Ergon Energy

Queensland Electricity Distribution Corporations ODRC Valuation of Electricity Supply Assets

Report for

Queensland Competition Authority
Covering Ergon Energy Assets

September 2000

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Document Status					
Rev No.	Author	Reviewer	Approved for Issue		
			Name	Signature	Date
0	G Taylor	N W Wyles	N. W Wyles	N. W Wyles	19/9/00

ARTHUR ANDERSEN

GHD

Ergon Energy
61 Mary Street
BRISBANE QLD 4000

Attention: Mr Paul Asnicar

Dear Sir,

Queensland Electricity Distribution Corporations

ODRC Valuation of Electricity Supply Assets - Ergon Energy

In accordance with your instructions we are pleased to present our Final Report for publication dated 4 September 2000 on the Optimised Depreciated Replacement Cost valuation of Ergon Energy electricity supply assets.

The report has been prepared using the methodology as outlined in the ENERGEX document "Valuation of Fixed Assets - 1999 Methodology Summary".

The ODRC valuation outlined in this report for Ergon Energy's electricity supply regulated assets at 31 December 1999 is **$2,523,227,757.**

Assumptions and limiting conditions that should be read with this valuation are included in the Report.

Yours faithfully,
GHD/Arthur Andersen Consortium

per

N. W. Wyles

Date: 19/9/2000

Gutteridge Haskins & Davey Pty Ltd
Neil W Wyles - Project Director

Roy J Farthing

Date: 19/9/2000

Arthur Andersen
Roy J Farthing - Partner, Asset Consulting & Valuation

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Executive Summary

ENERGEX and Ergon Energy had engaged a consortium consisting of GHD and Arthur Andersen to carry out an optimised depreciated replacement cost (ODRC) valuation of the network assets of Queensland Electricity Distribution Corporations.

The Corporations need accurate, consistent valuations for a range of purposes being:

- to provide shareholder Ministers with information about values of assets eg to assess shareholder value
- to provide information to regulators eg as part of the process of determining appropriate levels of revenue; and
- for internal management purposes eg to assess the performance of business units and contribution to overall financial performance.

The ODRC valuation as at 31 December 1999 for Ergon Energy is $2,523,227,757.

The valuation includes easements at deprival (market) value.

1. Introduction

1.1 Purpose

The Queensland distribution corporations, ENERGEX and Ergon Energy need accurate, consistent assets valuations for a range of purposes.

- to provide shareholder Ministers with information about values of assets eg to assess shareholder value
- to provide information to regulators eg as part of the process of determining appropriate levels of revenue; and
- for internal management purposes eg to assess performance of business units and contribution to overall financial performance.

To this end ENERGEX and Ergon Energy commissioned GHD in conjunction with Arthur Andersen to conduct an ODRC asset valuation of the electricity distribution assets for the Queensland Distribution Corporations.

The ODRC valuation was carried out in accordance with ENERGEX supplied guidelines titled "Valuation of Fixed Assets - 1999 Methodology Summary". The guidelines require deprival value to be measured as the lower of ODRC and recoverable amount. The GHD/AA commission was to calculate the ODRC.

In carrying out the ODRC valuation GHD/AA produced standard replacement costs and effective lives that could be applied to all Queensland assets taking into account factors such as:

- large variance in weather conditions
- large distances encountered in Queensland
- differences in urban, rural and remote rural areas
- differences in geotechnical conditions

1.2 Electricity Distribution in Australia

Australian electricity is supplied by six State and two Territory systems as well as the Snowy Mountains hydro scheme. The systems in New South Wales, Victoria, South Australia and the Australian Capital Territory are inter-connected.

- Among the supply organisations are:
- 17 generators
- 5 high voltage transmission operators and system managers

- 21 distributors
- 28 electricity retailers
- 2 vertically integrated suppliers

1.2.1 Competition

Electricity supply industry reform in Australia was undertaken to achieve the following key objectives:

- To provide low and sustainable electricity prices to consumers over the long term;
- To create an efficient electricity supply industry in Australia;
- To maximise consumer choice and encourage efficient investment;
- To ensure an appropriate regulatory environment to protect consumer service and safety standards;
- To ensure long-term security of supply; and
- To provide a framework for an effective and sustainable competitive energy market.

1.2.2 The Electricity Regulatory Environment

The distribution of electricity is a natural monopoly. As such the amount an electricity business can charge to deliver electricity via poles and wires is subject to government regulation. Distribution tariffs and other aspects of the regulatory regime are to be reviewed over the next 18 months to determine fees for the five-year period from 2001.

As electricity cannot be stored or branded to distinguish its generator, all generated electricity is centrally pooled and scheduled to meet demand. This pool is managed by the National Electricity Market Management Company (NEMMCO).

1.2.3 The National Electricity Market

The National Electricity Market (NEM) is a wholesale market for the supply and purchase of electricity in New South Wales, Victoria, South Australia and the Australian Capital Territory. The market uses the concept of a pool where the electricity output from generators is centrally controlled by the National Electricity Market Management Company (NEMMCO) to balance with the customer demand. Generators compete by bidding prices for different levels of generation and these are used by NEMMCO to determine the price of electricity, which changes for each half-hour of the day. The spot price is essentially the clearing price to match the supply and demand of electricity. Electricity retailers purchase electricity from the pool to sell to end-use customers.

1.2.4 Role of NEMMCO

National Electricity Market Management Company (NEMMCO) has been established to manage the operation of the wholesale electricity market and security of the power system.

NEMMCO's objectives are:

- To establish and conduct the wholesale electricity market efficiently on a self funding/break even basis;
- To promote the on-going development of, and changes to, the wholesale electricity market with the objective of improving its efficiency; and
- To undertake the responsibility for the coordination of power system planning for the wholesale electricity market.

NEMMCO's major functions include:

- Registering prospective Code Participants;
- Managing the power system to balance supply and demand for electricity based on the generating capacity available to the wholesale market;
- Maintaining power system security;
- Administering the spot market including calculation of spot prices, Metering of Market Participants, and spot market settlements;
- Registering meter providers;
- Ensuring that adequate ancillary services are available to operate the power system; and
- Coordinating global power system planning in conjunction with Network Service Providers and in consultation with Market Participants.

1.2.5 Franchise Fees

Franchise Fees are paid to the respective State Governments, and are effectively a monopoly tax on profits an electricity business earns from retailing electricity to franchise customers.

1.3 Queensland Electricity Industry Structure And Competition

The Queensland electricity supply industry is now divided into four main segments: generation, transmission, distribution and retail.

The generators sell electricity through a central trading ‘pool’ arrangement where retailers take supply to meet their customer’s needs. The new industry structure and trading arrangements provide a mechanism for a competitive energy market.

The transmission and distribution companies are responsible for the delivery of power.

1.3.1 ENERGEX

ENERGEX is a distributor of electricity and a retailer of energy products and services. It purchases electricity from electricity generators that are both privately and government owned. The electricity is supplied to ENERGEX through a high-voltage transmission network that is owned and operated by Powerlink Queensland, a government owned corporation.

ENERGEX retails gas and electricity products and services to more than one million customers.

Key ENERGEX Facts

- over 1,022,000 customers
- ENERGEX has an annual revenue of $1,559 million
- Total geographic area of 24,830 square kilometres
- supplied 14,954 GW hrs of electricity
- ENERGEX facilitated a reduction in greenhouse gas emissions of 117,000 tonnes in 1998/99 - 9000 tonnes above targets set with the Australian Greenhouse Office.

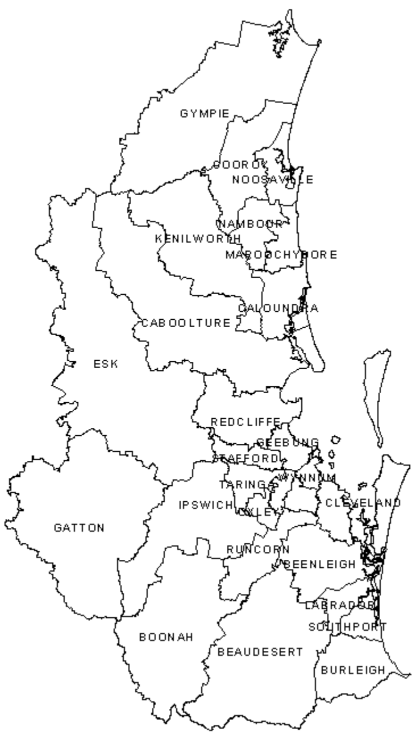

Figure 1 Distribution area of ENERGEX

1.3.2 *Ergon Energy*

Ergon Energy became one of Australia's largest energy companies with the merger of the six regional Queensland distribution corporations, and their subsequent re-branding to Ergon Energy from July 1999.

Key Ergon Energy Facts:

- Over 550,000 customers
- Manages 135,000 km of electricity network
- Ergon Energy has annual revenue of $1,150 million
- Distributes electricity across approximately 1 million square kilometres
- Ergon Energy sold more than 11,000 GWh of energy last financial year
- Ergon Energy sold 180 GWh of green energy last financial year

A brief description of the six regional electricity corporations and their service areas forming Ergon Energy are described in the following sections.

1.3.2.1 Far North Queensland

Ergon Energy distributes electricity to nearly 100,000 customers, across 340,000 square kilometres in Far North Queensland.

Cairns and the Atherton Tableland are at the centre of Ergon's Far North Queensland service area which extends from Cardwell North to Thursday Island and throughout the Torres Strait Islands, and west to Doomadgee in the Gulf region.

Figure 2 illustrates the distribution area of Ergon Energy in Far North Queensland.

Figure 2: Distribution Area of Ergon Energy (Far North Queensland)

In remote areas, Ergon Energy meets the needs of communities isolated from the State electricity distribution network, through independent generation systems and small community based electricity grids.

