,317,535.50)	($1,317,535.50)	($1,317,535.50)	($1,317,535.50)	($1,317,535.50)	($1,317,535.50)	($1,317,535.50)	($1,317,535.50)
						$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
							$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Total annual finance payments	**($21,958.92)**	**($109,794.62)**	**($219,589.25)**	**($1,537,124.75)**	**($2,854,660.24)**	**($2,854,660.24)**	**($2,854,660.24)**	**($2,854,660.24)**	**($2,854,660.24)**	**($2,854,660.24)**	**($2,854,660.24)**	**($2,854,660.24)**	**($2,854,660.24)**	**($2,854,660.24)**	**($2,854,660.24)**	**($2,854,660.24)**

Rothbury Supply Development & Nulkaba Subst Dev.

Input values shown in green

interest rate	**7%**															
No of years	**15** years															
	2003	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
actual capex forecast	1500000	7900000	2500000	5000000	5000000	1000000									
calculated finance payments	($164,691.94)	($164,691.94)	($164,691.94)	($164,691.94)	($164,691.94)	($164,691.94)	($164,691.94)	($164,691.94)	($164,691.94)	($164,691.94)	($164,691.94)	($164,691.94)	($164,691.94)	($164,691.94)	($164,691.94)	($164,691.94)
		($867,377.54)	($867,377.54)	($867,377.54)	($867,377.54)	($867,377.54)	($867,377.54)	($867,377.54)	($867,377.54)	($867,377.54)	($867,377.54)	($867,377.54)	($867,377.54)	($867,377.54)	($867,377.54)	($867,377.54)
			($274,486.56)	($274,486.56)	($274,486.56)	($274,486.56)	($274,486.56)	($274,486.56)	($274,486.56)	($274,486.56)	($274,486.56)	($274,486.56)	($274,486.56)	($274,486.56)	($274,486.56)	($274,486.56)
				($548,973.12)	($548,973.12)	($548,973.12)	($548,973.12)	($548,973.12)	($548,973.12)	($548,973.12)	($548,973.12)	($548,973.12)	($548,973.12)	($548,973.12)	($548,973.12)	($548,973.12)
					($548,973.12)	($548,973.12)	($548,973.12)	($548,973.12)	($548,973.12)	($548,973.12)	($548,973.12)	($548,973.12)	($548,973.12)	($548,973.12)	($548,973.12)	($548,973.12)
						($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)
							$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Total annual finance payments	**($164,691.94)**	**($1,032,069.47)**	**($1,306,556.03)**	**($1,855,529.16)**	**($2,404,502.28)**	**($2,514,296.91)**	**($2,514,296.91)**	**($2,514,296.91)**	**($2,514,296.91)**	**($2,514,296.91)**	**($2,514,296.91)**	**($2,514,296.91)**	**($2,514,296.91)**	**($2,514,296.91)**	**($2,514,296.91)**	**($2,514,296.91)**

Scone Zone Subst Dev

Input values shown in green

interest rate	**7%**															
No of years	**15** years															
	2003	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
actual capex forecast			2000000	3000000												
calculated finance payments	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
		$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
			($219,589.25)	($219,589.25)	($219,589.25)	($219,589.25)	($219,589.25)	($219,589.25)	($219,589.25)	($219,589.25)	($219,589.25)	($219,589.25)	($219,589.25)	($219,589.25)	($219,589.25)	($219,589.25)
				($329,383.87)	($329,383.87)	($329,383.87)	($329,383.87)	($329,383.87)	($329,383.87)	($329,383.87)	($329,383.87)	($329,383.87)	($329,383.87)	($329,383.87)	($329,383.87)	($329,383.87)
					$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
						$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
							$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Total annual finance payments	**$0.00**	**$0.00**	**($219,589.25)**	**($548,973.12)**	**($548,973.12)**	**($548,973.12)**	**($548,973.12)**	**($548,973.12)**	**($548,973.12)**	**($548,973.12)**	**($548,973.12)**	**($548,973.12)**	**($548,973.12)**	**($548,973.12)**	**($548,973.12)**	**($548,973.12)**

Tomaree Zone Sub Dev.

