# 1 TRANSEND - BUSINESS CHARACTERISTICS AND PERFORMANCE

## 1.1 Introduction

This chapter describes Transend's regulated transmission business. By identifying the main characteristics of the transmission network, the chapter sets the context for Transend's future expenditure plans, which is the principal focus of this submission.

The chapter provides information on:

- Transend's history and development
- Tasmania's transmission system
- upgrading and modernising the network
- performance comparisons with other TNSPs
- future network developments
- Transend's future goals.

The chapter closes with an overview of the structure of this submission, which sets out Transend's revenue cap application to the Commission for the period starting 1 January 2004.

## 1.2 Transend's history and development

Transend Networks Pty Ltd owns and operates the electricity transmission system in Tasmania — the link between power stations and the electricity distribution network. The company's assets carry electricity from 28 power stations to substations around the State. Transend owns a system of 3,500 circuit kilometres of transmission lines (2,300 route kilometres), 45 substations and ten switching stations.

The Tasmanian Energy Regulator (the Regulator) licenses Transend to operate its electricity transmission system in Tasmania. Under the licence the company must comply with various requirements for network performance and system security. Transend must also undertake its functions and fulfil its responsibilities according to the *Tasmanian Electricity Supply Industry Act 1995* (ESI Act) and the *Tasmanian Electricity Code* (TEC).

Transend started trading on 1 July 1998, after the disaggregation of the Hydro-Electric Corporation (HEC). Before disaggregation, the electricity supply industry in Tasmania was vertically integrated. The HEC was established by the Tasmanian Government in 1914 and grew to become the sole producer and supplier of electricity in the State.

National competition policy was a catalyst for the restructure and disaggregation of the HEC, resulting in the creation of two new companies: Transend Networks Pty Ltd and Aurora Energy Pty Ltd (an electricity distribution and retail company). The generation activities were retained in the HEC, which adopted the trading name 'Hydro Tasmania'.

While the HEC was formally disaggregated in 1998, full separation of the former HEC has been ongoing. Many shared resources, contracts, and activities were still in place at the time Transend became a separate and independent entity. Transend now has a better appreciation of the resource requirements and costs of operating the company on a stand-alone basis.

Inevitably, the increased requirements for resources have been reflected in a growth in staff numbers as shown in Table 1.1. The transfer of the system control function from Hydro Tasmania to Transend on 1 July 2000 resulted in 27 staff transferring to Transend.

**Table 1.1: Transend's staff numbers**

| | July 1998 | April 2001 | April 2002 |
|---|---|---|---|
| Staff numbers | 46 | 95 | 115 |

Notwithstanding the increases in staff numbers, Transend remains substantially the smallest employer amongst TNSPs in Australia.[1]

### 1.3 Tasmania's transmission system

The natural monopoly characteristics of electricity transmission mean that all transmission network service providers (TNSPs) operate in geographical areas that are in some sense 'unique'. In addition, the age and configuration of each network depends on investment decisions that governments and private investors made in the past.

It follows that each TNSP will have company-specific operational issues that must be taken into consideration in developing their future operating objectives and expenditure plans. Transend is no different — the principal characteristics of the network in Tasmania must be understood before future expenditure plans can be critically appraised.

Transmission networks provide a high-voltage connection and electricity transportation service between generators and the distribution network. The distribution network, in turn, transports electricity at lower voltages to end-users. Transmission service has two components:

- supply side: provides generators with access to the wholesale energy market
- demand side: provides retailers with access (via the distribution network) to the wholesale energy market, to retail energy to customers.

It is therefore appropriate to consider both the generation and the load characteristics of the transmission system.

In addition, as Transend is the only Australian network to connect an almost entirely hydro-based system, it is essential that the operational and cost impacts of a hydro-based system are fully understood. These aspects of Transend's transmission system are now considered in turn.