1.3.2.2 North Queensland

Ergon Energy in North Queensland provide electricity and associated products and services to more than 225,000 people in an area of 458,000 square kilometres. The North Queensland supply area extends from Townsville North to Ingham, south to Collinsville and west to the Northern Territory border. The remote townships of Boulia, Burketown and Camooweal are serviced by small diesel-powered stations.

Figure 3 illustrates the distribution area of Ergon Energy in North Queensland.

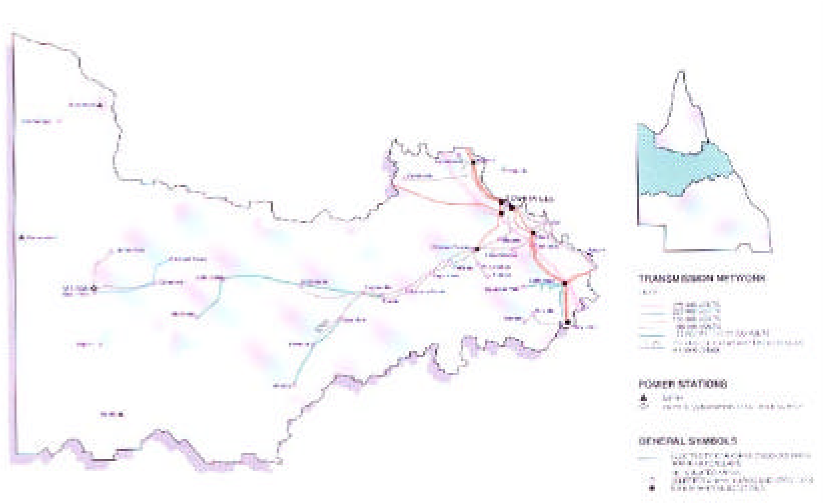

Figure 3: Distribution Area of Ergon Energy (North Queensland)

1.3.2.3 Mackay

Ergon Energy in Mackay supplies electricity to over 50,000 customers across 28,466 square kilometers and seven local Coucil authorities.

Figure 4 illustrates the distribution area of Ergon Energy in Mackay.

Figure 4: Distribution Area of Ergon Energy (Mackay)

Major customers of Ergon Energy in Mackay include coal mining operations, coal exporting terminals, Queensland Rail, the sugar industry, beef processing facilities and resorts located in the tourism strip between Mackay and the Whitsundays.

1.3.2.4 Capricornia

Ergon Energy in Capricornia Owns and Operates an electricity network infrastructure which services approximately 93,000 customers located in an area of 432,000 square kilometres. Ergon Energy manages approximately 31,500 km of distribution line.

Figure 5 illustrates the distribution area of Ergon Energy in Capricornia.

Figure 5: Distribution Area of Ergon Energy (Capricornia)

1.3.2.5 Wide Bay Burnett

Ergon Energy in Wide Bay Burnett supplies approximately 95,000 customers through 17,158 km of lines.

Figure 6 illustrates the distribution area of Ergon Energy in Wide Bay Burnett.

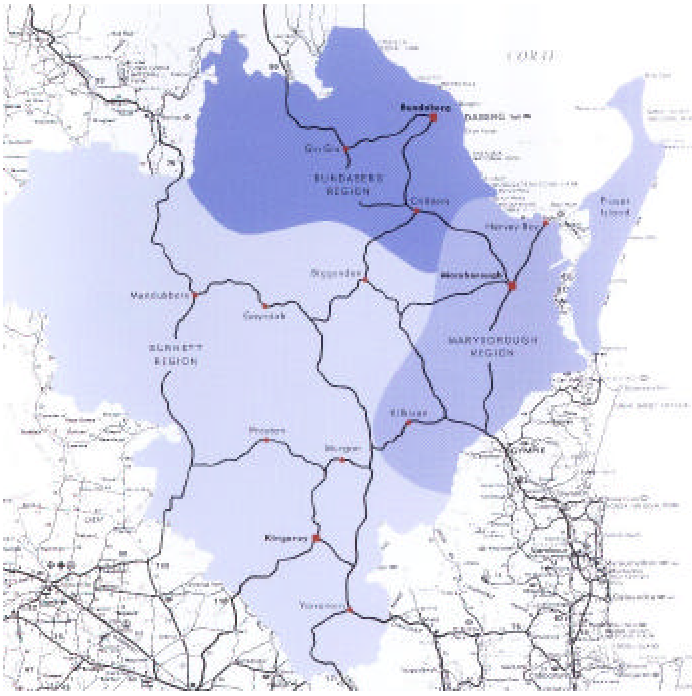

Figure 6: Distribution Area of Ergon Energy (Wide Bay Burnett)

1.3.2.6 South West Queensland

Ergon Energy in South West Queensland is responsible for the supply of electricity and related services. There is more than 42,000 km of line covering 413,000 square kilometres.

Figure 7 on the following page illustrates the distribution area of Ergon Energy in South West Queensland.

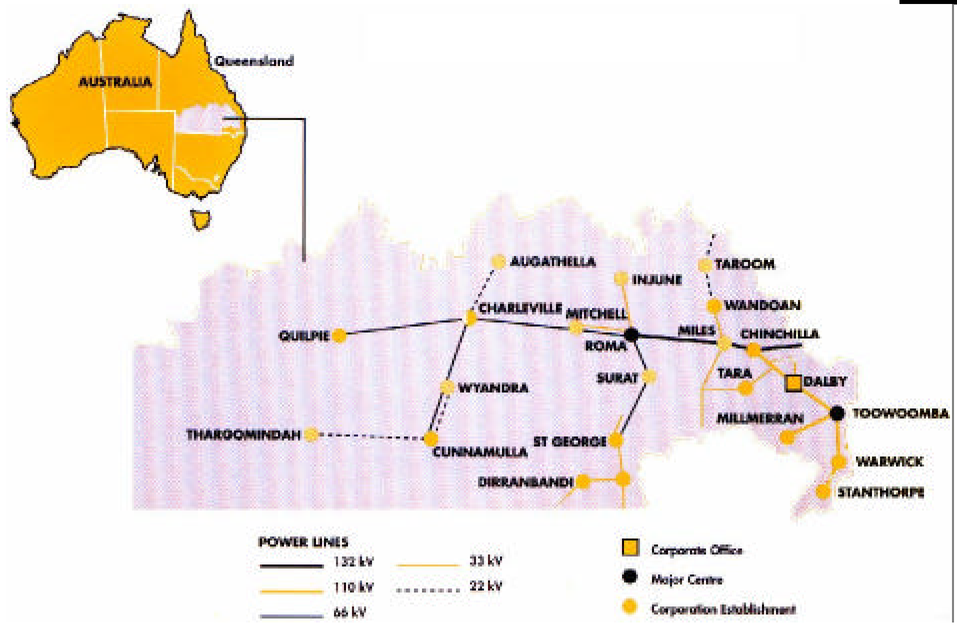

Figure 7: Distribution Area of Ergon Energy (South West Queensland)

1.4 The Victorian Electricity Industry Structure and Competition

The Victorian electricity industry is presently made up of –

- Generation companies (7)
- A transmission company (GPU Powernet)
- An independent statutory authority (VPX)
- Distribution Companies (5)

1.4.1 Victorian Electricity Distributors

There are five electricity distributors in Victoria. Table 1 below provides a summary of electricity distribution in Victoria.

Victorian Electricity Distributors	Area	Total Number of Customers
Citipower	157 km^2	250 000
United Energy	1450 km^2	643 000
AGL Electricity (formerly Solaris)	950 km^2	NA
TXV (formerly Eastern Energy)	80 000 km^2	500 000
Powercor	150 000 km^2	550 000

Table 1: Electricity distributors in Victoria

1.5 South Australian Electricity Industry Structure And Competition

Starting in October 1998, the Government implemented the restructure of South Australia's electricity businesses. Currently the structure which is still undergoing change is:

1. ETSA Utilities is the distribution business that manages the electricity distribution systems. ETSA utilities is a member of the Cheung Kong Group of companies.
2. ETSA Power was acquired by AGL in January 2000. AGL is the electricity retailer in South Australia.
3. Flinders Power, Optima Energy and Synergen are the three generation companies with installed capacities of 760 MW, 1,280 MW and 359 MW.
4. The transmission business, ElectraNet SA has over 5,550 km of high voltage transmission lines operating at 66 kV, 132 kV and 275 kV
5. Terra Gas Trader is a gas trading business established to manage the State's gas contracts and gas bank.

1.5.1 South Australian Electricity Distribution

ETSA Utilities is the sole electricity distributor in South Australia. The following information in Table 2 provides an overview of ETSA Utilities.

South Australian Electricity Distributor	Area	Total Number of Customers	Circuit km of line
ETSA Utilities	178,200 km^2	734,000	72,633

Table 2: Electricity distributor in South Australia

1.6 Western Australian Electricity Industry Structure And Competition

A major objective for the Western Australian Government is to encourage competition in the electricity distribution industry to bring about a lower cost and reliable energy supply for the State.

In January 1995, the State Energy Commission of Western Australia (SECWA) was restructuring and resulted in the formation of Western Power and Alinta Gas separate and competing corporative electricity and gas utilities owned by the State.

Western Power was established by the Electricity Corporations Act 1994 and is responsible for the generation, transmission, distribution and sale of electricity.

Functions which SECWA previously undertook (such as energy policy and regulatory functions), have been transferred to the Office of Energy.

1.6.1 Western Australian Electricity Distribution

Western Power is Western Australia's sole electricity distributor. Western Power owns, maintains and operates five major power stations and 32 smaller power stations with a total capacity of more than 3,000 megawatts. It operates two major interconnected systems, in the southwest corner of Western Australia and the Pilbara in the north, as well as 29 separate systems in remote parts of the State.

