POWERLINK
NETWORK ASSET VALUATION REVIEW

Prepared for

Australian Competition & Consumer Commission

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TABLE OF CONTENTS

SECTIONS

1. INTRODUCTION

The Australian Competition & Consumer Commission (the Commission) is currently conducting an inquiry into the appropriate revenue cap to be applied to the non-contestable elements of the transmission services provided by the Powerlink transmission network.

An important facet of this Inquiry is determining the valuation of the assets used by Powerlink to provide these non-contestable transmission services. Section 6.2.3(d)(4)(iii) of the National Electricity Code (the Code) requires that assets in service on 1 July 1999 be valued at the value determined by the Jurisdictional Regulator, in this case the Queensland Electricity Reform Unit (ERU). The ERU's valuation of Powerlink's transmission assets as at 1 July 1999 is contained in a February 2000 report prepared by a consortium consisting of Arthur Andersen, GHD and Worley International (the Consortium).

However the Code permits the Commission to require the opening asset value to be independently verified through a process agreed with the National Competition Council. In accordance with this provision of the Code, the Commission has engaged PB Associates to review the optimised depreciated replacement cost (ODRC) valuation conducted by the Consortium. In particular the Consultant is required to review the appropriateness of the assumptions, methodologies and findings of the Consortium's 1999 valuation of Powerlink's transmission asset base in terms of meeting the requirements of the Code.

Furthermore PB Associates has been asked, as part of this review, to consider the following:

- the appropriateness and practicality of using economic valuation or historic cost approaches as alternatives to ODRC, consistent with the requirements of the Code; and
- other matters as are necessary to enable the Commission to make a Code-compliant valuation of the non-contestable assets of Powerlink expected to be in service on 1 January 2002.

The Consortium's valuation forms the basis for the existing regulatory determination made by the ERU. However, following internal review, and refinement of its internal estimating procedures, Powerlink has submitted additional information to the Commission that indicates that the Consortium valuation understates the replacement cost of its network assets. Powerlink has also submitted further information on the treatment of easements for regulatory valuation purposes. In undertaking this review, PB Associates has considered the additional information in addition to the Consortium's valuation report.

This review is concerned only with the valuation of the Powerlink assets in service as of 1 July 1999, and how the value of these assets should be adjusted to represent their deprival value as of 1 January 2002. In order to determine a Code compliant valuation of the Powerlink asset base as of 1 January 2002 it is necessary to adjust the valuation to account for asset additions and removals between 1 July 1999 and 1 January 2002. The Commission requires such assets to be treated differently in that they should be valued on the basis of actual installation cost rather than an estimated replacement cost. Powerlink's information on asset additions and deletions has been separately included as part of its formal application to the Commission and is discussed in PB Associates' report on Powerlink's capital expenditure.

Nevertheless Powerlink has provided both the Commission and PB Associates with information on the costs of its portion of the Queensland – New South Wales Interconnector (QNI) in relation to the project budget. At the time of writing this report QNI had not been commissioned and was therefore not part of the regulated asset base. It is expected to be in service by 1 January 2002. Consistent with the treatment of other asset

additions and removals, this report does not address issues in relation to the value at which QNI is added to the asset base. This issue will be discussed in PB Associates subsequent report on Capital Expenditure.

2. SUMMARY OF FINDINGS

The following comments summarise the results of our examination of the Consortium's report on the ODRC Valuation of Powerlink's Network Assets:-

- The Consortium's replacement cost valuation for Powerlink's network assets, excluding easements but including spares, was **$2.992M**. The optimised depreciated replacement cost (ODRC) valuation was **$1,700M**. This valuation was as of 1 July 1999, and included both regulated and non-regulated assets.

- For regulatory pricing purposes the above valuations need to be adjusted for the removal of regulated assets. This will require a reduction of the replacement cost valuation by **$33M** and a reduction of the ODRC valuation of **$27M**.

- Powerlink has provided its own valuation of asset replacement costs, for the asset base as it existed on 1 July 1999, which it submits should be used as the basis for its 2002 regulatory price review. This new valuation makes a number of adjustments, including the removal of non-regulated assets, to the Consortium valuation and in particular incorporates higher asset replacement costs. The Powerlink valuation of the replacement cost of these *regulated* network assets, excluding easements, spares and other non-network assets is **$3,149M**, with a valuation date of 1 July 2000.

- Powerlink's revised valuation uses replacement costs that are based on its current project management and construction practices. In conducting this review PB Associates tried to compare Powerlink's estimated replacement costs with costs elsewhere in the industry and with the costs that might be achievable in a highly competitive environment. However we were unable, in the time available, to reach any firm conclusion on the efficiency of the replacement costs used by Powerlink in its revised valuation.

- During discussions with Powerlink and the Commission, nothing has come to PB Associates' attention to indicate that the deprival value of the network assets should be written down below the assessed ODRC value.

- The processes used by the Consortium to verify and validate Powerlink's register of network assets were robust and we concur with the Consortium's conclusion that the asset register has sufficient integrity for the purposes of an ODRC valuation.

- The replacement cost of non-regulated network assets is assessed by Powerlink to be **$38M** as at 1 July 2000. We have not tested the accuracy of the schedule of non-regulated assets and note that there appear to be no guidelines on what assets are to be included in the regulatory asset base and what assets lie outside the regulatory framework. We suggest that the Commission include relevant guidelines in its document on ODRC asset valuation to be issued by the end of 2002.

- We concur with Powerlink's view that 7.6% is a more realistic value for interest during construction than the 6.5% apparently used in the Consortium valuation.

- None of the three transmission line easement valuations reviewed for this study demonstrated the degree of rigour and depth of analysis that has been applied to the estimation of asset replacement costs, even though the value of easements will have a very significant impact on the total value of the asset base.

- Of the three easement valuations, Powerlink's valuation is the most robust, although we are unable to endorse the methodology used as conforming to an accepted method

of valuing easements. There are issues relating to the Powerlink valuation that require further consideration, most particularly the derivation and allocation of assemblage costs.

- Acceptance of the Powerlink valuation would result in a regulated easement valuation of **$198M** s at 1 July 2000. This is 16% of Powerlink's assessment of the ODRC of network assets.

- The asset lives used in both the Consortium and Powerlink valuations are consistent with those used in other regulatory jurisdictions. Further, the treatment of residual lives is generally consistent with the NSW Treasury Guidelines.

- The indication is that the Consortium's valuation incorporates a reasonably thorough optimisation process. This has reduced the replacement cost of the network asset base by 3%. The Powerlink valuation retains the optimisations used in the Consortium report and we recommend that the Commission accept these.

- Powerlink's standard accounting practice is to index the asset base forward by the Consumer Price Index – All Groups, Brisbane, in order to update the replacement cost of its asset base annually. However the relationship between the actual costs of transmission projects and movements in the CPI is not necessarily consistent.

- Two possible approaches are possible for capturing movements in replacement costs, where these differ from CPI. One approach is to develop a composite industry-specific index reflecting changes in the costs of inputs used for transmission system construction. A second approach is to undertake a periodic revaluation of the asset base, basing each revaluation on current replacement costs. This second approach mirrors the standard CPI-X approach to regulation, with its regular revenue resets. If the second approach is adopted it might be appropriate to allow some indexation of the value of the asset base between valuations.

3. BACKGROUND

3.1 NATIONAL ELECTRICITY CODE REQUIREMENTS

Section 6.2.3 of the Code requires that, for the determination of a revenue cap for transmission network businesses, assets in existence and generally in service on 1 July 1999 be valued at the value determined by the jurisdictional regulator, provided that this valuation does not exceed the deprival value. However the Code does allow the Commission to independently verify this valuation, through a process agreed with the National Competition Council.

The deprival value of a network asset is a measure of the economic loss the network owner would suffer if it were deprived of the use of the asset. This is generally taken to be the lower of the ODRC or the economic value of the asset, where the economic value is the present value of the future revenue stream resulting from the use of the asset.

In assessing deprival values the ODRC generally prevails, except in cases where the provision of a grid supply is uneconomic due to the high cost of the connection required. This can apply, for example, in the case of long rural distribution feeders where the revenue stream is small in relation to the capital cost of the feeder.