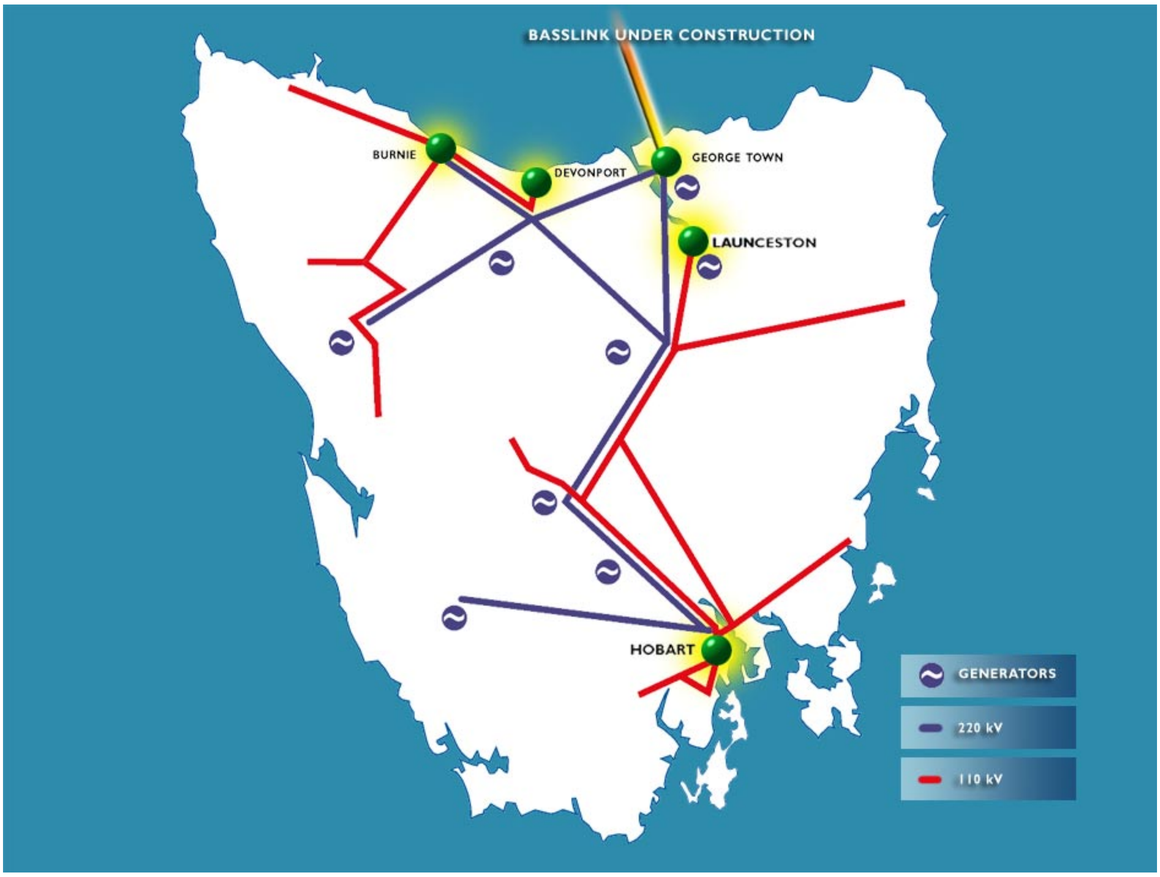
#### 1.3.1 Transend's network – connecting generation and load

A very simplified map of Transend's transmission network, including the proposed Basslink connection is shown in Figure 1.1.

More detailed information about the Tasmanian transmission network, switching stations, connected generators and substation loads is shown in Figure 1.2. It should be noted that some of the substations shown in Figure 1.2 are owned by the customers they connect.

*[1] In 2002, ElectraNet employed 150 staff, SPI PowerNet 270, Powerlink 500 and Transgrid 950. Even allowing for differences between the TNSPs in the quantity of external contracting resources used by each, this broad comparison shows the relatively small size of Transend's in-house resource base.*

**Figure 1.1: Simplified map of Transend's network**




The transmission network is made up of:

- 220 kV lines that transfer power around the State
- 110 kV lines that provide limited support to the 220 kV network and connect loads and generators to the 220 kV network.

Power is transferred between the 220 kV network and the 110 kV network via auto-transformers at Sheffield, Burnie, Palmerston, George Town, Chapel Street, Farrell and Hadspen.