Western Australian Electricity Distributor	Area	Total Number of Customers
Western Power	2 525 000 km^2	740 000

Table 3: Electricity distributor in Western Australia

1.7 Tasmanian Electricity Industry Structure And Competition

The Tasmanian Electricity Regulator was established as part of the reform of the Tasmanian electricity supply industry. The Regulator is independent of the Tasmanian Government and the electricity industry and is responsible for the administration of the Electricity Supply Industry Act 1995.

The Act is supported by detailed consumer protection and price control regulations. The Act creates the Tasmanian Electricity Code which establishes the technical specification of network security, reliability and connection standards.

The revised industry structure has three separate electricity entities.

The disaggregation process resulted in the formation of three separate corporate identities with discrete areas of responsibility:

1. Aurora Energy Pty Ltd, which is the distribution business selling electricity to homes and businesses around Tasmania.
2. Transend Networks Pty Ltd, which is responsible for the upgrade and maintenance of the extra high voltage (EHV) transmission system; and
3. Hydro-Electric Corporation, which now has a specialised focus on power generation and water management;

1.7.1 Tasmanian Electricity Distributor

Aurora Energy Pty Ltd is Tasmania's electricity distribution company.

Tasmanian Electricity Distributor	Area	Total Number of Customers	Residential Customers	Business/Industrial Customers
Aurora Energy	68 331 km^2	245 498	206 926	38 574

Table 4: Electricity distributor in Tasmania

Aurora Energy maintain and operate 16,000 kilometres of high voltage lines and 9,500 kilometres of low voltage lines statewide.

1.8 New South Wales Electricity Industry Structure And Competition

In May 1995 the New South Wales Government announced major structural reform of the New South Wales electricity industry in preparation for a competitive national energy market.

Following a NSW Government review of the structure of the electricity industry, the State's 25 electricity distributors were merged into six new energy services corporations.

Figure 8 below shows the area of each corporation in New South Wales.

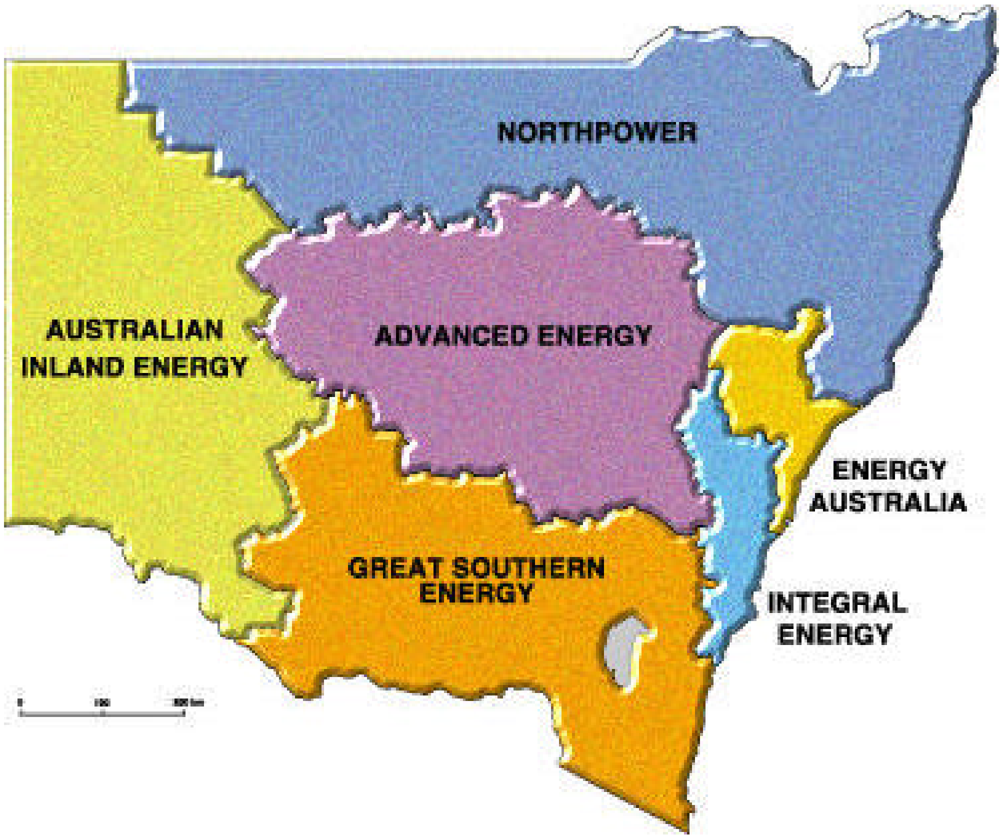

Figure 8: New South Wales Electricity Distributors and their Distribution Areas

1.8.1 New South Wales Electricity Distributors

There are six electricity distributors in New South Wales. Table 5 below provides a summary of electricity distribution in New South Wales.

New South Wales Electricity Distributor	Area	Total Number of Customers
Advance Energy	195 775 km^2	NA
Australian Inland Energy	155 000 km^2	19 300
Energy Australia	22 275 km^2	1 300 000
Great Southern Energy	174 450 km^2	NA
Integral Energy	24 500	NA
North Power	230 000	NA

Table 5: Electricity distributors in New South Wales

1.9 State Comparisons

Electricity supply businesses have combined assets of $A60 billion. New South Wales (including the ACT) and Victoria accounted for about 60% of total electricity customers.

Table 6 below outlines the total number of customers by state.

State	Total Number of Customers	Residential Customers	Business/Industrial Customers
Queensland	1 532 034	1 346 548	185 486
Victoria	2 038 051	1 804 169	233 882
South Australia	724 531	630 080	94 471
Western Australia	761 704	673 571	88 133
Tasmania	245 498	206 926	38 572
New South Wales (including ACT)	2 947 013	2 555 906	391 107
Northern Territory	63 126	51 998	11 128

Table 6: Number of Electricity Customers by State

Australia is a high electricity consuming country by world standards with per capita electricity consumption of 8,400 kWh per year, the ninth largest electricity consumption per capita in the world.

Electricity accounts for more than 18 percent of Australian's total final energy consumption.

Most of the load centres are located on the south-eastern seaboard of Australia. Tasmania may also join the NEM if an interconnection is built undersea to Victoria. Western Australia and the Northern Territory will not be included in the national market because these systems are considerable distances from the south-east supply system.

New South Wales accounts for 37% of total electricity consumption. Table 7 below outlines electricity consumption by State.

State	Total Consumption	Residential Consumption	Business/Industrial Consumption
	Million kWh	Million kWh	Million kWh
Queensland	32 210	9 369	22 841
Victoria	34 855	10 281	24 574
South Australia	9 939	3 693	6 246
Western Australia	11 063	3 268	7 796
Tasmania	8 985	1 887	7 098
New South Wales (including ACT)	58 713	18 315	40 398
Northern Territory	1 525	412	1 113

Table 7: Electricity Consumption by State

The South Australian electricity market is different from the markets in Victoria and New South Wales. These differences arise from a combination of demand, supply and the level of excess generation.

South Australia and Victoria have demand peaks that occur during the summer months, while New South Wales has a winter peak.

The increased use of air conditioners in Victoria and South Australia is the main contributor for these two States having a summer peak.

The supply-demand balance in South Australia is said to be ‘tighter’ than in other regions of the National Electricity Market (NEM). This places a greater reliance for system security on the generating plants, which results in higher prices in South Australia than in New South Wales and Victoria.

Queensland will be connected to the NSW, VIC, SA grid with a new high voltage transmission line currently under construction. An unregulated DC link has recently formed a grid connection.

2. ODRC Methodology

2.1 Optimised Depreciated Replacement Cost Approach

The optimised depreciated replacement cost (ODRC) approach involves:

- Establishing the gross current replacement cost of the existing assets by reference to modern equivalent assets with the same service potential.
- Adjusting or optimising the gross current replacement cost determined above for over-design, over-capacity and redundant assets.
- Depreciating this value to reflect the anticipated effective working life of the asset from new, the age of the asset and the estimated residual value at the end of the asset's working life.

This approach to value can be regarded as a surrogate for market value in circumstances where it is not possible to determine values for specialised assets using a market comparison approach.

It follows therefore that the valuation approach should seek to reflect market behaviour, or put another way, the application of the approach should seek to replicate the thought process that would be followed by an informed potential purchaser acting without compulsion.

Where market evidence is readily available it is possible to establish a relationship between market value and replacement cost. Where market evidence is available for the same broad asset at varying ages, it becomes possible to establish a loss in value or depreciation profile. By its very nature, such a profile takes into account supply/demand characteristics and the impact of all other factors on value.

Conversely, in the absence of suitable market data, the valuer should seek to construct a loss in value or depreciation profile by measuring by other means, the various factors that impact on value.

In respect of the optimisation part of this measurement process, the valuer attempts to assess value by reference to the concept of substitution. It is logical to assume that the maximum amount a potential purchaser would be prepared to pay for an asset is represented by the purchaser's lowest alternative cost to replicate the function of the asset. In assessing what represents the lowest alternative cost, consideration must be given to the optimum set of assets that would be required to provide the reasonably foreseeable services required to be delivered by the assets.

If the existing asset does not represent the lowest cost alternative asset to provide the reasonably foreseeable services, then the potential purchaser will adopt the replacement cost of the lowest cost alternative in place of the reproduction cost of the existing asset.

The ODRC therefore represents "the minimum cost of replacing or replicating the service potential embodied in the network with modern equivalent assets in the most efficient way possible from an engineering perspective, given the service requirements, the age and condition of the existing assets and replacement in the normal course of business"[1]

This concept is consistent with the principles of fairness and equity required in assessing access charges in that users only pay for those assets that are required in a commercial context and therefore are not required to pay for any excess capacity or over-engineering embodied in the existing assets.