Input values shown in green

interest rate	**7%**															
No of years	**15** years															
	2003	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
actual capex forecast				400000	11000000	12000000										
calculated finance payments	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
		$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
			$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
				($43,917.85)	($43,917.85)	($43,917.85)	($43,917.85)	($43,917.85)	($43,917.85)	($43,917.85)	($43,917.85)	($43,917.85)	($43,917.85)	($43,917.85)	($43,917.85)	($43,917.85)
					($1,207,740.87)	($1,207,740.87)	($1,207,740.87)	($1,207,740.87)	($1,207,740.87)	($1,207,740.87)	($1,207,740.87)	($1,207,740.87)	($1,207,740.87)	($1,207,740.87)	($1,207,740.87)	($1,207,740.87)
						($1,317,535.50)	($1,317,535.50)	($1,317,535.50)	($1,317,535.50)	($1,317,535.50)	($1,317,535.50)	($1,317,535.50)	($1,317,535.50)	($1,317,535.50)	($1,317,535.50)	($1,317,535.50)
							$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Total annual finance payments	**$0.00**	**$0.00**	**$0.00**	**($43,917.85)**	**($1,251,658.72)**	**($2,569,194.22)**	**($2,569,194.22)**	**($2,569,194.22)**	**($2,569,194.22)**	**($2,569,194.22)**	**($2,569,194.22)**	**($2,569,194.22)**	**($2,569,194.22)**	**($2,569,194.22)**	**($2,569,194.22)**	**($2,569,194.22)**

Appendix B - Assessed Value of Energy at Risk, Kurri and East Maitland

Newcastle CBD Development

Input values shown in green

interest rate	**7%**															
No of years	**15** years															
	2003	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
actual capex forecast	930000	5500000	5500000	1000000	1000000	4000000	4000000								
calculated finance payments	($102,109.00)	($102,109.00)	($102,109.00)	($102,109.00)	($102,109.00)	($102,109.00)	($102,109.00)	($102,109.00)	($102,109.00)	($102,109.00)	($102,109.00)	($102,109.00)	($102,109.00)	($102,109.00)	($102,109.00)
		($603,870.44)	($603,870.44)	($603,870.44)	($603,870.44)	($603,870.44)	($603,870.44)	($603,870.44)	($603,870.44)	($603,870.44)	($603,870.44)	($603,870.44)	($603,870.44)	($603,870.44)	($603,870.44)
			($603,870.44)	($603,870.44)	($603,870.44)	($603,870.44)	($603,870.44)	($603,870.44)	($603,870.44)	($603,870.44)	($603,870.44)	($603,870.44)	($603,870.44)	($603,870.44)	($603,870.44)
				($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)
					($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)
						($439,178.50)	($439,178.50)	($439,178.50)	($439,178.50)	($439,178.50)	($439,178.50)	($439,178.50)	($439,178.50)	($439,178.50)	($439,178.50)
							($439,178.50)	($439,178.50)	($439,178.50)	($439,178.50)	($439,178.50)	($439,178.50)	($439,178.50)	($439,178.50)	($439,178.50)
Total annual finance payments	**($102,109.00)**	**($705,979.44)**	**($1,309,849.87)**	**($1,419,644.50)**	**($1,529,439.12)**	**($1,968,617.62)**	**($2,407,796.12)**	**($2,407,796.12)**	**($2,407,796.12)**	**($2,407,796.12)**	**($2,407,796.12)**	**($2,407,796.12)**	**($2,407,796.12)**	**($2,407,796.12)**	**($2,407,796.12)**