This is discussed further in Section 3.5

3.2 STATEMENT OF REGULATORY PRINCIPLES

On 27 May 1999 the Commission issued a Draft Statement of Principles for the Regulation of Transmission Revenues. Sections 4 and 5 of this document are pertinent to the valuation of a transmission business's asset base.

It should be noted that Commission's document was only issued in draft form and that a final document has still to be issued. While the document defines a number of "Regulatory Principles" in relation to the valuation of transmission network assets, there are some areas where the Commission's thinking requires further clarification. This is especially true in respect of optimisation and the methodology to be used for the valuation of easements.

Further the Draft Statement of Regulatory Principles indicates that the Commission is presently not inclined to use a formal "economic value" test in the assessment of deprival values. Rather, it is open to network owners to present evidence that an asset's value should be written down if the asset is unable to generate an economic return. Alternatively it is proposed that the Commission could write down the value of the system below ODRC on its own initiative in recognition of evidence that the current regulatory asset base valuation exceeds the ODV of the network.

In respect of easement valuations, the Commission's Draft Statement of Principles notes that, to the extent that the acquisition of easements requires expenditure by the network owner, it would be improper for the regulator to ignore their existence or deny a reasonable return on the funds employed. The Commission would appear attracted to a deprival approach to the valuation of easements, relying on an optimisation process to deal with situations where easement replacement values have reached the point where lower cost network options, avoiding the use of the easement, are available. However any change in the deprival value of an easement would need to be matched by a corresponding depreciation adjustment. In situations where there was an appreciation in easement values the adjustment would be negative. This would result in a loss of income in the year the depreciation adjustment was applied and this would offset the windfall capital gain from the appreciation in asset value.

3.3 THE CONSORTIUM VALUATION

The Consortium's assessment of the value of Powerlink's assets, as of 1 July 1999, is as follows:

Asset	**Replacement Cost**	**Depreciated Optimised Replacement Cost**
Network Assets[1]	$2,991,675,000	$1,699,605,000
Easements	$1,100,153,000	$1,100,153,000
Land & Buildings	$43,973,000	$43,973,000
Non-Network Assets[2]	$40,254,378	$20,038,314
TOTAL	**$4,186,055,378**	**$2,863,769,314**

The above valuation includes both regulated and non-regulated assets. If non-regulated assets were removed from the asset base, the replacement cost value of network assets would reduce by **$33,322,700** and the ODRC value of network assets would reduce by **$27,056,600**.

With the exception of easements these values, with minor adjustments, were accepted by the ERU in its regulatory determination of June 2000. In the case of easements the above value, based on the deprival value concept, was not accepted and an alternative value, also prepared by the consortium but using an indexed historical roll forward approach, of **$114,658,000** was used.

In reviewing this valuation it is noted that the Commission's Draft Statement of Principles for the Regulation of Transmission Revenues is not legally binding. Further, unlike New South Wales or New Zealand, no guidelines have been issued by regulatory authorities in Queensland on the methodology for valuation of network assets of electricity transmission and distribution businesses. The only legal requirement constraining the consortium's valuation is the decision made by the Council of Australian Governments on 19 August 1994, and referenced in the National Electricity Code that deprival value should be the preferred approach to valuing network assets[3].

The Consortium's valuation report notes the existence of the Commission's Draft Statement of Principles and discusses it in some detail. However the report does not state the extent to which the valuers relied on this document in developing their valuation methodology. Rather the valuation report discusses the merits of a range of different possible approaches to the valuation of electricity network assets and draws its own conclusion as to the most appropriate methodology to use.

Nevertheless an ODRC valuation is presented that is generally consistent with both the requirements of the National Electricity Code and the Commission's Draft Statement. No

[1] Excludes work in progress but includes spares.

[2] Written down values as per audited financial statements

[3] See National Electricity Code, Section 6.2.3(d)(4)(iv)A

formal economic value test is applied. While this is consistent with the Commission's approach, it raises the question as to whether such a test is necessary for compliance with the Code.

In the absence of any regulatory requirement as to the methodology to be used in undertaking the deprival valuation, PB Associates has reviewed the consortium's valuation in the context of the relevant sections of the Commission's Draft Statement. Where appropriate, reference is also made to the requirements in other jurisdictions, particularly New South Wales and New Zealand, where the regulators have both issued comprehensive guidelines for the ODV valuation of electricity network assets.

3.4 THE POWERLINK VALUATION

Powerlink has submitted a revised valuation for network assets and easements to the Commission, based on work that it has undertaken following the completion of the Consortium's valuation. The Company has advised PB Associates that the replacement costs used in the Consortium valuation were provided by the Consortium, rather than by Powerlink. Powerlink had concerns about some aspects of the costs but accepted them for the ERU price determination, since there was not time for the further investigation required to substantiate Powerlink's concerns.

This further investigation has now been undertaken and the new valuation incorporates the results of these studies.

The new valuation is related to the Consortium valuation as follows:

- The network asset base is the same as that of the Consortium's valuation, except for correction of minor errors. Hence both valuations relate to the asset base as it existed on 1 July 1999. Asset additions and removals subsequent to 1 July 1999 have not been included in the Powerlink valuation and are dealt with separately in Powerlink's formal application to the Commission.

- An adjustment has been made to remove the non-regulated assets that were included in the Consortium valuation.

- The Consortium's valuation has been rolled forward to 1 July 2000 using the following adjustments:

    1. Replacement costs of all assets have been escalated by 2.2% to reflect the movement in the Brisbane consumer price index, as measured by the Australian Bureau of Statistics.

    2. An additional year's depreciation has been included in the assessment of ODRC.

- Subsequent to the above roll forward the following additional adjustments have been made:

    1. Powerlink has re-evaluated the base replacement costs of substations and added locational factors to all substation costs, where this was deemed appropriate. A Consultant's report on 132 kV substation costs has been provided to support this re-evaluation. The net effect of this adjustment is to increase substation replacement costs by 3.9% above the rolled forward Consortium value.

    2. Powerlink has substituted revised transmission line costs to take account of the latest costs associated with transmission line erection contracts and materials. It states that the revised costs reflect recent project costs and recent tender information, as well as movements in commodity costs for aluminium and steel. The net effect of this adjustment is to increase transmission line replacement

costs by 3.2% above the rolled forward Consortium value.

3. Powerlink has escalated all transmission line and substation costs by 1.1%, being the difference between its estimate of 7.6% as being a reasonable value for interest during construction (IDC) and the 6.5% used by the Consortium. A Consultancy report by Price Waterhouse Coopers has been submitted in support of the revised IDC value.

4. The Powerlink valuation classifies OPGW as a transmission line asset rather than a communication asset. This change is in keeping with the physical nature of the asset and is supported by PB Associates. It results in a value of around $8.2M being transferred from communication to transmission line assets.

5. Powerlink supports the use of an optimised replacement cost approach to the valuation of line easements. However, in taking this position, it may not have considered the impact of any depreciation adjustment the Commission may require. Alternatively, Powerlink proposes an alternative easement valuation methodology that would value easements at approximately $84M (74%) above the Consortium's lower easement valuation. This is discussed further in Section 5.4.3.

A comparison between the Consortium's July 1999 values for network assets and easements and the corresponding July 2000 values proposed by Powerlink is given in the table below:

	Consortium		**Powerlink**	
	Replacement Cost	**ODRC**	**Replacement Cost**	**ODRC**
Transmission Lines	$1,989M	$1,186M	$2,106M	$1,214M
Substations	$935M	$477M	$983M	$473M
Communications	$67M	$34M	$59M	$25M
Easements				
- Replacement Cost	$1,100M			
- Historic Roll Forward	$115M			
- Powerlink			$198M	

Note: In the above table the Consortium valuation is taken directly from the Valuation Report and is expressed in July 1999 dollars. The Powerlink valuation is for regulated assets only and includes all the adjustments noted in Section 3.4, including a 2.2% indexation to July 2000 dollars.

3.5 ECONOMIC VALUATION

Application of the economic value test is problematic in regulated environments, as the asset valuation methodology requires a forecast of the future income stream. However the future income stream is, in itself, determined by the regulator, generally on the basis of the value of the assets employed. The logic is circular, as the assessment of the potential income stream is not independent of the valuation process.