2.2 Gross Current Replacement Cost

The Gross Current Replacement Cost (GCRC) is based on modern equivalent assets and is determined by reference to the current market buying price, current reproduction cost or replacement cost of modern equivalent assets.

In respect of specialised assets, such as most network infrastructure, the appropriate cost is the lower of the current replacement cost and the current reproduction cost of the gross service potential of the existing asset.

The GCRC can be established:

- By comparison with recent costs of similar assets;
- By reference to historical costs, adjusted for inflationary increases since construction;
- By contacting suppliers, manufacturers or their agents; or
- By reference to recently published prices.

Other assets such as motor vehicles, mobile plant, computer and office equipment are usually valued using a market comparison approach where sufficient market evidence exists. For the purpose of this exercise, given that these assets are not considered material in respect of the overall asset base of Ergon Energy, the current carrying value will be adopted as being representative of the market value for the existing use.

2.3 Optimisation Principles

Because the ODRC of network assets is based on the service potential of the existing assets, it is necessary to adjust the GCRC of modern equivalent assets for over-design, over-capacity and redundant assets.

IPART (NSW) states that "an optimised system is a reconfigured system using modern technology designed to serve the current load with current technology, with some allowances for growth. This method excludes any unused or under

[1] NSW Treasury, Policy Guidelines for Valuation of Network Assets of Electricity Network Businesses, December 1995.

utilised assets and allows for potential cost savings that may have resulted from technological improvement."[2]

2.4 Depreciation

2.4.1 Effective Lives

The effective working life of an asset is the estimated life of the asset, assuming continued use in its present function, as part of a continuing business. It is considered to be at an end when it has become unserviceable or obsolete or when the present value of operating and maintenance costs is less than the cost of replacement.

The standard and frequency of maintenance is a significant factor in the determination of effective lives. All other things being equal, a regularly and well-maintained asset will have a longer effective life than an identical asset which is subjected to poor and infrequent maintenance.

Effective lives are assessed based on:

- Examination of asset service records;
- Discussion with technical staff;
- Physical inspection;
- Benchmarking against known retirement practices.

In addition to these generic factors that impact on effective lives, assets of the same type within a network may have different lives due to different service conditions. Such factors might include:

- Environmental conditions;
- Level of use;
- Level of maintenance.

2.4.2 Obsolescence

In determining when to retire a particular asset or class of assets the operator will normally compare the existing asset or assets with currently available assets. Their assessment will necessarily take account of economic, functional, technological and physical obsolescence factors.

Physical obsolescence measures the consumption of service potential. It can be measured by using straight-line depreciation, that is, life consumed over total life.

Technological obsolescence results from changes in the design and materials of construction of currently available assets. As construction techniques improve and stronger and lighter materials become available, it is often possible to

[2] IPART, Aspects of the NSW Rail Access Regime, Draft Report, February 1999.

construct assets with equivalent or improved output at lower cost levels. This form of obsolescence is particularly apparent in new or emerging technologies. The application of the modern equivalent asset cost takes account of technological obsolescence.

Functional obsolescence results from changes in the design and materials of construction of currently available assets, however the impact on value is measured by reference to changes in operating and maintenance costs rather than reductions in capital costs. By benchmarking maintenance and operating costs for the subject assets against the estimated maintenance and operating costs of modern equivalent assets of similar capacity we can measure the effects of functional obsolescence.

Economic obsolescence results from external economic factors. It is defined as the impairment of desirability or useful life arising from economic forces, such as changes in optimum use, legislative enactments which restrict and impair the right to use the assets for their intended use, and changes in supply and demand relationships.

The residual value of an asset must be estimated to perform a depreciation calculation. This residual value reflects the fact that the asset may no longer be an economic proposition in its present role, however, it may remain in use but with profitability impaired due to increased maintenance costs and lack of efficiency compared with more modern assets. Alternatively it may be possible to sell the assets to a secondary user or for salvage value.

The final selection of the rate and amount of depreciation is based on an assessment of the total and remaining effective working life and the level of residual value (if any) of the asset at the end of its effective working life.

2.5 Materiality

Our valuations have been determined having regard to the principles of materiality as identified in Australian Accounting Standard AAS5 "Materiality" which defines materiality as follows:

"Materiality means, in relation to information, that information which if omitted, misstated or not disclosed has the potential to adversely affect decisions about the allocation of scarce resources made by users of the financial report or the discharge of accountability by the management or governing body of the entity".

Materiality in the context of these valuations is generally considered to be of the order of ± 5% in gross asset value.

3. Asset Data Sources and Verification

3.1 Introduction

As part of the ODRC valuation it is necessary to certify that the input data is of a quality appropriate to the valuation.

An audit of Ergon Energy was carried out focussing on:

- processes used to populate and maintain databases
- accuracy of data capture of assets
- appropriateness of asset descriptions to correctly assess modern equivalent replacement costs and impact of optimisation on the asset valuation
- physical inspection of sampled assets.

The audit aim was to sample a significant number of assets covering various asset groups in terms of geographic location, value, quantity and/or age. This was considered sufficient to verify the accuracy of the data for the valuation.

Because of the nature of Ergon Energy as an amalgamation of six previously separate supply authorities there are differences between the various regions as to database systems and procedures. Three regions, Cairns, Rockhampton and Mackay have similar GIS and asset recording systems. As a result a total of four regions were individually audited, reflecting the different database systems geographic diversity of the organisation. The regions audited were:

- Far North Queensland
- North Queensland
- Wide Bay Burnett
- South West Queensland

GHD/AA verified that procedures were in place to cover:

- data capture
- database maintenance
- updating of records
- identification of redundant assets
- attributes capture
- use of defaults

3.2 Verification Outcome - Summary

Ergon Energy now as one organisation produced a single asset database for the valuation. The new database was populated by data supplied from the six regions.

A procedure was implemented to ensure data was presented in a consistent manner for entry into the central database. During the population a few systematic errors were detected, however these were corrected before the final data was extracted for the valuation.

A comparison of 1996 data with the new database output did not show any significant areas of discrepancy.

The increases in quantities were explainable due to factors such as:

- introduction of Geographical Information Systems (GIS) in all regions since 1996;
- introduction of asset management systems in North Queensland, South West Queensland and Far North Queensland regions;
- consistent use of customer information system (CIS) for extraction of LV services and meter quantities.

While the new database procedure and output was audited, verification effort was put into the systems at the regions supplying the data.

Overall the verification resulted in a good confidence in the valuation result. The main area where improvement in systems and data capture is required is Wide Bay Burnett. While the data from Wide Bay Burnett is of a lower quality than that received from the other regions it is considered acceptable to give a credible ODRC valuation for Ergon Energy.

4. Standard Replacement Costs

4.1 Overview

To achieve consistency of the ODRC valuations for the Queensland Distribution Corporations standard replacement costs were developed for Queensland.

The gross current replacement cost is based on modern equivalent assets and is determined by reference to current market buying price, current reproduction cost or replacement cost of modern equivalent assets.

For specialised assets such as most distribution network infrastructure the appropriate cost is the lower of the current replacement cost and the current reproduction cost of the gross service potential of the existing asset.

It was noted that for the 1996 valuation a test named "Break Even Lengths of Transmission Line" (BELT) was applied to determine if detailed economic value assessment was warranted. The analysis showed this was not necessary. As there has been no major change in transmission line lengths the BELT test of 1996 was taken to still be valid.

The replacement cost can be established by:

- comparison with recent costs of similar assets
- reference to historical costs, adjusted for inflationary increases since construction
- contacting suppliers manufactures or their agents; or
- reference to recently published prices.

The replacement costs require a number of inputs including:

- unit costs
- cost basis
- indirect costs

4.2 Unit Costs

Many of the assets comprising the distribution network can be classified into standardised asset groups and subgroups.

On this basis unit replacement costs can be determined for the modern equivalent and applied on a unit basis eg per km of 11/22 kV overhead distribution line.

The gross current replacement cost being determined by multiplying the number of units by the unit cost.

Unit costs can be developed for different situations eg urban and rural, heavy and light current carrying ability.

Adjustment factors can be applied to allow for local issues such as CBD, rocky terrain, significant clearing, cyclone design.

4.3 Cost Basis

There has been some debate in valuations as to whether gross current replacement costs should be determined on a "greenfields" or "brownfields" basis,

The "greenfields" approach assumes construction in an area free from any development. The "brownfields" approach assumes construction occurs around all existing infrastructure and development (other than the asset valued).

"Brownfields" approach has been used for the valuation because it is consistent with the concept of establishing the potential purchaser's lowest alternative cost to replicate the network ie a duplicate network would need to be built in the existing environment. The current cost value should reflect the current state of land use and development.

The "brownfields" cost approach is widely used for ODRC valuations including electricity, gas and water infrastructure assets in most states of Australia.

The costs also reflect the long term cost trends associated with large scale constructions rather than smaller piece meal constructions which, though the latter often reflects construction in the normal course of business, may not reflect the minimum cost at which construction can be undertaken.

4.4 Indirect Costs

4.4.1 Direct Costs (Taxes)

The unit costs for this valuation assume no sales tax is applicable based on advice that sales tax is not included in units rates.

GST is to be applied from 1 July 2000 and does not affect the 31 December 1999 value.

4.4.2 Indirect Costs

Due allowance is to be made for indirect costs associated with the acquisition and/or creation of the asset such as on costs, design and engineering costs, freight, duty, local delivery, interest during construction etc.