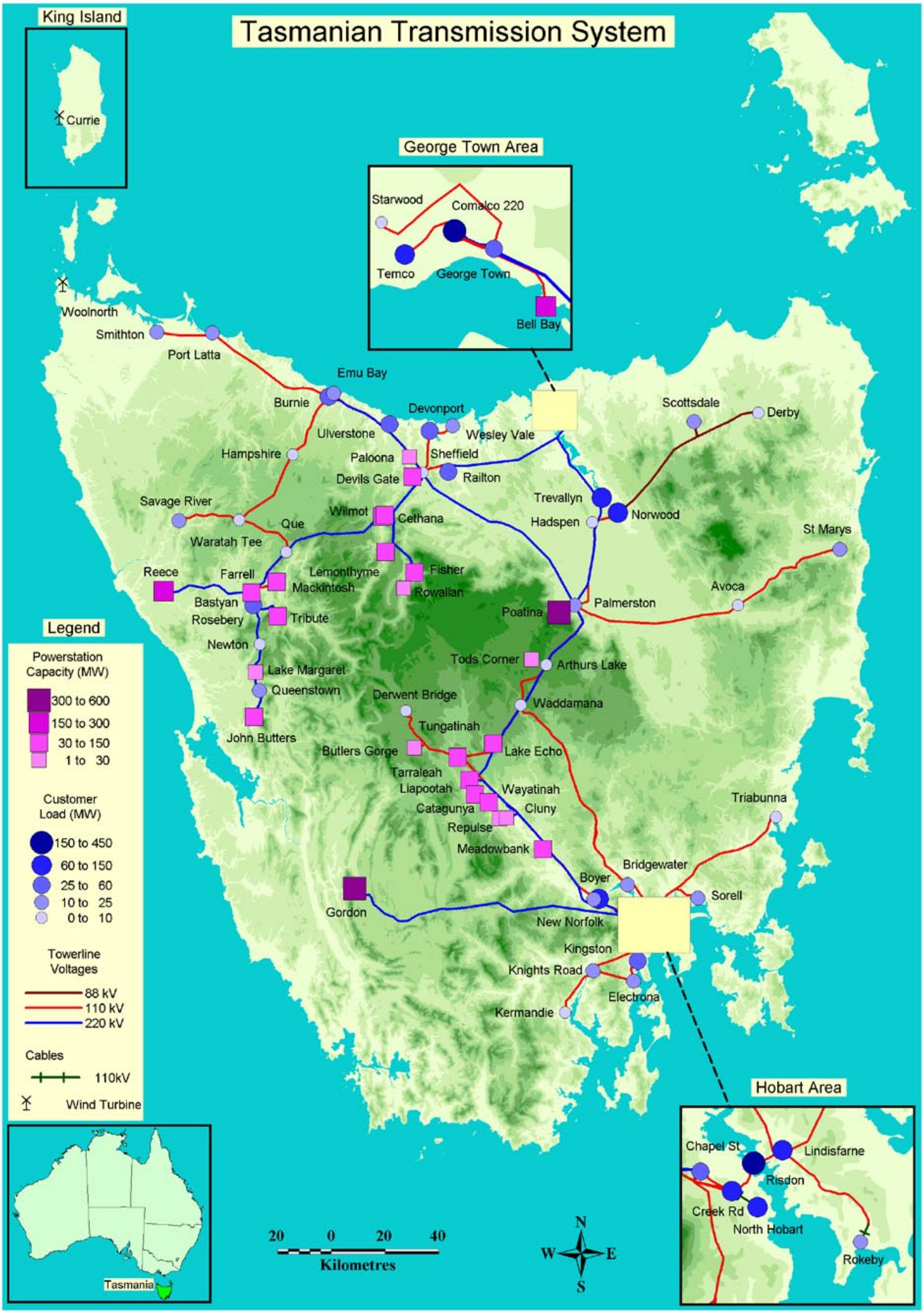
The availability of low-cost high-voltage supply has been a feature of the Tasmanian electricity system, and major industrial customers now account for about 44% of the total maximum demand on the system and about 60% of Tasmania's energy consumption.

### 1.3.2 Impact of hydro-generation on the transmission system

Transend's transmission system has been shaped largely by the nature of Tasmania's generation system. Electricity generation in Tasmania is dominated by hydro units, which account for 90% of capacity and, depending on water availability, up to 99% of energy supplied.

This distinguishes Tasmania from all other electricity systems in the world and in the region. Even in hydro-dominated New Zealand, only 60% of the installed generation capacity is hydro and, in the year 2000, provided only 69% of the energy supplied.

**Figure 1.2: Schematic map of Transend's network**



In a hydro-based system the capability to generate is determined not by the amount of installed generator capacity available, but by the amount of stored water available to generate the required energy. That is, the generating system is constrained by energy, not by capacity. Moreover, until Basslink starts operating in 2005, the power system in Tasmania is isolated from other Australian power systems. Tasmania therefore depends on its own resources for security of supply.

Hydro-based systems create a set of operating conditions for transmission networks that differ from those of thermal-based systems. Features with a substantial influence on the configuration of Transend's network are:

- geographic dispersion of generation (determined by the location of suitable water-catchment sites)
- generator size (driven by water storage size and inflow)
- generator load factor (driven by inflow variability)
- seasonality of generator operation.

In Tasmania, the combined result of these factors is a large number of small generators in dispersed locations, remote from load centres. As a result, more network investment and maintenance effort are needed to connect generation and load than would otherwise be the case.

Each factor that has contributed to this outcome is discussed below.

#### 1.3.2.1 Geographic dispersion

Water resources in Tasmania are widely dispersed, situated in the State's remote north-west, south-west and central plateau regions. World Heritage status in the central-west has prevented transmission network connection between lines serving the north-west and south-west areas. This pattern has raised transmission costs and lessened system security by denying the network the benefit of full interconnection.