In the case of a distribution network an economic value test can be applied fairly easily if an agreed mechanism exists for avoiding this circularity problem. The New Zealand ODV guidelines previously allowed an unregulated electricity price to be assumed for the purpose of application of the test, leaving the valuer free to assume a price based on the cost of alternative energy sources. This approach was not without its problems, and the most recent revision to the New Zealand Guidelines has placed a cap on the electricity price that can be assumed. The New South Wales Guidelines do not address this circularity problem.

The traditional approach to assessment of economic value assumes that, having decided on an appropriate pricing strategy, it is possible to forecast future revenue flows generated by a given asset with a high level of certainty. Assuming a significant variable component in the pricing mix, future revenues from a particular transmission asset will be determined by the location of the generation on the network in relation to the load, as well as by the merit order for generator dispatch.

In the case of transmission networks operating within the National Electricity Market this assumption of predictability is flawed, particularly for the shared portion of a network.

The network owner has little control over the location of generators, which is determined by investors in electricity generation. The likelihood is that generator locations will change with time, but this change is unpredictable, and likely to occur relatively quickly when assessed in the context of the engineering lives of transmission assets.

The merit order for generator dispatch is determined, not by Powerlink, but by NEMMCO on the basis of bids into the wholesale electricity market. This will be determined not only by the relative costs of different types of generation, but also by the location of each generator on the network and the real time bidding strategies used by individual generators in the market. The merit order can therefore change quickly, and is likely to be even more volatile and unpredictable than generator location.

The situation is further complicated by the fact that an electricity market will deliver the lowest energy prices only in situations where power flows the network are unaffected by capacity constraints. This is because when power flows through a network are limited by a constraint, prices on one side of a constraint will be higher than they would have been if the constraint had not existed. Hence the very existence of the market makes a rational economic analysis of the need for a particular transmission asset difficult, since the presence of transmission constraints reduces the efficiency of market operation.

In the unshared components of a transmission network, individual assets, generally referred to as connection assets, can be assigned to specific customers, be they generators or loads. Capacity of connection assets can be readily matched to customer requirements. However, removal of excess connection asset capacity is a technical optimisation issue. The economic valuation of connection assets is driven only by the level of asset utilisation, assuming that revenue streams are not protected by bilateral contracts and that there is a high variable component in the pricing mix. As discussed above, asset utilisations can be volatile, particularly for generator customers, making future revenues difficult to forecast.

With the lack of any economic value analysis in the Consortium valuation, there is an implicit assumption that the deprival value of the network will be equal to the ODRC. This is a pragmatic approach, in the absence of any persuasive evidence to the contrary. It is

also consistent with the approach taken by the Commission in its Draft Statement as discussed in Section 2.2.

Powerlink has made no request for the value of any part of its network to be written down below the ODRC value. Indeed all representations made by Powerlink to the Commission and PB Associates have argued that the value of the asset base should be increased above the ODRC valuation assessed by the Consortium. Furthermore, during the discussions with Powerlink and the Commission, nothing has come to PB Associates' attention to indicate that the deprival value of the network should be written down below the assessed ODRC value.

3.6 HISTORIC COST VALUATION

The use of depreciated historic costs as the basis for asset valuation assumes a pricing strategy based on cost recovery. In our view this is incompatible with the economic philosophy that underlies the electricity industry structure in Australia today. This assumes that energy prices should be set, not on the basis of costs, but by market forces. We note that the underlying premise for the deprival valuation methodology is that assets should be valued in terms of the economic loss suffered if deprived of the use of the asset. This loss is measured either on the basis of the cost of replacing the asset with a modern equivalent or, if this is not economic, on the basis of the future income stream foregone. In our view this approach, while not perfect, is more consistent with modern economic thinking.

This view is also consistent with the Commission's Draft Statement of Regulatory Principles, which states categorically that the Commission will not consider historic costs as an asset valuation methodology for assets commissioned prior to 1 July 1999.

It is noted that assets commissioned after 1 July 1999 are to be added to the regulatory asset base at actual cost, provided they meet the required prudency criteria. Changes to the asset value due to the asset additions and removals after 1 July 1999, including the impact of QNI, are considered in PB Associates report on capital expenditure.

4. ASSET DEFINITION AND IDENTIFICATION

4.1 GENERAL

The starting point for the asset valuation is the type and number of assets owned by Powerlink. These details are included in spreadsheets attached to the Consortium report. Four separate spreadsheets are provided, for transmission lines, substations, communications assets and easements.

The accuracy of the asset register has a significant effect on the accuracy of the final valuation figure and as such the process used to verify the asset register is an important consideration in reviewing the valuation report. In commenting on the approach taken to defining and identifying transmission assets for this valuation, the following items, which are considered to be prudent steps in the validation process, have been considered:

- what validation of the asset registers was undertaken during the valuation process;
- have sample field visits been carried out by Powerlink or the Consortium to verify asset data;
- are the assets listed in the registers divided appropriately;
- are methods used to estimate asset details reasonable, where accurate data has not been provided; and
- was there a check on the definition of system boundaries.

An independent assessment of the accuracy of Powerlink's transmission asset records is outside of the scope of this review. The level of validation carried out is therefore reviewed only on the basis of the comments made in the Consortium's report. A review of the consistency, type and thoroughness of the validation of the asset registers is set out in the following sections.

4.2 CLASSIFICATION OF DATA

The Consortium's valuation report classifies network assets into three separate categories, transmission lines, substations and communications equipment. This is consistent with the way the assets are identified and recorded in the fixed assets module of Powerlink's SAP financial system. Powerlink has confirmed that the SAP register is used as the basis for both the financial and regulatory asset records.

The substation database breaks down substation assets into building blocks or "base planning objects" (BPO) that form the basis not only for valuation, but also for maintenance tracking and estimating the cost of new projects. Each substation on the network can be built up by assembling together the necessary BPOs according to the substation's size and configuration. An issue for this review is the manner in which replacement costs are assigned to individual BPOs. This is discussed in Section 5.2.

The transmission line database is broken down into "built sections", where each built section represents an historical transmission line construction project. There is a wide diversity in the size and age of built sections and, due to the reconfiguration of the network over time, an existing transmission line may comprise several built sections. The methodology used by Powerlink to assign replacement costs to individual built sections is discussed in Section 5.1.

Communications assets are broken down by individual asset. Communication assets do not form a significant component of the total network asset base due to both their lower initial asset costs and their shorter engineering lives. In the Consortium valuation, communication assets amounted to 1.9% of the replacement cost of the network asset base and 1.5% of the ODRC. Therefore, on the basis of materiality, communications assts are not considered in detail in this review.

4.3 VALIDATION / VERIFICATION OF DATA

In undertaking its valuation the Consortium completed a sample audit of data prepared by Powerlink in respect of quantities, systems and processes. The audit process included the following steps:

1. A review of the systems and processes adopted to identify and record assets.

2. A physical inspection of sample assets. The consortium inspected six substations and a number of transmission line sections in Powerlink's southern and central regions.

3. A review of other data sources such as operating diagrams and drawings.

4. A comparison of recorded asset data with independently sourced data in respect of content, description capacity, age and condition.

The Consortium's valuation report notes that Powerlink now adopts a formalised documented system for the identification and recording of fixed assets. The procedures used were considered appropriate and, if applied correctly, should lead to an accurate record of the asset base.

The validation process found errors in the recording of the commissioning date for substation control and protection (secondary) systems and also some inconsistencies in the quantities of communication assets. These errors were corrected prior to the completion of the Consortium's valuation, even though neither was likely to have a material impact on the total asset value.

Overall the Consortium concluded that the asset data had sufficient integrity for the purposes of an ODRC valuation. We accept the validity of the approach used by the Consortium and concur with this conclusion.

Subsequent to the completion of the Consortium valuation, Powerlink has found some minor errors in the asset list used by the Consortium. The impact of these errors is not considered material but they have been corrected in the Powerlink valuation.

4.4 SEPARATION OF REGULATED FROM NON-REGULATED ASSETS

The Consortium valuation included all Powerlink assets, and did not distinguish between regulated and non-regulated assets.

However the subsequent Powerlink valuation has separated out assets associated with bilateral contracts which with a small number of large industrial customers, such as the Boyne Island aluminium smelter, which are connected directly to its network. These contracts sit outside the regulatory framework and connection assets used to supply these customers are not subject to regulation by the Commission.