For the purposes of identifying the direct and indirect costs attributable to a network asset the principles detailed in Australian Accounting Standard AAS11 "Accounting for Construction Contracts" has been adopted.

Interest during construction (IDC) takes account of the capitalisation period and the Corporations disclosed debt rate. The capitalisation period is the period in which:

- construction expenditures are made or borrowings are made for the expenditures
- the asset is being prepared for use including preconstruction activities
- finance costs are incurred

IDC was not considered material for the valuation of most distribution assets due to the capitalisaiton period typically being only a few months. The assets for which IDC has some material affects are bulk supply substations and transmission lines.

4.5 Building Blocks

To develop unit replacement costs building blocks were developed for each asset category. The building block included:

- material
- labour
- transport
- indirect costs

For consistency of models a labour rate of $55 per hour was used. This was based on typical contractor rates and an allowance for contract administration and management.

Indirect cost vary depending on complexity of assets. This is due to higher design, testing and commissioning costs for assets such as bulk supply substations.

Typically indirect costs as a percentage of direct costs are:

- substation 20-23%
- overhead lines 6-10%

4.6 Unit Rates

4.6.1 Modern Equivalent Asset

The ODRC valuation is based on MEA. For two 132 kV categories, single circuit steel tower and single circuit wood poles, the MEA is considered to be single circuit concrete pole construction. The existing steel and wood assets were depreciated to their respective standard effective lives.

4.6.2 Adjustment Factors

A number of adjustment factors affecting Ergon Energy have been identified.

Bulk Supply and Zone Substation

Standard replacement unit costs on a state basis have been developed. There are some differences in design standards, however as the valuation is carried out on a modern equivalent replacement basis this was not considered to be material.

The rates are based on building blocks for categories such as outdoor feeder bay, transformer feeder bay to allow a gross replacement cost to be determined. These building block costs have been modelled by the Corporations and benchmarked to GHD databases.

An exception to the standard building block is the variety of building and switchyard sizes and ancillary equipment used by Ergon Energy. For this valuation a total replacement cost has been determined based on the individual installations.

Zone Substation Transformers

Standard costs have been developed for transformers to represent supply, delivery and erection at site.

The unit cost was derived by obtaining and averaging costs from the three main transformer manufacturers in Australia.

Remote Locations

Due to the remoteness of locations in the north western areas of Queensland an adjustment factor is applied to allow for the additional labour and transport costs. The adjustment factor of 15% is based on labour being 35% higher and transport being 50% higher in the remote areas and labour on average making up 34% and transport making up 6% of the unit rate.

5. Optimisation Principles

5.1 Principles

Because the ODRC of network assets is based on the service potential of the existing assets, it is necessary to adjust the gross current replacement cost of modern equivalent assets for over-design, over-capacity and redundant assets.

IPART (NSW) states that *"an optimised system is a reconfigured system using modern technology designed to serve the current load with current technology, with some allowances for growth. This method excludes any unused or under utilised assets and allows for potential cost savings that may have resulted from technological improvement."*[3]

Therefore, when adopting the ODRC approach the valuer must establish whether the asset in its current form represents the optimum replacement given technological and functional changes since construction. By way of example optimisation may be required in situations where:

- the existing asset has a greater capacity than is required for existing and reasonably foreseeable use;
- the capacity or service potential embodied in the existing asset could be replaced more cheaply than the cost of reproduction of the existing asset due to improvements in construction techniques, economies of scale, etc.

In assessing the level of optimisation, it is important to recognise that it is not intended that a complete redesign or "greenfields optimisation" of the network be undertaken. Instead "incremental optimisation" is adopted, which allows progressive optimisation to the extent that it occurs in the normal course of business.

NSW Treasury states: *"Incremental optimisation places a limiting constraint on the extent of optimisation. It denies a valuation based on optimal replacement of an entity's entire asset network. This latter approach is known as "greenfields optimisation".*

The incremental ODRC approach recognises that there is always some degree of suboptimality and allowance for growth in future demand, and it reflects the historical development of the existing business, the time lag in asset planning and construction, the very long lives of the assets, and the replacement of its components, in the normal course of business. As systems expand and change, a degree of suboptimality at any point of time is inevitable and is part of the total cost of output."[4]

It has been generally accepted when conducting ODRC valuations that the following constraints should be assumed:

[3] IPART Aspects of the NSW Rail Access Regime, Draft Report, February 1999

[4] NSW Treasury, Policy Guidelines for Valuation of Network Assets of Electricity Network Businesses, December 1995

- The location of generating plants and points of bulk supply should be assumed to be fixed.
- The location of customers should not be varied.
- The existing boundaries of other network businesses should not be varied.
- Only existing easements, line and cable routes should be assumed.

Identifying Over-Capacity

The optimisation should be based on the reasonably expected level of use of the asset which is determined by reference to the required level of service potential or output consistent with both the reasonably foreseeable future demand and the objective of minimising the whole of life costs.

Whilst reliably projecting load growth has its own problems, the issue of what represents a reasonable timeframe is also problematic. This is because both elements have a degree of subjectivity in their determination.

Given the fact that many infrastructure assets are long lived and have a high capital cost, adopting an artificially short timeframe can have a distorting effect on the valuation. Furthermore the incremental cost of providing additional capacity at initial construction rather than on an incremental basis in response to actual demand growth often makes good commercial sense when considered over the longer term.

It is our view that, consistent with the principles adopted in the NSW Treasury Guidelines, the planning horizon assumed for future growth in power flows should be consistent with that used for business planning and total asset management planning. These would typically be:

- up to 15 years for subtransmission networks except zone substation transformers
- up to 10 years for zone substation transformers; and
- 5 years for distribution networks.

Identifying Over-Engineering

One of the key features to consider in respect of whether a distribution network is over-engineered is the required reliability and security of the power system supplies.

The required level of service for distribution networks will be defined in terms of currently accepted service standards in the electricity supply industry in Australia and countries with similar conditions. The level of services include:

- acceptable reliability of supply based on industry accepted indices for proportions of customers subject to interruptions, the number and duration of outages and types of customers affected
- safety requirements where these influence the choice of materials or type of construction

- voltage stability
- degree of security of supply considered appropriate in different circumstance such as urban and rural, residential and industrial. This is assessed by reference to the level of in-built redundancy such as n, n-1, n-2 etc
- levels of electrical losses

5.2 Optimisation Criteria

The following criteria was applied by the Corporation to their network to determine the optimisation to be applied for valuation. The overriding criteria is that the optimised system cannot be better than the system in place. We audited the process and tested selected areas of the network to ensure consistency of application.

Zone Substations

Each zone substation is to be examined for optimisation:

- reliability criteria

  This will be based on the requirements to meet reliability criteria within the normally accepted definitions of:

  n loss of equipment will result in loss of supply for an acceptable period

  n-1 loss of one piece of equipment will not result in interruption to supply

- transformer capacity

  Based on the accepted planning horizon, supportable load growth projections, voltage stability, fault levels, reliability criteria and cyclic ratings, each transformer shall be examined for suitable rating.

  Where existing rating exceeds the predicted demand by more than 20% and materiality is applicable, the transformer shall be optimised down to the nearest modern equivalent standard rating.

- spare equipment

  Any spare equipment such as circuit breakers shall be optimised out where they will not be required in the accepted planning horizon.

- configuration

  Any bus configuration that is above the required reliability criteria shall be optimised to an applicable configuration eg a double bus selectable configuration originally built for n-1 criteria that no longer applies would be optimised to single bus configuration.

  Any equipment that becomes redundant due to sub transmission line/cable optimisation shall be optimised out.

- building

Optimise if over designed for the application.

Subtransmission Lines and Cables

Using the maximum demand, planning horizon, fault level and cyclic ratings the conductor shall be optimised to the nearest lower standard size.

Where a line has been built to a higher voltage configuration but energised at a lower voltage it shall be optimised to the lower voltage if the high voltage will not be needed in the accepted planning horizon.

Distribution Transformers

The following transformers should be removed from any calculations and not optimised:

- single phase pole transformers for single rural customers
- transformers with one or a small number of customers where the rating is required for maximum demand eg irrigation pumps required only for a small number of months in a year.

Distribution transformers are sized to provide:

a) adequate capacity availability to existing connected customers,

b) allowance for growth in existing customers,

c) connection of new customers,

d) utilisation of a range of standard transformer sizes and configurations, and

e) in the case of urban locations, some allowance for LV load transfer.

<u>Optimisation of Urban Distribution Transformers</u>

For urban areas, an average individual transformer utilisation of 80% can be managed. This provides appropriate recognition of load transfer requirements and the use of standard transformer sizes. It should be noted that load transfers to avoid loss of supply during low voltage works whilst not mandatory are an expectation of customers in an urban environment.

Applying a load factor of 27% to an optimal transformer utilisation of 80%, results in a target energy utilisation measure of 21.6% for urban areas.

<u>Optimisation of Rural Distribution Transformers</u>

Rural areas will require specific allowances for the transformer sizing and After Diversity Maximum Demand (ADMD) components. Rural properties tend to have a mixture of residential and farm buildings on the same low voltage mains and transformer. There are also additional appliances used such as household water pumps. This hybrid load arrangement results in an increased ADMD. The diversity is also lower due to the reduced number of customers for each of the distribution transformers. This limits the ability of the Distributors to optimise the transformer size by low voltage circuit configuration.

Applying a load factor of 20% and a target transformer utilisation of 60% which takes into account the utilisation of standard transformer sizes, a target energy utilisation measure of 12% is appropriate in rural areas.

Underground Reticulation

Any existing underground reticulation should be valued on the basis of replacement cost of underground reticulation only if it is required by local planning guidelines or where a prudent commercial operator would reticulate these parts of the system underground in the normal course of business based on existing accepted community standards in that location. If there are no grounds for undergrounding then the assets should be valued at the replacement cost of equivalent overhead reticulation.