Croudace Bay Development

Input values shown in green

interest rate	**7%**														
No of years	**15** years														
	2003	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
actual capex forecast	1500000	1000000	5000000	3000000											
calculated finance payments	($164,691.94)	($164,691.94)	($164,691.94)	($164,691.94)	($164,691.94)	($164,691.94)	($164,691.94)	($164,691.94)	($164,691.94)	($164,691.94)	($164,691.94)	($164,691.94)	($164,691.94)	($164,691.94)	($164,691.94)
		($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)
			($548,973.12)	($548,973.12)	($548,973.12)	($548,973.12)	($548,973.12)	($548,973.12)	($548,973.12)	($548,973.12)	($548,973.12)	($548,973.12)	($548,973.12)	($548,973.12)	($548,973.12)
				($329,383.87)	($329,383.87)	($329,383.87)	($329,383.87)	($329,383.87)	($329,383.87)	($329,383.87)	($329,383.87)	($329,383.87)	($329,383.87)	($329,383.87)	($329,383.87)
					$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
						$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
							$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Total annual finance payments	**($164,691.94)**	**($274,486.56)**	**($823,459.69)**	**($1,152,843.56)**	**($1,152,843.56)**	**($1,152,843.56)**	**($1,152,843.56)**	**($1,152,843.56)**	**($1,152,843.56)**	**($1,152,843.56)**	**($1,152,843.56)**	**($1,152,843.56)**	**($1,152,843.56)**	**($1,152,843.56)**	**($1,152,843.56)**

Raymond Terrace Supply Development

Input values shown in green

interest rate	**7%**														
No of years	**15** years														
	2003	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
actual capex forecast	300000	1500000	4200000	2000000											
calculated finance payments	($32,938.39)	($32,938.39)	($32,938.39)	($32,938.39)	($32,938.39)	($32,938.39)	($32,938.39)	($32,938.39)	($32,938.39)	($32,938.39)	($32,938.39)	($32,938.39)	($32,938.39)	($32,938.39)	($32,938.39)
		($164,691.94)	($164,691.94)	($164,691.94)	($164,691.94)	($164,691.94)	($164,691.94)	($164,691.94)	($164,691.94)	($164,691.94)	($164,691.94)	($164,691.94)	($164,691.94)	($164,691.94)	($164,691.94)
			($461,137.42)	($461,137.42)	($461,137.42)	($461,137.42)	($461,137.42)	($461,137.42)	($461,137.42)	($461,137.42)	($461,137.42)	($461,137.42)	($461,137.42)	($461,137.42)	($461,137.42)
				($219,589.25)	($219,589.25)	($219,589.25)	($219,589.25)	($219,589.25)	($219,589.25)	($219,589.25)	($219,589.25)	($219,589.25)	($219,589.25)	($219,589.25)	($219,589.25)
					$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
						$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
							$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Total annual finance payments	**($32,938.39)**	**($197,630.32)**	**($658,767.75)**	**($878,357.00)**	**($878,357.00)**	**($878,357.00)**	**($878,357.00)**	**($878,357.00)**	**($878,357.00)**	**($878,357.00)**	**($878,357.00)**	**($878,357.00)**	**($878,357.00)**	**($878,357.00)**	**($878,357.00)**

Mallabula Zone & 33kV Supply dev.

Input values shown in green

interest rate	**7%**														
No of years	**15** years														
	2003	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
actual capex forecast	1000000	5000000	3500000												
calculated finance payments	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)
		($548,973.12)	($548,973.12)	($548,973.12)	($548,973.12)	($548,973.12)	($548,973.12)	($548,973.12)	($548,973.12)	($548,973.12)	($548,973.12)	($548,973.12)	($548,973.12)	($548,973.12)	($548,973.12)
			($384,281.19)	($384,281.19)	($384,281.19)	($384,281.19)	($384,281.19)	($384,281.19)	($384,281.19)	($384,281.19)	($384,281.19)	($384,281.19)	($384,281.19)	($384,281.19)	($384,281.19)
				$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
					$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
						$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
							$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Total annual finance payments	**($109,794.62)**	**($658,767.75)**	**($1,043,048.93)**	**($1,043,048.93)**	**($1,043,048.93)**	**($1,043,048.93)**	**($1,043,048.93)**	**($1,043,048.93)**	**($1,043,048.93)**	**($1,043,048.93)**	**($1,043,048.93)**	**($1,043,048.93)**	**($1,043,048.93)**	**($1,043,048.93)**	**($1,043,048.93)**