Exclusion of these non-regulated assets is done by means of a regulation factor in the valuation spreadsheet. Where an asset is fully regulated a regulation factor of 1 is used. Conversely, the regulation factor is 0 for assets that are not regulated. Where assets are shared between the regulated and non-regulated parts of the business, the regulation factor

is between 0 and 1, depending on the relative use made of the asset between the regulated and non-regulated part of the business.

This approach is reasonable and should give an accurate breakdown between regulated and non-regulated assets, provided the regulation factors are correctly applied. However, the accuracy with which these factors have been applied has not been tested as part of this review.

These non-regulated assets form only a small component of Powerlink's business, as shown in the table below:

	Regulated Replacement Cost	**Non-Regulated Replacement Cost**	**% Non-Regulated**
Transmission Lines	$2,106M	$19M	0.9%
Substations	$983M	$18M	1.8%
Communications	$59.02M	$0.69M	1.2%
Easements (Powerlink value)	$202.68M	$0.21M	0.1%

There appears to be no attempt by Powerlink to allocate non-network assets between the regulated and unregulated parts of the business.

Further, Powerlink currently engages in some activities, such as design and maintenance, that are potentially contestable but which are currently either undertaken in-house or undertaken by Ergon Energy using an uncontested service contract. It is not clear whether the assets used to support these activities should be included in the regulated asset base. However, given that the total value of non-network assets is small in relation to the regulated asset base, this issue is not material to this review.

In undertaking this review we have not tested whether Powerlink's schedule of non-regulated network assets is complete. Overseas, there is some evidence that industry participants are becoming more reluctant to invest in regulated areas, and prefer to invest in non-regulated sectors. Given this trend, it is suggested that, in its proposed document on asset valuation, the Commission clarifies what assets are to be included in the regulatory asset base and what assets lie outside the regulatory framework. Guidance on the treatment of assets shared by both the regulated and non-regulated parts of the business would also be useful.

5. ASSET REPLACEMENT COSTS

5.1 TRANSMISSION LINES AND SUBSTATIONS

5.1.1 Transmission Lines

PB Associates has undertaken a high level benchmarking study comparing the transmission line replacement costs used in the Powerlink valuation costs with those accepted by regulators in other jurisdictions. It should be noted that cost estimating is not an exact science and that costs are different in different areas. Hence the results of the comparison should be taken as indicative rather than definitive.

The comparison indicates that:

1. From our discussions with Powerlink, we believe that its methodology for estimating the replacement cost of transmission lines is generally sound.

   The transmission line asset base is segmented into "built sections", each representing an historical construction project. For each type of standard line construction Powerlink estimates a base replacement cost, assuming defined standard project conditions apply. For individual built sections, a range of correction factors is applied to the relevant base cost to account for deviations from the defined standard conditions. This allows for project specific cost impacts to be taken into account.

   Powerlink advises that the unit rates in Powerlink's data bases are continually updated and compared to actual construction costs, which gives weight to the reasoning that the variation factor approach used by Powerlink results in reasonable estimates being produced.[4] This is important with regards to lines because: -

   - The application of multiple correction factors could lead to a double counting of some of the impacts of transmission line constraints on replacement costs.

   - Some aspects of the selection of the appropriate individual correction factor, particularly the terrain factor, could be subjective.

   - Selection of short segmented 'built sections' could lead to higher prices than if unit rates are applied as the higher cost segments are specifically identified rather than built into the unit rate. This is borne out by an analysis of Powerlink's valuation spreadsheet. The 25% of transmission line projects with the highest built section replacement cost have an average length of 105 km and an average correction factor of 1.88. However the 25% of projects with the lowest built section replacement cost have an average length of 0.68 km and an average correction factor of 8.41.

   The Consortium's valuation report states that the correction factors, including the terrain factor, have been reviewed, applied to a sample of assets and found reasonable. Powerlink believes that its approach to the application of correction factors is the most comprehensive package for valuing the modern equivalent cost of installed transmission lines in Australia and have provided examples where the use of correction factors has resulted in cost estimates that were below the actual cost of construction. We have not examined other estimating packages but have no reason to dispute this.

[4] Neil Pearce, "Transmission Line Valuation – Factors", Internal Memorandum, October 1999

2. , There are a large number of different asset types recorded in the asset register, consistent with the detailed project by project approach taken by the Powerlink and reflective of a system constructed over a number of years using the optimum construction types at the time of construction. However the base replacement costs for similar construction types in each asset class are the same. This indicates that replacement costs have been determined on the basis of replacement with a modern equivalent asset rather than a like for like replacement.

3. The Consortium has used the same correction factors as Powerlink in the estimation of replacement costs, but based its valuation on its own assessment of appropriate unit costs. The Powerlink valuation uses different unit costs, based on Powerlink's latest data on transmission line erection contract costs and materials costs. The resulting difference between the Powerlink unit costs and the Consortium's costs is 3.2% ($37M). From our discussions with Powerlink, we believe that the difference is mainly due to different sources of data used, obtained at different times. However, without having access to the Consortium's detailed cost assumptions, it is difficult to determine exactly where the differences lie.

4 The average replacement cost of Powerlink's 275 kV lines is approximately 6% higher than the average replacement cost of TransGrid's 330 kV lines when normalised by route length and 1% lower when normalised by circuit length, after TransGrid's costs have been escalated forward to July 2000 dollars. However TransGrid has a higher proportion of single circuit lines, which would have a higher replacement cost per circuit km. There could be a number of reasons for these differences, given that the difference in voltage should not have a major impact on the constructed cost of two lines of similar lengths and over similar routes. One possible reason, for example, is the fact that 60% of Powerlink's 275 kV lines are designed for cyclonic wind loading.

5 Averaged over the whole network Powerlink's 132kV line replacement costs are approximately 66% higher than those of TransGrid, when normalised by circuit kilometre.

However, there are fundamental differences between the two networks. These include:

- We understand that nearly all of TransGrid's 132 kV lines are wood pole lines with light conductors. However, most of Powerlink's 132 kV lines are substantial steel tower lines with heavy conductors.

- The impact of locational differences and differences in scale may be significant. Powerlink has relatively short lengths of 132 kV construction and its 132 kV lines are concentrated in the central and northern areas, where construction costs are higher.

- The 132kV NSW pole line construction costs are related to rural construction where much of the Powerlink's 132kV transmission network is located in more expensive and difficult terrain.

- In northern parts of its area Powerlink must design for increased wind loading due to cyclonic conditions.

6 110kV circuits are listed as 132kV assets for the purposes of valuation. It is not expected that this will have a material effect.

Where Powerlink's transmission line replacement costs appear higher than those on which the most recent TransGrid ODRC valuation is based, indications are that there are valid explanations for these differences. Powerlink has justified its own estimated replacement costs by providing examples of recent transmission line construction projects where the

actual construction cost was higher than the replacement cost estimated using its building block estimating methodology.

It may also be that TransGrid has used a different approach to disaggregating its asset base for estimation of replacement costs. Powerlink's approach to disaggregation and, in particular, its application of correction factors to individual projects assumes that the asset bases would be replaced on an incremental basis, reflecting the historical development of the network. Hence the replacement cost of the asset base incorporates a large number of small, relatively high cost projects.

5.1.2 Substations

High level comparisons of the substation replacement costs proposed by Powerlink with those used by TransGrid in the ODRC valuation included in the Commission's recent regulatory review of TransGrid has given the following results, corrected to July 2000 dollars:

- Powerlink's proposed replacement cost is $85k per MVA of installed transformer capacity, whereas TransGrid's was $45k.
- Powerlink's proposed replacement cost is $12.5m per substation whereas TransGrid's was $17m.
- Powerlink's proposed replacement cost is $1,4m per circuit breaker bay whereas TransGrid's was $1.5m.
- Powerlink's proposed replacement cost is $7.8m per transformer whereas TransGrid's was $8.6m per transformer.

The above comparisons indicate that substation costs vary widely and are influenced by a large number of factors. In particular, high-level benchmarking comparisons do not adequately allow for the differences in the network configurations of the two TNSPs. Hence high-level comparisons are, in themselves, of limited value as a basis for whether a particular TNSP's asset replacement costs are reasonable for valuation purposes.