5.3 Optimisation Applied

Ergon Energy reviewed the 1996 optimisation and considered network configurations and load changes within the network since that date.

Using the optimisation principles each region carried out optimisation which resulted in the following areas being optimised.

- Transmission 66 kV and 33 kV lines
- 66 kV and 11 kV circuit breakers from zone substations
- Power transformers from zone substation
- Distribution transformers

As was in the case in 1996, the optimisation carried out is relatively small with approximately $29 million in replacement cost optimised for the 31 December 1999 valuation.

6. Effective Lives

6.1 Introduction

For consistency of the ODRC valuations for the Queensland Distribution Corporation, standard affective lives were developed to apply across Queensland.

The effective lives used for the asset valuation of the Queensland Distributors considers the expected physical life of the asset modified by local business based technical issues. Allowance is also made for economic considerations where they will impact on the expected asset life.

The range of factors considered includes the following:

- Supply Constraints

  There are no perceived constraints on supply of electricity to the customers of the distributors. Networks are available and the businesses have the intent of providing electricity to all customers who meet supply objectives.

- Demand Factors

  The demand for electricity by customers can potentially affect the usage of the assets, thereby affecting the asset lives through reduced or increased demand:

  – Decreasing Electricity Demand.

    The customers use of electricity supplied by the network could reduce to such an extent that existing assets become partially or wholly redundant based on the capacity existing assets are able to carry. This can be due to factors such as:

    - Customers switching to an alternative energy source.
    - Customers moving from areas supported by the network.
    - Networks being constructed for a higher forecast demand that is not realised in the future.

    Note that the impact of demand fluctuations will generally be captured in the optimisation determination.

    There are no expectations of reduction in demand for the distributor's assets through reduced demand for electricity. Electricity is seen as the prime energy source into the foreseeable future.

  – Increasing Electricity Demand.

It is also possible that the demand for electricity over time will increase so that the existing network will not be able to meet the customer requirements.

Provided that the replacement of the existing assets with larger capacity assets is already included in the corporate business plan, the economic life of the existing assets is limited to the expected time of replacement.

Provision is made in the growth allowances for optimisation for acceptable increases in demand.

- Technological Redundancy

  Network assets may become redundant as new technology is introduced that replaces the assets or reduces the period that the assets are estimated to stay in operation before the new technology is implemented.

  There is no expectation that gross changes in technology will impact on the expected lives of the current assets. Proven technology is used as the basis for testing the impact.

  The modern equivalent assets considered in establishing the replacement costs for the valuation assume proven technology.

- Legislative and Environmental Changes

  Legislative or environmental changes may result in changes to operational practices that could be reflected in the determination of asset lives.

  Testing this with personnel from the distribution corporations determined that there are no expectations for assets lives being shortened due to external political influences. An exception maybe the current push to underground existing overhead lines. At this stage this has not been legislated and as such has not been taken into account in this valuation.

- Operational Costs and Practices

  A typical life cycle for an asset will have greater repairs and maintenance cost as the asset ages. Therefore the asset may still be operational but the cost of keeping it in operation may be higher than the cost of replacement. The asset will have reached its economic life prior to the technical life as the business will seek to replace the asset.

  If operations and maintenance costs fall and other economic factors are not valid, then the effect might be to extend technical life.

  The Queensland distributors have made, and will continue to make, economic business decisions in establishing the timing of replacement of some assets. Examples are

  – the replacement of Consac LV cables when localised problems are encountered. The area based replacement is more cost effective than continued localised repairs.

- the replacement of wood poles in Far North Queensland due to above ground rotting and short lives being achieved.

In such cases the effective lives will be adjusted if the assets can be separately identified.

- Renewal and Replacement Programmes

  Groups of assets may have their economic life determined by a renewal or replacement programme date rather than the technical life. The programme effectively overrides the technical life assumption as a shorter economic life has been placed on the asset.

  A number of economic and safety matters may have induced management to undertake the replacement programme within a lesser time frame rather than the original replacement protocol.

  The adoption of a formalised replacement programme may foreshorten the life of some assets within a particular group. Businesses may have a replacement philosophy for individual non-performing assets but where there is no continuous recognised programme covering an asset group it is not possible to adopt a broad reduction in technical life.

  Ergon Energy has nominated wood pole lines in Far North Queensland as assets affected by a replacement philosophy due to the poor performance compared with other wood poles in Queensland.

- Engineering Input to Asset Lives

  The effective lives will also be influenced by technical management issues.

  These issues can be grouped as follows:

  - Design Standards

    In some situations the original specification or design of an asset contains a basic flaw or the level of service requirements have changed. The performance of the asset could be severely restricted due to this fault.

  - Construction Quality

    In many cases the specification and materials for the assets may prove to be perfect but ineffective on-site supervision of construction techniques or faulty workmanship may result in a significant reduction in technical lives.

  - Material Quality

    As with the construction quality, it is often the case that materials that have tested perfectly at acceptance will have some basic fault that may shorten the lives of the assets.

  - Operational Stresses

    In some cases assets have been operated outside the normal working conditions for which they have been designed. In this case the additional stresses generated may result in the reduction in technical lives of the assets.

– Maintenance History/Practice

In many cases assets that have been properly constructed using appropriate design standards and material specifications behave perfectly in the early years of life. However, inappropriate or inadequate maintenance may then have been carried out over an extended period due to budget restraints or ignorance. This can have a considerable effect on the technical lives of such assets.

– Asset Working Environment

In most cases this is a key factor that affects the technical life of an asset. For those assets whose working environment includes exposure to the elements, the impact on technical life can be significant.

6.2 Ergon Energy Infrastructure Effective Lives

6.2.1 Effective Lives

The issues raised in the introduction have been considered in the establishment of effective lives for Ergon Energy assets.

GHD has consulted with technical managers at Ergon Energy to assist in the establishment of effective lives for use in the valuation of the electrical assets of the business.

GHD also maintains a database of effective lives as used by other electrical and utility businesses. This has been considered and modified to account for local conditions by the consultation with Ergon Energy staff.

The following list is the outcome of such deliberations

Asset Grouping	Recommended Life	Comments
Overhead Sub-transmission Lines	45 years wood 50 years concrete 50 years steel	Separate treatment of wood and concrete poles required due to expected life differential. Far North Queensland is to be treated as 35 years.
Underground Sub-transmission cables	45 years	33 kV solid demonstrating longer life
Zone Substation Equipment	45 years	
Zone Substation Transformers	45 years	
Overhead Distribution Lines	35 years wood 45 years concrete	Separate view on concrete poles suggests these be treated as having 45 year life. Pilot wires treated separately and given 35 years
Underground Distribution Cables	60 years	Early manufactured XLPE cables demonstrating shorter life than PILC due to lack of metal sheathing for moisture protection
Distribution Equipment	35 years	Indoor switchgear has slightly longer life
Distribution Transformers	35 years	
Low Voltage Overhead Lines	35 years wood 45 years concrete	Concrete poles demonstrating longer life
Low Voltage Underground Cables	60 years	
Low Voltage services	35 years	
Communications	7 years	

Street lighting	20 years	
Metering	25 years	

Ergon Energy is the amalgamation of six electricity distribution businesses. Each had variations in maintenance, construction and operating practices for the network assets. The following comments are an amalgamation of findings for the combined business.

Ergon Energy asset managers believe that maintenance practices for most asset groups have been appropriate to the asset type and the network arrangements.

Generally assets have not been historically overstressed in terms of loading and therefore it is not expected to contribute to a reduction in effective lives.

Construction quality has been reasonably consistent and there is no evidence of poor quality impacting lives.

The impact of external stresses has not been evident as Ergon Energy managers are confident that they have planned for such contingencies in asset development.

6.2.2 Poles and Wires

The life expectancy of poles and wires is heavily influenced by the material of the pole.

Experience of Ergon Energy is that wood poles have a shorter life than steel and concrete poles. Records indicate approximately 45 years as a mean life for subtransmission wood poles and 35 years for distribution and low voltage wood poles.

Exception to this is the performance of wood poles in Far North Queensland where experience is that poles are not lasting as long as would be expected. The asset records show a weighted average life of 28 years. It is possible more recent poles are not lasting as well. While this situation should be reviewed at the next valuation, for this valuation the 1996 value of 35 years is still considered appropriate.

Overhead lines with steel poles or towers are designed for a life of at least 55 years however more experience is required to indicate this is being achieved. As such 50 years as adopted in 1996 and NSW has been used.

Areas with high wind loading require over design but databases cannot indicate such special areas, thus an average life is assumed for all poles by material type.

Concrete poles are relatively recent as asset types and expectations are that they will have lives well in excess of wood poles, but as none of these assets have yet demonstrated failure patterns the life expectancy adopted is conservative. 50 years as was adopted in 1996 has also been adopted for subtransmission lines for this valuation.

Ergon Energy is able to separate the overhead assets into groups based on the material of the poles, at least for the subtransmission assets, and this has been used in the valuation. For the distribution and low voltage lines the assumption is that a majority of poles are wood material and 35 years has been adopted.

Future investigation into the life expectancy of concrete poles will be of value in determining a less conservative effective life.

6.2.3 Transformers

Transformers have been operated conservatively and there is a belief that they have not been over stressed as a group. Individual zone transformers may demonstrate overloading but the evidence is that group operation is conservative and that inspection programmes are showing condition is as expected. The bulk of transformer quantities are 66/11 kV in the 4-11 MVA range. These have an average weighted age of 26 years with a standard deviation of 13 years. The oldest being 47 years. Of the other transformer categories some have an average weighted age of 45 years with the oldest transformer being 62 years. While in 1996 40 years was adopted it is considered a life of 45 years is more appropriate due to the number of transformers greater than or approaching 40 years still in service.