Appendix B - Assessed Value of Energy at Risk, Kurri and East Maitland

RAAF Williamtown and Medowie Deve

Input values shown in green

interest rate	**7%**														
No of years	**15** years														
	2003	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
actual capex forecast	300000	1000000	1700000												
calculated finance payments	($32,938.39)	($32,938.39)	($32,938.39)	($32,938.39)	($32,938.39)	($32,938.39)	($32,938.39)	($32,938.39)	($32,938.39)	($32,938.39)	($32,938.39)	($32,938.39)	($32,938.39)	($32,938.39)	($32,938.39)
		($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)
			($186,650.86)	($186,650.86)	($186,650.86)	($186,650.86)	($186,650.86)	($186,650.86)	($186,650.86)	($186,650.86)	($186,650.86)	($186,650.86)	($186,650.86)	($186,650.86)	($186,650.86)
				$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
					$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
						$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
							$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Total annual finance payments	**($32,938.39)**	**($142,733.01)**	**($329,383.87)**	**($329,383.87)**	**($329,383.87)**	**($329,383.87)**	**($329,383.87)**	**($329,383.87)**	**($329,383.87)**	**($329,383.87)**	**($329,383.87)**	**($329,383.87)**	**($329,383.87)**	**($329,383.87)**	**($329,383.87)**

Thornton Zone Development

Input values shown in green

interest rate	**7%**														
No of years	**15** years														
	2003	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
actual capex forecast	200000	1000000	5000000	1000000											
calculated finance payments	($21,958.92)	($21,958.92)	($21,958.92)	($21,958.92)	($21,958.92)	($21,958.92)	($21,958.92)	($21,958.92)	($21,958.92)	($21,958.92)	($21,958.92)	($21,958.92)	($21,958.92)	($21,958.92)	($21,958.92)
		($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)
			($548,973.12)	($548,973.12)	($548,973.12)	($548,973.12)	($548,973.12)	($548,973.12)	($548,973.12)	($548,973.12)	($548,973.12)	($548,973.12)	($548,973.12)	($548,973.12)	($548,973.12)
				($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)	($109,794.62)
					$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
						$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
							$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Total annual finance payments	**($21,958.92)**	**($131,753.55)**	**($680,726.67)**	**($790,521.30)**	**($790,521.30)**	**($790,521.30)**	**($790,521.30)**	**($790,521.30)**	**($790,521.30)**	**($790,521.30)**	**($790,521.30)**	**($790,521.30)**	**($790,521.30)**	**($790,521.30)**	**($790,521.30)**