The difficulty in benchmarking substation costs is reinforced by the fact that the New South Wales Treasury Guidelines give standard costs for transmission line construction, but not for substations. Earlier versions of the New Zealand ODV Handbook also did not give standard asset values for transmission substations. While later versions of the Handbook include such values, it is understood that TransPower provided these and they are therefore specific to TransPower's situation.

The Consortium valuation used replacement costs that were determined by the Consortium itself, and not provided by Powerlink. PB Associates has not tested these costs in detail but notes that they were independently developed on behalf of the ERU, and used by the ERU as the basis for the regulatory determination that currently applies to Powerlink.

The replacement costs used in the Consortium's valuation were similar to Powerlink's costs for constructing 275 kV substations, but lower than its costs for constructing 132 kV substations. Powerlink therefore engaged GHD to compare the Consortium's replacement costs with Powerlink's to try and find an explanation for the differences. The GHD report found that:

- The Consortium's replacement cost estimate was based on capital city prices and did not take due account of location.
- The cost of 132 kV substation bays was significantly impacted by the size of the project.

Based on these findings, Powerlink considers that the substation replacement costs in the Consortium's final report should be adjusted upwards by the application of a locational factor and considers the locality factors published by Rawlinson to be appropriate.

Whilst locality factors may be applicable to general civil works, we question whether they are appropriate for the purchase of electrical plant, given that delivery costs for locations beyond Brisbane are likely to be only a small proportion of equipment purchase costs. It is also not clear why the Consortium's 275 kV construction costs were more consistent than its 132 kV costs with Powerlink's own database, given that they also did not include locational factors.

Nevertheless Powerlink has provided the following table that indicates that their estimated costs are comparable to actual construction costs, for both 275 kV and 132 kV substations. It can be seen that, for the four projects taken together, the actual construction cost was only 0.5% lower than the replacement cost estimated using Powerlink's replacement cost estimating methodology.

Project	Date Completed	Actual Cost Esc to 2001/02	Building Block Estimate	Variation
Rocklea 275/110kV	1997/98	$6.741M	$6.587M	-2.3%
Calvale & Tarong 275kV Extension	1998/99	$10.798M	$11.377	5.4%
Tangkam 110kV	1999/00	$6.378M	$6.414M	0.6%
Tully 132kV	2000/01	$6.301M	$5.990M	-5.2%
AVERAGE		$30.224M	$30.368M	0.5%

5.1.3 Summary

The Consortium valuation uses independently assessed replacement costs for the valuation of transmission line and substations. Subsequent to this valuation, Powerlink has undertaken further study and has proposed a new valuation, with substation replacement costs increased by around 3.9% and transmission line replacement costs increased by around 3.2% when compared to the Consortium's valuation, escalated to July 2000 values. Comparisons provided by Powerlink indicate that their revised valuations are a fair reflection of expected replacement costs, based on Powerlink's current project management and construction practices.

Such comparisons do not indicate whether Powerlink's increased costs are reasonable in comparison with costs elsewhere in the industry and with the costs that might be achievable in a highly competitive environment. PB Associates attempted to establish this by undertaking a high level benchmarking comparison with the replacement costs in the valuation submitted by TransGrid for its recent regulatory review. Significant differences were identified, but it is possible that these could be accounted for by differences in network configuration, differences in the cost structure between Queensland and New South Wales and legitimate differences in the assumptions on which the estimates were based (e.g. a large scale or incremental approach to construction). It was therefore not possible, in the time available, for us reach any conclusion on the efficiency of the replacement costs proposed by Powerlink.

5.2 INTEREST DURING CONSTRUCTION

In its submission to the Commission, Powerlink argues that the Consortium used a crude model for determining interest during construction (IDC). Accordingly, the Powerlink valuation incorporates a 1.1% loading on the assessed replacement cost of transmission lines and substations to account for the difference between its assessment of 7.6% and the figure of 6.5% that it states is used in the consortium valuation.

Powerlink's assessment of 7.6% for IDC is based on a study undertaken by Price Waterhouse Cooper (PWC) into the appropriate level of IDC. The PWC report argues that IDC should be based on the weighted average cost of capital (WACC), rather than the cost of debt capital alone. By examining the cash flows expended on five recent Powerlink projects, it develops a "standard" project S-curve and uses this to determine the cash flow profile of a typical project, which is assumed to extend over a two-year time frame. This converts into an IDC of 7.6% of the overall cost of the project if a WACC of 7.5% is assumed.

The PWC analysis is rigorous. The assumption of 7.5% for WACC is reasonable, given recent regulatory determinations, and the argument that IDC should be based on WACC is consistent with the Commission's Draft Statement of Principles. A two-year time frame is realistic for a transmission line project but it could be argued that 18 months is a more reasonable time frame for a substation project, particularly if the incremental three bay extension used for assessing substation replacement costs is assumed. However the difference this would make to the replacement value of the asset base is unlikely to be material and we therefore consider the PWC / Powerlink value for IDC to be reasonable.

There is nothing in the Consortium's valuation report to indicate that 6.5% was the value it used for IDC. The Consortium refers to IDC only in the context of determining an appropriate loading for indirect costs, although the report does indicate that its assessment of IDC is based on "an appropriate interest rate" rather than on WACC.

It should be noted that IDC is only relevant if the regulatory asset valuation makes no provision for work in progress. This is in accordance with the Commission's Statement of Regulatory Principles, which indicates that work in progress should be rolled forward at an appropriate rate of return but only included in the regulatory asset base after the project has been commissioned.

If the regulatory asset valuation used for regulatory pricing includes work in progress, then provision should not be made for IDC when estimating asset replacement costs, since an appropriate return for the funds invested would be provided for in the allowed revenue cap. In this regard it is noted that the Consortium's valuation included a line item for work in progress.

5.3 EASEMENTS

Three alternative methodologies have been proposed for the valuation of easements. These are each discussed separately in the sections below:

5.3.1 Deprival Valuation

The deprival valuation concept attempts to assess the cost of replacing existing easements, assuming current economic and social conditions. This approach is favoured by both Powerlink and the Consortium on the basis that it is consistent with the deprival valuation philosophy, although both acknowledge that the introduction of a pure deprival approach to easement valuation could create a price shock that may well be politically unacceptable. For example, the Consortium's valuation of Powerlink's existing easements

using a deprival value approach was **$1,100,153,000**. This is almost 93% of the Consortium's assessed ODRC of the transmission lines that use the easements.

In our view, it is simplistic to postulate that network companies should value easements using a pure replacement cost approach, simply because this is consistent with the deprival valuation philosophy used for valuing other network assets. This ignores the very significant economic differences between easements and other physical transmission network assets such as lines, substations and land. In particular:

- Transmission lines, substation equipment and land can generally be traded on an open market. For these assets the ODRC valuation is a reasonable approximation for what a willing, but not anxious, buyer would be prepared to pay. In other words, should the network owner have no further need for an asset, it could generally liquidate it at a price approaching the ODRC valuation. In the case of easements, there is no open market and generally the only likely purchaser is the serviant tenement. A sale of the easement may only be possible if there was a potential to generate an economic return greater than the sale price of the easement. This could occur if, for example, extinguishing an easement increased the subdivision potential or enabled buildings to be constructed on the land.

  Often, the presence of a transmission line has little or no impact on the economic potential of the land. This is particularly true in rural areas. We suspect therefore that many if not most, landowners would decline to buy back the easement, preferring to let it lie on the title. It follows that the economic value of the asset should be reduced to account for this limited liquidity.

- Landowners, and the general public, are becoming much more sensitive to environmental issues. It is likely that political considerations would today prevent the acquisition of many existing easements, irrespective of the value placed on them. However, in using the deprival value concept, there is an implicit assumption that every existing easement would still be available provided the purchaser was prepared to pay the going price. We believe this assumption is flawed, as evidenced by the rejection of the original route proposed for the QNI interconnector.

- For any easement there is an upper limit to what a prudent network owner would be prepared to pay. This is equivalent to the cost of bypassing the easement, either by using the same technology over a different route or using an alternative technology. For example, even if an easement in an urban area were politically acceptable, a network owner would not buy the easement if it would be cheaper to avoid easement costs by running underground cables under public streets.