The environment is an issue for distribution transformers where lightning strikes have caused numerous failures.

6.2.4 Zone Substation Equipment

The experience of Ergon Energy is that their switchgear is demonstrating a longer life than the 40 years adopted in 1996. The majority of the switchgear has an average weighted age of 25-30 years with standard deviation of 10-15 years. As such a life of 45 years has been adopted for this valuation.

The ancillary equipment category consists of different life equipment ranging from batteries to dc and ac switchboards. A compromise life of 25 years has been adopted.

6.2.5 Cables

Material quality is a recognised problem for some underground cabling. While sub-transmission cabling is all to the same standard generally being metal sheathed to minimise moisture problems, the distribution and low voltage cabling has shown some problems.

The sub-transmission gas and oil filled cables have demonstrated 45 year lives and the solid cable type being younger has already achieved 40 years in some locations. Thus 45 years is a suitable compromise for all the cable types.

Distribution cabling is a combination of PILC and XLPE cable and the latter originally supplied with no metallic sheathing in its construction. The result was that the material type is subject to greater moisture uptake that shorts the cable and has therefore demonstrated a shorter operating life than the PILC cabling. More recent XLPE designs have resulted in this early problem being resolved.

For this valuation there is no evidence to suggest the industry expected life of 60 years as applied in 1996 will not be achieved, leading to 60 years being adopted again.

The low voltage cabling has a similar problem where some sheathed cabling has regular failures. Periodic testing of the sheath is now undertaken. This cable would be given a shorter life compared to the 60 years for PILC and PVC low voltage cabling. However, as the problem cable is small in quantity a life of 60 years as used in 1996 and NSW has been applied to this group.

It is recommended Ergon Energy do further work on the establishment of material types for cables in defining asset groups. Performance is clearly based on the material. This knowledge will assist with refining the future valuation of the assets.

6.3 Effective Remaining Life

In principle when an asset reaches the end of its category life it has zero value under the straight line depreciation method used for ODRC valuation. However assets can be in service beyond this period and as such it is reasonable to allocate a value to these assets in order to recognise their value to the distribution network. A minimum remaining life can be applied to assets still in use that have exceeded the category effective life.

The concept of effective remaining life recognises that effective lives are an average, with some assets lasting longer while others will provide less service life.

For this valuation a three year effective remaining life has been used for all assets beyond their category effective life but still in use.

Three years is based on the premise that many material assets have a three year replacement period, which includes planning through to commissioning of a replacement asset as well as the retirement and decommissioning of the asset being replaced.

6.4 Queensland Standard Effective Lives

Based on the data retrieved, standard effective lives have been developed for Queensland. Due to area differences three regions have been defined:

- South East Queensland (covers assets belonging to ENERGEX)
- West and East Queensland (north of Gympie, south of Tully and west of the Great Dividing Range (covers assets belonging to Ergon Energy)
- North Queensland (covers Ergon Energy's Far North Queensland assets)

7. Non-System Assets

Non-system assets are defined as those assets that are not directly related to the supply and distribution of electricity. These assets only represent a small portion of the total value of Ergon Energy's assets. This is considered to be immaterial in the context of the overall value of Ergon Energy's asset base.

Some non-system assets have therefore been included at written down book value (WDBV) as at 31st December 1999. Where it was not possible to obtain this, due to insufficient information being available, the WDBV as at 30th June 1999 was used.

Non-system assets include real estate, motor vehicles, office and computer equipment, furniture and fittings, plant and tools.

Arthur Andersen has been requested to review third party valuations of the real estate assets owned by Ergon Energy. The relevant date of valuation for these properties is 31st December 1999. We advise that it is not within our scope of work to inspect and assess values for the remaining real estate assets owned by Ergon Energy.

Ergon Energy internal valuers were responsible for providing values for substation land, freehold land and buildings for all Ergon Energy regions (Far North Queensland, North Queensland, Capricornia, Wide Bay Burnett, Mackay and South West Queensland).

Our scope of works has been to review the basis of valuation and methodology adopted for regulatory pricing and financial reporting purposes.

7.1 Plant and Equipment

The values for plant and equipment have been obtained from Ergon Energy's fixed asset register and verified in accordance with the process described earlier in this report. Ergon Energy were not able to provide asset registers as at the reporting date of 31 December 1999, therefore, the values used for plant and equipment in this report for the ODRC valuation are as at 30th June 1999.

It should be noted that since the 1996 valuation the categories for plant and equipment have changed. In the 1996 valuation, furniture and fittings were included with office machines and equipment. These categories are now separate. The asset category office machines and equipment now includes administrative communication equipment.

7.2 Substation, Freehold Land & Buildings

Registered valuers from within Ergon Energy undertook valuations on substation land, freehold land and buildings. Arthur Andersen has been provided with schedules containing all valuations and has also discussed with each valuer, the basis of valuation and methodology adopted.

Land values have been ascertained by adopting unimproved capital values assessed by the Department of Natural Resources for rating and taxing purposes. We note that it is likely that this approach provides a conservative assessment of the value of these properties and suggest that future valuations should be determined on a current market basis. Whilst this is not an uncommon valuation approach it is inconsistent with the basis of valuation adopted for Ergon Energy. Due to operational constraints Ergon Energy has decided to use unimproved capital value despite the conservative result. We also note however that the properties assessed on this basis are not considered material having regard to the overall asset base of Ergon Energy.

Buildings have been valued using the Optimised Depreciated Replacement Cost Approach, which is appropriate under the deprival concept.

7.3 Easements

Arthur Andersen has been instructed to review the basis of valuation and the methodology utilised to assess the value of easements for Ergon Energy. We are aware that currently no guidelines exist for the valuation of easements.

Having regard to the basis of valuation (market value for existing use utilising the deprival concept) we are of the opinion that the methodology adopted by Ergon Energy is sound and consistent with methodology adopted by other electricity companies for the valuation of operational easements.

We advise that we have not checked land values used for the valuation of assessments as this is outside the scope of our brief. As such, Arthur Andersen recommends that a full valuation of Ergon Energy's easements be undertaken by a third party independent valuer to ensure probity and no conflict of interest.

7.3.1 Valuation Approach

Valuations for financial reporting purposes of operational Government Department assets should be assessed on the basis of deprival value. Deprival value can be expressed as the loss that might be expected to be incurred by an organisation, if that organisation was deprived of the service potential or future economic benefits represented by the asset at the date of valuation.

In accordance with Professional Practice 1999, Australian Property Institute, Guidance Note 9 Section 12.14 – Asset Valuation for Financial Reports of Local Government and Government Departments "under deprival value principles the entity would need to determine whether it would logically replace the service potential embodied in the asset if it were deprived of it."

In making these judgements, the following would need to be determined:

- the asset's contribution to the pursuit of the entity's objectives
- whether the asset would be replaced if the entity were deprived of it at the date of valuation
- if the asset would be replaced
- form or manner in which it would be replaced
- what it would cost to replace or reproduce the future economic benefits embodied in the asset

Ergon Energy's decision matrix (based on the above) determined that the easements would be replaced if they were denied of them. They also classified the easements as operational assets, in that they are currently being utilised in the operation of the entity. The appropriate basis of valuation for operational assets is the market value for existing use (deprival value). We concur with Ergon Energy that the deprival value concept is the appropriate basis for the valuation of easements.

7.3.2 Methodology

The methodology utilised by Ergon Energy for the valuation of their easements is consistent and in line with the deprival value concept described above. The methodology adopted by Ergon Energy involved assessing a freehold value for the land occupied by the easement, applying a diminution rate depending upon the class of land and the factoring in of additional amounts such as administration costs, native title and cultural heritage. The application of a diminution rate is appropriate, as the granting of an easement is an interest in the land, that is less than freehold.

The land categories used are as follows:

- Urban
- Semi-urban
- Transitional
- Rural Farming
- Grazing

7.3.3 Diminution Rates

Table 7.1 below shows land categories and diminution rates for each Ergon Energy region.

Category	Far North Queensland	North Queensland	Mackay	Capricornia	South West Queensland	Wide Bay
Urban	80%	20%-80%	N/A	60%	N/A	80%
Semi-urban	N/A	N/A	N/A	N/A	N/A	N/A
Transitional	40%	25%-40%	40%	50%	60%	40%-60%
Rural Farming	50%	35%	40%	40%	35%	35%
Grazing	30%	25%	N/A	30%	30%	30%

Table 7.1 Ergon Energy Diminution Rates

7.3.4 Land Values

Ergon Energy has assessed the values for each region based on the methodology described above for each category of land. As discussed above we have not verified these values as this is outside the scope of this review.

7.3.5 Additional Factors

In determining the value for easements Ergon Energy has also allowed for additional costs, which are incurred in acquiring easements. These additional costs include:

- Cultural heritage
- Native title
- Administration costs
- Acquisition costs
- Professional fees
- Surveying

7.3.6 Information Provided

In reviewing easement values the following information was provided:

- Valuation schedules from Mr. Neil Webley, Property Officer, Ergon Energy for the following regions:
  - Far North Queensland;
  - North Queensland;
  - Mackay;
  - South West Queensland; and
  - Wide Bay Burnett.
- Valuation schedule for the Capricornia region from Mr. Peter Lukin, Property Officer, Ergon;
- Held discussions with the above on basis of valuation, methodology utilised, source of market values and other factors that determine easement values.

7.4 Work-in-Progress

Throughout Ergon Energy's portfolio there were a number of assets that were under construction at the effective valuation date. Ergon Energy has provided us with confidential Work-in-Progress figures as at 31st December from each Ergon Energy region for system and non-system assets. We have not been able to categorise the WIP between system and non-system assets due to insufficient information being available.