Appendix C - Project Reconciliation Summary – Macquarie Park

Macquarie Park

Project scope (inclusions / exclusions)	Original project cost (board approval) ($M & date)	ACCC reg test approval ($ & date)	Revised approval amount ($ & date)	Changes impacting final cost					Final project cost	Comparison with benchmarked industry costs	Proportion of costs at competitive prices		Classification of costs (note changes due to reclassification)	
				Externally imposed scope changes		Internally imposed scope changes		Unit rates			Internal	External (or internal won thru open tender)	Transmission	Distribution
				1	2	1	2							
Construct: ■ Macquarie Park 132/11kV zone substation with 2x50MVA txs; 6x132kV CB bays; 20x11kV CB bays. ■ 2 x 800mm² 132kV UG cables x 1.3km ■ 132kV termination structures	$M14.25 excluding 132kV circuit costs and 11kV distribution feeders	Nil allowance in previous ACCC review (unknown that assets would be classified as transmission) $10M (@ 1998 costs) included in 1998 IPART submission	EA board approved additional $M5.3 for 132kV cable and assoc costs.	Rapid load growth and two major spot loads necessitated significant advancement of project from 2005 to 2001	Substation sited so as to minimise impact on adjacent kindergarten/pre school, thus increasing 11kV distribution costs	Stainless steel sheath on 132kV XLPE cables (EA standard)			$M20.49 (2001/02) (Trans = $12.0M) Distrbn = ($8.0M)	$16-17M (excludes 11kV feeder costs) Based on calculated RC comparison with NSW treasury guidelines	21%	79%	132kV cables, substation, transformers, and 11kV busbar and breakers. $12.5M / $20.5M	11kV distribution feeders $8M / $20.5M
				3										
				Substation sited so as to minimise impact on adjacent child care centre, significantly increasing 11kV ductline costs.										

Alternative project options were evaluated:		
Option	Description	NPC $M
1	66/11kV zone	25.2
2	33/11kV zone	28.8
3	132/11kV zone (preferred option)	11.6
4A	11kV deferred	15.7
4B	11kV deferred	21.7
4C	11kV deferred	15.5

Appendix D - Project Reconciliation Summary – Beresfield

Beresfield 132/33kV substation

Project scope (inclusions / exclusions)	Original project cost (board approval) ($M & date)	ACCC reg test approval ($ & date)	Revised approval amount ($ & date)	Changes impacting final cost					Final project cost	Comparison with benchmarked industry costs	Proportion of costs at competitive prices		Classification of costs (note changes due to reclassification)	
				Externally imposed scope changes		Internally imposed scope changes		Unit rates			Internal	External (or internal won thru open tender)	Transmission	Distribution
				1	2	1	2							
■ Construct 132/33kV STS @ Beresfield (2004) ■ Various 33kV feeder works (2004-2007) ■ New Thornton 33/11kV zone sub (2005) ■ Replace switchroom and transformers @ E.Maitland (2011) ■ Install capacitor banks @ E.Maitland & Tarro (2005/6) ■ Replace switchroom & transformers @ Tarro (2011)	$M20.6 excludes 33kV feeders works Allows $M16.8 for substation works and $M7.52 for feeder works	Refer EA report (undated)	M$24.32 Excludes 33kV feeder works	Scope of 33kV feeder works subject to finalisation of community consultation process and final route selection. Could cost $M4.5 to $M8.2.		Thornton zone sub. Final estimate approved in April 04 was $M9.2 (up from $M8.4 in original NPV study)	Beresford sub and 132kV feeder works approved in March 03 @ $M20.6 (same as original NPV study (undated)		Project not complete / commissioned	SKM have reviewed overall substation costs from preliminary line diagrams and find them to be consistent with industry standard costs. 33kV feeder costs have not been benchmarked as final routes and % of OH is not yet determined	24%	76%		

Alternative project options were evaluated:		
Option	Description	NPC $M
1	132/33kV at Beresfield (preferred)	$M44.28
2	132/11kV at various zone substations	$M47.61
3	132/66kV at Kurri STS	$M63.22