  Essentially this is an optimisation issue. In undertaking optimisations, most regulators accept the incremental basis on which a network was developed and allow existing transmission line routes to be assumed. However, if easement costs were to be taken into account in the optimisation process, it is doubtful that this would be appropriate. This is because, assuming a network owner was deprived of all his assets, the configuration of an optimal replacement network would be very different if existing transmission line routes were not readily available.

The deprival concept valuation of easements presented in the Consortium report is simply the Consortium's assessment of the cost to Powerlink of replacing its existing easements given their existing positions and assuming current market conditions. Even if the deprival concept were accepted in principle as a legitimate methodology for valuation of easements, we would expect proper consideration of the above factors to result in a significant reduction to the valuation assessed by the Consortium.

In valuing easements the Consortium divided the land into five categories: urban, transitional, rural farming and rural grazing and balance. Balance land was generally publicly owned and easements over balance land were considered to have no value.

For the other land categories, the average price per hectare of unencumbered freehold land was estimated for each of the three Powerlink areas, northern, central and southern, based on Arthur Andersen's experience and the experience of Powerlink and Ergon personnel. Each easement was valued on the basis of the likely freehold value of the land occupied by the easement, given land type and location, multiplied by a correction factor to account for compensation costs to cover additional factors such as injurious affection, disturbance, severance, timber, construction allowance encumbrance on title access tracks and the proximity affect on the home site.

Location factors ranged from 0.5 for rural grazing land to 1.5 for urban land. In determining the appropriate compensation factor the acquisition costs were compared to the land values for four easements. These easements did not include any transitional or urban land and in these cases the Consortium applied what it considered to be appropriate correction factors. Error in determining these two factors may not be material in that the proportion of total easement length that traverses urban or transitional land is likely to be small.

PB Associates has not engaged the services of a specialist land valuer to comment on this methodology. However we do note that acquiring an easement does not involve obtaining title to the land covered by the easement and that the value of an easement is likely to be related to the loss of the economic potential of the land due to the encumbrance. In grazing and farming areas, this is likely to be minor, except for land used, or intended to be used, as commercial forest.

Further the transitional factors noted above are generally site specific. A standard method of valuing an easement in a specific location is to assign a value equal to the difference in value of the lot on which the easement is located with and without the encumbrance. The methodology used by the consortium is at best an approximation, designed to simplify the process of deriving the total valuation of a large number of different easements, each with its own individual characteristics. In using this approach the selection of reliable correction factors is crucial, particularly in view of the materiality of the valuation in the context of the total value of the asset base. Indeed, given this materiality, an individual valuation of each easement could probably be justified. Irrespective of this, it is not at all clear that assigning correction factors on the basis of such a limited sample of control easements, which do not even appear to have been selected at random, is appropriate.

In addition to the area-based values determined by the above process the Consortium has added a fixed cost of $20,000 per km of easement length, to cover both the costs of determining an appropriate line route and also the costs of registering the easement. These costs include environmental impact studies, cultural heritage studies, corridor selection reports, community offsets, professional and survey fees and acquisition costs. This concept is reasonable. However, the report provides little evidence of any critical analysis by the Consortium into an appropriate level for these assemblage costs, and the figure used in the valuation would seem to be based purely on information provided by Powerlink.

The Commission, in its Draft Statement of Principles, stated that it proposes to adopt a deprival valuation approach to the valuation of easements. However, where the deprival valuation of an easement changes over time, the Commission would require the change to be reflected by a depreciation adjustment in a similar manner to the treatment of other network assets. This would ameliorate the price shocks, since any appreciation in the valuation of easements would be offset by a corresponding *negative* depreciation adjustment, which would reduce the regulated revenue cap in any year such an adjustment was applied.

If, the Commission decides to proceed on this basis, we nevertheless consider that a more careful assessment of Powerlink's total easement value is necessary in order to ensure that appropriate account is taken of the factors addressed above. A proper assessment is likely to be time consuming and expensive, but is justified on the basis that the inclusion of easement deprival values would significantly increase the total value of the asset base.

5.3.2 Historic Roll-Forward Valuation

The Consortium valuation also provides an historic roll forward valuation of the easements, which was assessed to be $114,658,000, or 10.4% of its assessed easement deprival value.

This valuation is determined by taking the easement valuation as of 1 July 1997, adding in the cost of easements acquired over the period 1996/1997 to 1998/1999 and indexing all values forward to 1 July 1999. It is understood that the opening easement value, and the actual costs added in for easements purchased after 1 July 1996, include all easement related costs, including assemblage costs. Further, while the opening easement asset value is shown at as 1 July 1997, the Consortium has subsequently added in easements purchased in the twelve months prior to this date. The reasoning behind this adjustment is not clear.

Powerlink considers the opening asset value used as the basis for this valuation to be unreliable. In its submission to the Commission it states that "Powerlink's book value for easements were not linked to actual historic cost. The current book values were the product of an allocation process undertaken in the early 1990s as a part of the industry restructuring"

In rolling forward the easement values the Consortium did not use an accepted, statistically derived index but developed its own index, in what appears to be a rather arbitrary fashion. The valuation report states:

"Due to time constraints we have been unable to properly analyse the market for the various easement categories to determine an appropriate property index. We have therefore had regard to the Consumer Price Index (CPI). However, based on our experience and analysis of movements in property values over a long period of time, property prices historically exceed the CPI by 100 basis points".

On this basis the Consortium has developed an indexing factor that arithmetically adds 1% to the calculated CPI movement for each year that a value is moved forward. Hence easements acquired in 1998/99, which on the basis of CPI should have been inflated by 0.08% corresponding to a 6-month index were actually inflated by 0.58%. Similarly easements acquired in 1996/7, which on the basis of CPI would have been inflated by 1.9% corresponding to a 2.5 year index, were actually inflated by 4.4%, derived by adding 1.9 to 2.5.

Given Powerlink's concerns over the legitimacy of the opening asset value, and the lack of rigour used in developing a roll forward index, the Consortium's historical roll forward valuation is not considered sufficiently reliable to be used as a basis for regulatory pricing.

5.3.3 Revalued Depreciated Actual Cost Approach

Powerlink has presented a hybrid approach that it submits should be used to value its easements for the price review, should the Commission not accept a replacement cost approach. The submission recognises that the Consortium's ODRC valuation of easements may not be acceptable to the Commission due to possible price shocks.

Powerlink's approach postulates that the costs of obtaining a transmission line easement should be segmented into two components.

1. The direct cost of purchasing the easement from the owner of the land.

2. The additional or assemblage factors that impact on the cost, and by implication the value of easements. These costs include environmental impact studies, cultural heritage studies, corridor selection reports, community offsets, professional and survey fees and acquisition costs. In the Consortium's deprival valuation, these costs were assessed as currently amounting to $20,000 per km of easement length.

Powerlink considers that direct costs should be valued on a historical roll forward basis with the historical costs being indexed forward to reflect the value of the dollar at the date of the valuation. This is also referred to an indexed depreciated actual cost (DAC) approach, although this description is misleading, as depreciation is not normally applied when valuing land and easements.

On the other hand, Powerlink considers that the additional or assemblage factors should be valued on the basis of their assessed current cost of $20,000 per km, as used by the Consortium in its deprival concept easement valuation.

In effect this is a hybrid situation, where direct costs are assessed on a historical roll forward basis while assemblage costs, which tend to depend on easement length rather than land value, be assessed on today's actual cost (ODRC).

On this basis Powerlink's assessment of the June 2000 value of its regulated easements is:

Direct costs (historical roll forward)	$66,714,806
Assemblage Costs (ODRC)	$131,612,000
Total	**$198,326,806**

In its submission Powerlink states that, while it was intended that the Consortium's historical roll forward approach should represent an "indexed DAC" valuation, this did not occur, since the valuation relied on Powerlink's book value for easements which are not linked to actual historic costs. The book values are the product of an allocation process undertaken in the early 1990s as part of the industry restructuring. Further, actual historic costs of many existing easements are not available.

In order to estimate an appropriate historic cost for each individual easement, Powerlink analysed a number of corridors that it had acquired since 1958, and for which cost data was available. It plotted the cost of acquisition for each easement in $/ha against year of acquisition, and plotted a "curve of best fit" which enabled it to assign a historic acquisition cost per hectare for every easement it owns, based on the size of the easement and the date of acquisition. It is noted that this approach does not account for the type of land involved or the location of the easement.