8. Valuation Outcomes

8.1 Optimised Depreciated Replacement Value

The optimised depreciated replacement value for Ergon Energy's regulated electricity network assets is $2,523 million as detailed in Table 8.

Asset Category	Replacement Cost (@31.12.99) $	Depreciated Replacement Cost (@31.12.99) $	Optimised Replacement Cost (@31.12.99) $	Optimised Depreciated Replacement Cost (@31.12.99) $
System Assets				
132/110 kV Overhead	275,276,921	181,488,141	275,276,921	181,488,141
66 kV Overhead	352,453,135	164,495,930	340,985,615	161,415,409
33 kV Overhead	221,391,705	76,325,976	219,993,915	75,988,509
132/110 kV Underground	1,404,000	1,154,400	1,404,000	1,154,400
66 kV Underground	4,569,500	3,181,638	4,569,500	3,181,638
33 kV Underground	6,896,400	5,144,273	6,896,400	5,144,273
Terminations	480,000	282,492	480,000	282,492
Zone Substations				
132/110kV circuits	43,624,280	26,289,252	43,624,280	26,289,252
66kV circuits	223,148,160	111,775,429	215,187,960	108,998,373
33kV circuits	68,444,280	31,989,890	68,094,680	31,839,338
11/22kV circuits	178,737,920	99,207,299	176,391,720	98,352,150
Power Transformers	177,754,300	89,998,882	173,138,800	87,340,660
Switchyard, Buildings & AFLC Equipment	51,070,338	23,465,816	51,070,338	23,465,816
11/22 kV Overhead	905,881,391	275,158,551	905,881,391	275,158,551
11/22 kV Underground	79,902,859	57,641,086	79,902,859	57,641,086
Distribution Equipment	76,792,989	39,841,947	76,792,989	39,841,947
SWER Transformers & Equipment	117,914,643	56,326,606	117,914,643	56,326,606
22/11kV Pole Mount Transformer	459,913,375	220,137,420	458,730,893	218,954,938
33kV Pole Mount Transformer	9,831,710	2,534,773	9,831,710	2,534,773
11 kV Padmount Transformer	50,180,895	26,007,295	50,180,895	26,007,295
22 kV Padmount Transformer				

	24,669,700	16,493,260	24,669,700	16,493,260
11 kV Ground Transformer	17,719,910	9,878,605	17,719,910	9,878,605
11 kV Cable Box Transformer	6,474,260	2,892,955	6,474,260	2,892,955
33kV Ground Transformer	89,400	50,234	89,400	50,234
Distribution Indoor Substation Switchgear	4,018,300	1,875,811	4,018,300	1,875,811
SWER Overhead Lines	377,296,582	121,225,222	377,296,582	121,225,222
Low Voltage Overhead	364,618,068	129,329,229	364,618,068	129,329,229
Low Voltage Underground	237,324,713	191,651,745	237,324,713	191,651,745
Low Voltage Overhead Service	98,129,316	67,435,997	98,129,316	67,435,997
Communications - Pilot Wires	4,806,780	3,187,941	4,806,780	3,187,941
Control Centres	4,566,360	1,577,297	4,566,360	1,577,297
Street Lighting	59,671,797	24,228,689	59,671,797	24,228,689
Meters & Relays	178,331,970	95,598,346	178,331,970	95,598,346
Generation Assets	74,536,426	38,511,300	74,536,426	38,511,300
Total System Assets	*4,757,922,382*	*2,196,383,726*	*4,728,603,090*	*2,185,342,280*
Non-System Assets				
Total Plant and Equipment	78,070,509	78,070,509	78,070,509	78,070,509
Total Buildings and Land	94,500,398	94,500,398	94,500,398	94,500,398
Easements (note 1)	41,687,660	41,687,660	41,687,660	41,687,660
Works in Progress	123,626,910	123,626,910	123,626,910	123,626,910
Total Non-System Assets	*337,885,477*	*337,885,477*	*337,885,477*	*337,885,477*
TOTAL ERGON ENERGY DISTRIBUTION ASSETS	**$5,095,807,859**	**$2,534,269,204**	**$5,066,488,567**	**$2,523,227,757**

Notes:

1. Easements included at deprival (market) value. Book value is $11,423,421

Table 8: Ergon Energy ODRC Summary

The Ergon Energy age data was supplied on a weighted remaining life basis ie effective remaining lives were carried out at a individual asset level before determined weighted average remaining life. The ODRC values in Table 8 should only be used for valuation purposes, not asset management purposes such as determining average age of assets. This information can be obtained from the Ergon Energy asset database.

9. Future Roll Forward to 30th June 2000

In accordance with instructions from Ergon Energy we have conducted a future roll forward valuation to 30th June 2000. This roll forward has been based on the current ODRC valuation as at 31st December 1999.

We have applied a forecasted index from Access Economics' 'Five Year Business outlook'. A factor of 1.005 has been used to inflate the replacement cost of all assets to reflect the increase for this period.

With respect to optimisation, we have used the same level of optimisation determined in the current ODRC valuation. The weighted average age of the assets has been recalculated as at 30th June 2000.

Ergon Energy has provided the budgeted capital expenditure for the period between 1st January 2000 to 30th June 2000 of $ 108,043,485. We have assumed for this exercise that all December 1999 WIP has been capitalised by 30th June 2000.

The valuation rolled forward to 30 June 2000 has been calculated to be $2,580,873,532.

10. Quality Statement

The consortium believes the quality of the data provided by Ergon Energy and subsequent valuation outcome achieved is as follows:

Item	Valuation Element	Quality Level Perceived
1	**Asset Register (note 1)**	
a	Component breakup – hierarchical level	H
b	Management of data	G
2	**Attribute Details (note 1)**	
a	Asset description	G
b	Identification and categorisation	G
3	**Data Verification (note 1)**	G
4	**System Optimisation**	
b	Quality of information	V
c	Relationship to databases	H
5	**Age Profiles (note 1)**	
a	Age of assets	A
b	Economic impacts	A
6	**Replacement/Optimised Values**	G
7	**Depreciated Values**	G
8	**Overall Quality Rating**	G

Note:

1. See Section 3 for more details on asset data quality.

Legend:

E	Excellent quality	95-100%confidence
H	High quality	90-95% confidence
V	Very good quality	85-90% confidence
G	Good quality	80-85% confidence
A	Average quality	75-80% confidence
P	Poor quality	<75% confidence

1. Asset Register – a measure of the quality of data held plus the manipulation of that data and the corporate approach to its management

2. Attribute Details – a measure of the level of data held, the aggregation of data and the ability to describe the assets in sufficient detail to accurately value the assets ie component details
3. Data verification – the ability of the valuer to check the accuracy and consistency of data provided
4. System Optimisation – the measure of the level of optimisation undertaken by the business ie the understanding of the capacity and demand levels for the assets
5. Age Profiles – the measure of the ability of the business to advise a commissioning/construction date for each asset or group of assets. Also the understanding of business impacts on the reduction in effective life
6. Replacement/Optimisation – a measure of the quality of the outcome of application of business data
7. Depreciated Values – a measure of the quality of the optimised depreciated values
8. Overall Quality Rating – indicates the valuation quality considering the preceding factors and the business' preparedness for the valuation.

11. Assumptions and Limiting Conditions

Disclosure of Information

This valuation has been prepared on the basis that full disclosure of all information and facts which may effect the valuation has been made to the Consortium, and we have made no allowance in the valuation for less than full disclosure. It is assumed that the asset owner will carry out responsible and competent asset management practices in order to sustain the value of the assets.

Use of Report

The report is only for the attention of the parties to whom it is addressed or their professional advisers. The Consortium accepts no liability to any third party unless previous written permission is obtained.

This appraisal report may not be included or referred to in any Securities and Exchange Commission filing or other public document.

Non- Publication

Neither the whole nor any part of this valuation or diskettes that accompany it nor any reference thereto may be included in any document, circular or statement without our written prior approval of the form and context in which it will appear.

Ownership of Assets

No deduction has been made in our valuation in respect of any outstanding amounts owing under any finance lease or hire purchase agreement. The assets have been valued as being wholly owned and free of all encumbrances.

Information by Others

Information furnished by others, upon which all or portions of this appraisal are based, is believed to be reliable but has not been verified in all cases. No warranty is given as to the accuracy of such information.

Legislative Compliance

Full compliance with all Federal, State, and local zoning, use, occupancy, environmental, and similar laws and regulations is assumed unless otherwise stated.

Market Conditions

No responsibility is taken for changes in market conditions and no obligation is assumed to revise this report to reflect events or conditions, which occur subsequent to the date hereof.

Further Consultations

No member of the Consortium or any individual associated with the preparation of this report shall be required by reason of this report to give further consultation, provide testimony, or appear in court or at other legal proceedings unless specific arrangements therefore have been made.

Liability

The Consortium's maximum liability relating to services rendered under this report, other than as a result of professional negligence or wilful misconduct in preparation of the report, shall be limited to the fees paid to the Consortium for its services.

Indemnity

The client shall indemnify and hold harmless the Consortium and its personnel from and against any claims, liabilities, costs, and expenses (including, without limitation, attorney's fees and time of the Consortium personnel involved) brought against, paid, or incurred the Consortium at any time and in any way arising out of or relating to the Consortium's services under this report, except to the extent finally determined to have resulted from gross negligence or wilful misconduct of the Consortium's personnel. This provision shall survive the termination of this agreement for any reason.

Valuation Not to be Disaggregated

The valuation should be treated as a valuation overall and is not to be disaggregated. In the event that parts of the system are sold or treated separately, the various optimisation factors and other assumptions made may need to be reviewed for application to particular parts of the network.