Appendix E - Project Reconciliation Summary – Homebush Bay

Homebush Bay 132kV undergrounding

Project scope (inclusions / exclusions)	Original project cost (board approval) ($M & date)	ACCC reg test approval ($ & date)	Revised approval amount ($ & date)	Changes impacting final cost					Final project cost	Comparison with benchmarked industry costs	Proportion of costs at competitive prices		Classification of costs (note changes due to reclassification)	
				Externally imposed scope changes		Internally imposed scope changes		Unit rates			Internal	External (or internal won thru open tender)	Transmission	Distribution
				1	2	1	2							
Undergrounding sections of 132kV steel lattice tower transmission lines (completed 1988). ■ Line (age / life) x length UG'd x CSA ■ 90X (25 / 17+yrs) x 3.86km x 1600 Al ■ 92F(2) (25 / 17+ yrs) x 3.86km x 1600 Al ■ 926/3 (27 / 17+ yrs) x 4.1km x 1600 Al ■ 927/3 (27 / 17+ yrs) x 4.1km x 1600 Al * ■ 200 (38 / 5 yrs) x 1.32km x 630 Al ■ 201 (38 / 5 yrs) x 1.38km x 630 Al ■ +11kV feeder x ~3km sharing tower with 200/201. * All replaced "like for like" with underground, except for 927/3 feeder which was looped into new Homebush Bay zone substation.	$40M of which $30M was paid by OCA. Remaining $10M funded by EA (in exchange for "official Olympic partner" status). (approx figures – to be confirmed)			Changes in project costs from original estimates not identified					$37M of which $27M was funded by OCA Completed 1998	Removal of 46 x double circuit steel lattice towers Installation of 6 x 132 kV UG XLPE cables (18.62) 132kV cable terminations (UGOH x 12, zone sub x 2) SKM valuation of underground portions of these 132kV circuits @ Dec 2003 is $M41.85	Not known, but likely to be minor component	Not known, but likely to be major component	100% transmission	

Appendix F - Project Reconciliation Summary – Sydney CBD

Sydney CBD transmission works

Project scope (inclusions / exclusions)	Original project cost (board approval) ($M & date)	ACCC reg test approval ($ & date)	Revised approval amount ($ & date)	Changes impacting final cost					Final project cost	Comparison with benchmarked industry costs	Proportion of costs at competitive prices		Classification of costs (note changes due to reclassification)	
				Externally imposed scope changes		Internally imposed scope changes		Unit rates			Internal	External (or internal won thru open tender)	Transmission	Distribution
				1	2	1	2							
<u>Campbell St (Surry Hills) Zone</u> ■ Land ■ 132/11kV zone substation ■ 2 x 132/11kV transformers ■ 11 (??) x 132kV GIS switchgear ■ 4 x 132kV cable terminations ■ ?? x 11kV indoor CBs <u>132kV cable connections (NB 50/50% allocated transmission / distribution)</u> ■ Wattle St – Haymarket ■ Haymarket – Campbell St ■ EnergyAustralia cable tunnel <u>Transgrid cable tunnel (shared)</u> EA share of cost of Transgrid cable tunnel	Board approval for $M88 (??? TBC) in 2001 total project cost, including trans and distbn components. Excludes $M5.4 separately approved for TG tunnel (tot $M93.4)	$41.2M (1999) Equiv to $M43.7 in 2001$.		Site move (Sydney Council would not grant DA approval to original site) $M5.8	Increased environmental and planning requirements. $M3.6	Additional 132kV bays at Campbell St. $M0.7	Additional 132kV feeder to Campbell St. $M2.4	Cost increases total $M37. Major items: TG cable tunnel $M2.9 132kV cables $M12.6 EA cable tunnel $M14.2 Project mgt and design $M4.3 Campbell St building $M2.9	Expected final cost is $M93.5 (TF), though Transgrid cable tunnel has $M30 variation claim pending!!	Unlike conventional network assets (e.g. switchgear, transformers, cables, etc.) for which unit rates of modern equivalent assets can be derived, cable tunnels are almost unique to the particular situation/application. SKM has collected information about the design features, and costs of some modern electrical cable tunnels and found that the costs vary markedly from country to country, and application to application.	EA labour and overhead $M14.5M (17% of total)	Materials $M20 (23%) Contracts $M50.9 (60%) External total $M70.95 (83%)	100% of Campbell St and TG tunnel. 50% of other 132kV cable connection costs ($M67.5 / $M93.5)	50% of other 132kV cable connection costs ($M25.9 / $M93.5)