The historic cost of each easement was calculated of the basis of its area and the unit costs indicated by the "curve of best fit", and then rolled forward on the basis of the consumer price index (All Groups – Australia) to determine a July 2000 value. The impact of this roll forward is to increase the direct cost component of easement values by 94% over estimated historic costs of $34,462,969.

Powerlink commissioned a report from Arthur Andersen to critique this approach. The consultant concluded that:

- It could not endorse the methodology as conforming to accepted valuation standards. It was of the view that it should only be considered a transition method to avoid the sudden increase in value that would occur under the deprival concept.

- Too few easements were analysed to make an accurate assessment of the manner in which the direct costs of easement acquisition would change with time. However, on the basis of the numbers developed by Powerlink, Arthur Andersen would have used a curve of best fit that indicated significantly higher easement acquisition costs after about 1970, than those assumed by Powerlink.

- If the Commission accepts this alternative approach, there is a possibility that a precedent may be set that could evolve into a number of potential problems for Powerlink, the Commission and other regulators and utilities. There could be numerous assessments of value between book value and ODRC value, all with equally supportable justification.

- There is a real need for future research and discussion on this topic to better understand the issues associated with stakeholder interests.

Notwithstanding Arthur Andersen's legitimate concerns about the methodology, the Powerlink calculation would seem to be the most rigorous of the three valuations presented. The "curve of best fit" used by Powerlink is conservative in that it ensures that apparently high settlements reached in three of the eleven easements studies, do not excessively inflate the estimates of historic cost on which the valuation is based.

The separation of an assemblage cost per km based on present day cost, to cover environmental impact studies, cultural heritage studies, corridor selection reports, community offsets, professional fees surveying and acquisition costs is supported. These costs are real and are incurred whenever a new line is constructed. Inclusion of these costs in the ORDC asset base is consistent with the deprival concept of infrastructure asset valuation.

Whether these costs should be included as an easement cost or as a component of the replacement cost of the transmission line asset is an issue. Usually a number of routes are considered at an early stage of the design of a new transmission line and many of these costs are incurred not because of the easement in itself, but because of the nature of the transmission line to be constructed on the easement. For these reasons our preference is for these additional assemblage costs to be allocated to the transmission line assets rather than the easement. It may be that differing accounting treatment of these costs by different network owners helps explain why there is little consistency in the determination of appropriate easement valuations for regulatory pricing purposes.

In its deprival concept valuation the consortium used a fixed cost of $20,000 per km of easement for assemblage. However, the assemblage cost is likely to vary considerably, depending on the location of the line or easement. Further study is needed into the appropriate level of assemblage costs and how they should be treated in ODRC valuations. Issues that need to be addressed include what assemblage costs are valid, whether locational factors should be allowed for and whether the costs should be charged against the easement or the line. Other issues include treatment of older lines that are not constructed over legal easements particularly where new easements would be required if these lines were to be replaced, and treatment of any easement with a capacity to carry additional lines that have not yet been constructed. A further issue, particularly if it is accepted that assemblage should be allocated against a line rather than an easement, is the extent to which assemblage costs apply when a second or third line is constructed over an existing easement.

We agree that the direct cost of obtaining an easement should also be included in asset base used for regulatory pricing purposes. In its Statement of Regulatory Principles the Commission states that "To the extent that the acquisition of easements requires expenditure by the TNSP, it would be improper for the regulator to their existence or deny a reasonable return on the funds employed." However, in both the Consortium's historic roll forward approach and Powerlink's indexed DAC approach the value is rolled forward

according to an index that bears no relationship to the special characteristics of an easement as an economic asset. The result is likely to be an easement value somewhere between that which would apply using a pure historic cost approach and that which would apply using a replacement cost approach. While we are not opposed to the use of an indexed DAC approach, we note that is not based on any sound economic theory but appears to be a pragmatic compromise between two extremes, neither of which are completely satisfactory as a regulatory pricing mechanism. In this sense the methodology is transitional, and likely to be useful only until a more robust easement valuation mechanism emerges.

5.3.4 Recommendation and Conclusion

Three different easement valuations, ranging between $115M and $1,100M and each using a different valuation methodology, have been considered in this review. None of the valuations demonstrated the degree of rigour and depth of analysis that had been applied to the estimation of asset replacement costs, even though the value of easements will have a significant impact on the total value of the asset base.

Of the three easement valuations presented, we consider that Powerlink's valuation of easements is the most rigorous, although we are unable to endorse the methodology as an accepted method for valuing easements for regulatory pricing purposes. Nevertheless there are issues relating to the Powerlink valuation that require further consideration, particularly the derivation and allocation of assemblage costs.

Acceptance of the Powerlink valuation would result in a regulated easement valuation of **$198.3M** as of 1 July 2000. This is 16% of Powerlink's assessment of transmission line ODRC.

As a reality check, we attempted to benchmark this assessment against the value of easement included in the asset valuation accepted by the Commission for the TransGrid pricing determination. However, in this case, the Commission did not use the ODRC valuation but instead used a slightly lower alternative valuation provided by IPART. This was an economic valuation that did not break the asset base down into separate asset categories.

However the Determination did include a December 1998 ODRC valuation of the TransGrid assets. This showed the value of easements as $428.1M, 39% of the total transmission line ODRC. The Commission's consultants confirmed that this value conformed to deprival / ODRC principles but gave no details as to how this conclusion was reached. It was not clear of the extent to which this deprival valuation of TransGrid's easements included assemblage costs.

6. ASSET LIVES

6.1 ECONOMIC LIVES

The Consortium's valuation relied on asset lives supplied to it by Powerlink. These lives were reviewed during the course of the valuation, but the Consortium found no reason to depart from these values.

In the Table below these asset lives are compared with those used elsewhere in Australia, and NZ and UK.

Category	Powerlink	NSW Guidelines	TransGrid	NZ ODV Handbook[1]	UK (PB Power)
Transmission lines					
Tower	50	50	50	55	68
Wood Pole	45	35	50	45	53
Underground cables	45	45		55	
Transformers	40	50	35 to 40	55	
HV Switching Equipment	40	40	40	45	50
Controls/Protection					
Electromechanical	15	40	40	45	
Auxiliary & Ancillary Equipment	40	35 to 40	40	45	40

Note 1 The NZ ODV Handbook is published by the NZ Ministry of Economic and Development.

It can be seen that, in general the asset lives employed by Powerlink are consistent with those used elsewhere in the industry.

Some points of difference are:

Transmission lines on wood poles – Powerlink has used a 45 year life compared to a 35 year life recommended by the NSW Treasury Guidelines. A 45 year life is consistent with the recommended life for wood poles in NZ & UK, as well as the value used by TransGrid.

Transformers – the lives chosen by Powerlink are generally shorter than used elsewhere. This may be due to Powerlink's proximity to the coast and high exposure to cyclones and lightning.

Controls and Protection – Powerlink apply an asset life of 15 years for all secondary systems, which is lower than the 40 years used by other TNSPs and would appear to be based on the expected life of electronic equipment. This difference is unlikely to be material and, in any case, will result in a lower asset valuation.

Overall the asset lives used by Powerlink for valuation purposes are consistent with those used elsewhere in the industry and are considered appropriate for regulatory asset valuation purposes. The shorter lives used for some assets would tend to reduce the ODRC asset value, due to the higher depreciation associated with a shorter life.

A minor change was made to the asset lives used for valuing communication assets in Powerlink's June 2000 valuation. This valuation uses a standard life of 15 years for all communications assets, except buildings, towers and establishment, rather than the range of values used by the consortium. This change was done to simplify the valuation assessment and is not considered material.

6.2 RESIDUAL LIVES

Both the Consortium and Powerlink allowed a minimum residual life of three years for assets that, at the time of valuation, had less than three years of their standard economic life remaining or where the standard economic life had expired. For communications assets the residual life is two years. This is appropriate and is generally consistent with the NSW Treasury Guidelines.

7. OPTIMISATION

7.1 GENERAL

Optimisation is the process of adjusting the replacement cost of the existing network assets to account for over design, over capacity and redundant assets. The optimisation process is consistent with the deprival valuation philosophy in that assets should be optimised out if a network owner, when deprived of the assets, would not rebuild them when constructing a replacement network, designed to provide a similar level of service under similar load growth conditions.

The deprival philosophy suggests a greenfields approach to optimisation where a completely new network is configured, in the most efficient way possible, having no regard to the existing network design. However, this ignores the fact that networks evolve over an extended period of time, and constantly have to be adapted in response to changing patterns of electricity supply and demand. Therefore, regulators generally accept an incremental approach to optimisation.

In the optimisation of the Powerlink network, the Consortium indicated that the following constraints were assumed.

- The location of generating plants and points of bulk supply was assumed to be fixed.
- Only existing line and cable routes were assumed.
- The optimised network had an import / export capacity similar to that of the existing system.
- The optimised system should have inherent stability, reactive power support and fault level ratings sufficient for business and total asset management planning, but not more than the existing system.

The Consortium states that a rigorous review of the optimisation of a transmission network requires detailed computer analysis and knowledge of the operation difficulties applicable to the system. Hence optimisation studies are normally performed by the asset owner and reviewed by the valuer.

We concur with these comments, and the approach proposed, with the one proviso that, as noted in Section 5.4.1, the assumption that only existing line routes be assumed is inappropriate if the easement replacement costs built into the asset valuation reach the point where alternative routes for any specific line would be more economic.

Powerlink has provided a copy of their network optimisation rules that, in broad terms, require that the requirements of the National Electricity code be met, under a single outage contingency. This is appropriate.

7.2 OPTIMISATION OF THE POWERLINK SYSTEM.

In optimising the network for the consortium valuation, the optimisation used for the 1997 ODRC valuation was taken as the basis for discussion.

The optimisation process resulted in the following adjustments:

- Transformer capacities were optimised down at seven substations.

- Transformer bays were optimised out at two substations.
- Transmission line configurations have been optimised in four instances.
- Two existing communications links have been optimised out.
- Nine substations have been reconfigured to avoid over engineering.
- Thirty-eight substation assets and two transmission lines associated with the Boyne Island smelter have been optimised out as Comalco and Powerlink dispute their ownership.

The impact of these optimisations on the Consortium's valuation is shown in the table below.

	Replacement Cost	**Optimised Replacement Cost**	**Depreciated Replacement Cost**	**ODRC**
Transmission Lines	$1,988.5M	$1,930.7M	$1,216.1M	$1,186.9M
Substations	$934.6M	$901.3M	$487.7M	$476.8M
Communications	$66.6M	$64.5M	$34.3M	$33.9M
Total	$2,989.7M	$2,896.5M	$1,738.1M	$1,697.6M

The indication is that the Consortium's valuation incorporates a reasonably thorough optimisation process. This has reduced the replacement cost of the network asset base by 3.1% and the ODRC by 2.3%.

Nevertheless, in undertaking an optimisation it is important that the valuer examines each element in the network in a consistent and methodical way, rather than look for optimisation opportunities using a more ad hoc approach. There is no statement in the Consortium's report confirming that such a methodical process has been worked through and therefore we are unable to exclude the possibility that legitimate optimisations have been overlooked.

The reason that assets with disputed ownership have been left in the asset base and optimised out, rather than removed completely is not clear. This will not affect the price review as network owners are only allowed a regulated return on the depreciated value of the asset base.

The Powerlink valuation retains the optimisations used in the Consortium report and we recommend that the Commission accept these.

8. INDEXING THE TRANSMISSION CAPITAL BASE FORWARD

Powerlink's standard accounting practice is to index the asset base forward by the Consumer Price Index – All Groups, Brisbane, in order to update the replacement cost of its asset base annually. In developing its June 2000 valuation further adjustments have been made where the base costs used by the Consortium in its valuation, indexed forward to June 2000, did not align with Powerlink's data.

The issue of indexing the capital base forward to so that the ODRC valuation reflects current costs has no simple answer. For example, the replacement costs quoted in the New South Wales Treasury Guidelines are based on estimated prices in 1995, when the Guidelines were written. These have been tested by PB Associates and found to be comparable with current price levels. This in itself infers that the prices are not linked directly to the CPI and this is demonstrated by the UK experience.

It would seem that transmission system project costs might currently not be increasing in line with movements in the CPI. This is possibly due to the more competitive environment in which transmission companies now operate. This may be providing the necessary incentive for companies to seek more innovative and efficient ways of implementing projects.

In the United Kingdom the average prices of the general transmission equipment including transmission switchgear, metering and protection, overhead line conductors, and wood poles decreased by 7% during the period 1996 to 1998. These price trends were wholly consistent with prevailing market conditions and the introduction of foreign competition. Suppliers have been forced to be more commercially innovative, stocks have been kept to a minimum and until mid to late 1996 supply had exceeded demand, certainly in European markets.

In addition, many of the construction and refurbishment contracts put in place in the restructured and/or privatised supply industries are likely to require the successful contractor to purchase materials. Transmission businesses are employing more and more contractors and the consequently the labour costs rather then the material costs are becoming more relevant to capital budgeting.

In the recent UK Transmission Price Review the transmission businesses conceded a 1% per annum reduction in procurement costs over the period of the price review.

However, indications are that the situation is dynamic. Market conditions suggest a healthy export market for plant and that supply is mirroring demand. Raw material costs are beginning to rise (e.g. copper, aluminium, and steel) and recent market testing has indicated the following price trends in Europe for future purchases:

Line conductors and fittings	+6% on current prices;
Primary Transformers	+5% on current prices;
Transmission Switchgear	+7% on current prices;

The above trends may not be directly applicable to the Australian electricity transmission industry but some of the principles will certainly apply here as the regulatory regime drives the transmission companies to strive for efficiencies in purchasing and procurement.

The above discussion indicates that, in PB Associates' experience, transmission line and substation costs do not necessarily move in line with CPI. It follows that and a regular

annual adjustment in line with CPI may not be a valid method of updating asset valuations based on replacement costs

It is likely that movements in replacement costs are influenced by two different drivers, each operating in a different direction:

- Resource inputs, particularly local plant and labour, will tend to increase with time, more or less in line with CPI.

- Market pressures, and the influences of a competitive environment, encourage the more efficient use of resources, which in turn acts to reduce costs. The introduction of new technology can also result in reductions in the cost of modern equivalent assets.

Movements in replacement costs with time will depend on the relative influence of each of the above drivers. It is likely that, over a short period of time, replacement cost movements will be primarily driven by changes in the cost of resource inputs. However, over a longer time span, the influence of cost reductions due to competition and technology changes should become apparent.

Two possible approaches are possible to capturing movements in replacement costs, where these differ from CPI. The first approach, suggested by Powerlink, is to develop a composite industry specific index reflecting changes in the costs of inputs used for transmission system construction. A second approach is to undertake a periodic revaluation of the asset base, basing each revaluation on current replacement costs. This second approach mirrors the standard CPI-X approach to regulation, with its regular revenue resets. If the second approach is adopted it might be appropriate to allow some indexation of the value of the asset base between valuations.

APPENDIX A
GLOSSARY OF TERMS

Glossary of Terms

ACCC	Australian Competition and Consumer Commission
BPO	Base Planning Object
Code	National Electricity Code
Commission	Australian Competition and Consumer Commission
Consortium	The Consortium comprising Arthur Andersen, Worley International and GHD. This Consortium undertook a June 1999 valuation of Powerlink's assets for the ERU.
CPI	Consumer Price Index
DAC	Depreciated Actual Cost
ERU	Queensland Electricity Reform Unit
GHD	Gutteridge Haskins & Davey Pty Ltd
IDC	Interest During Construction
IPART	Independent Pricing and Regulatory Tribunal of New South Wales
NEMMCO	National Electricity Market Management Company
NSW	New South Wales
NZ	New Zealand
ODRC	Optimised Depreciated Replacement Cost
ODV	Optimised Deprival Valuation
OPGW	Optical Fibre Ground Wire
PWC	Price Waterhouse Cooper
QNI	Queensland – New South Wales Interconnector
SAP	Proprietary name of the asset management software used by Powerlink.
TNSP	Transmission Network Service Provider
UK	United Kingdom
WACC	Weighted Average Cost of Capital