To transport electricity to Tasmania's population of 472,000, Transend must invest in, and maintain, a network that extends for 3,500 km. In contrast, New South Wales, with a population of 6,460,000, has a transmission network of 12,000 circuit km, just four times that of Tasmania.

Despite having a smaller area than Queensland, Tasmania has an energy density (GWh/km) that is 30% lower. Implications for investment, maintenance costs and reliability will be discussed in Section 1.5.

#### 1.3.2.2 Small size of generation plant

To capture water resources, the generation system has 27 hydro-electric power stations with a total capacity of 2,263 MW.

Bell Bay, the only thermal power station, has in the past provided backup to hydro-electric generation during periods of lower-than-average rainfall. The station was originally oil-fired, but is now being converted in two stages to gas-fired generation.

The small average size of the hydro units requires a greater number of power station connections to meet the load than the number required in the thermal-based States. There is a corresponding need for additional transmission provision (as shown in Table 1.2 over).

**Table 1.2: Hydro- and thermal-based connections — comparison**

| | Total system size MW installed capacity | Number of generators connected to supply 90% of capacity | Kilometres of network/MW peak capacity |
|---|---|---|---|
| Tasmania | 2,514 | 27 | 2.1 |
| South Australia | 3,137 | 11 | 1.8 |
| Victoria | 8,290 | 8 | 0.7 |
| Queensland | 9,333 | 10 | 1.5 |
| NSW | 12,197 | 6 | 0.9 |

*Source: Benchmark Economics, see Appendix 2*

### 1.3.2.3 Generator load factor

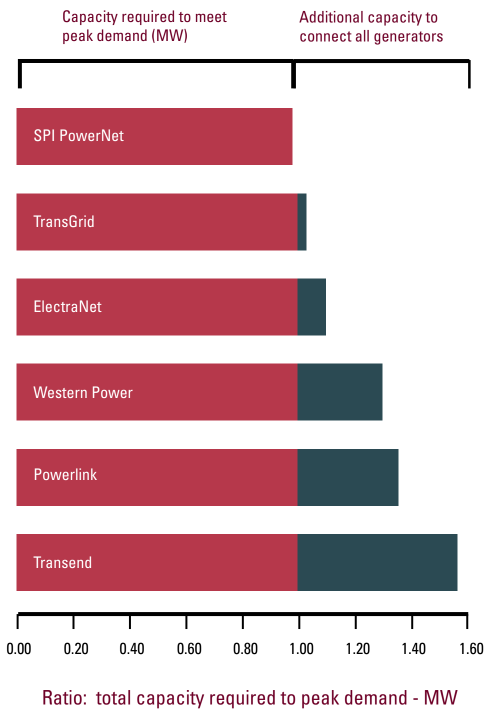
The capacity to generate from hydro-based systems is constrained by the availability of water, hence the operation of power stations largely depends on prevailing weather conditions. Given the uncertainty of water inflows to catchments, hydro-systems typically need to provide more generation capacity to meet a given level of demand. Low load factors, (measured as average energy output relative to total generation capacity provided) are a feature of hydro-generation systems internationally.

The ratio of generation capacity to peak demand shows quite substantial differences between the Australian transmission networks. Figure 1.3 shows that Transend, the only network that connects a predominantly hydro-based generation system, needs substantially more investment than the thermal-based networks. Two examples illustrate this difference:

Tasmania: to meet a peak demand of 1,630 MW, Transend connects 2,514 MW of generator capacity (53% above peak demand).

Victoria: to meet a peak demand of around 8,000 MW, SPI PowerNet connects a generator capacity roughly equivalent to this demand (equal to peak demand).

**Figure 1.3: Transmission capacity required to meet peak demand**




*Source: Benchmark Economics*

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#### 1.3.2.4 Seasonality of generation operation

The seasonal pattern of rainfall also influences power flows across the network. During the high rainfall periods in winter and spring, generation is predominantly from the north and west of the State. The transmission network's power flows therefore run from north to south. The direction of these power flows are reversed in the summer and autumn months as generation is predominantly from larger storages in the centre and south of the State.

This seasonality of generation creates additional network costs as the transmission system is sized to handle the different generation flows. In essence, both 'ends' of the 220 kV network backbone require sufficient capacity to carry energy for the whole State. Transend's additional network capacity results in a lower load factor compared to thermal-based systems.

Transend's ability to obtain network outages is also affected by the variability of rainfall. The nature of a hydro-generation system means that Transend's maintenance and renewal program must have regard to the value of water. In some instances, planned network outages may need to be deferred to permit optimum water use. Transend's difficulty in obtaining outages has been exacerbated in recent years by the low storage levels in Hydro Tasmania's dams.

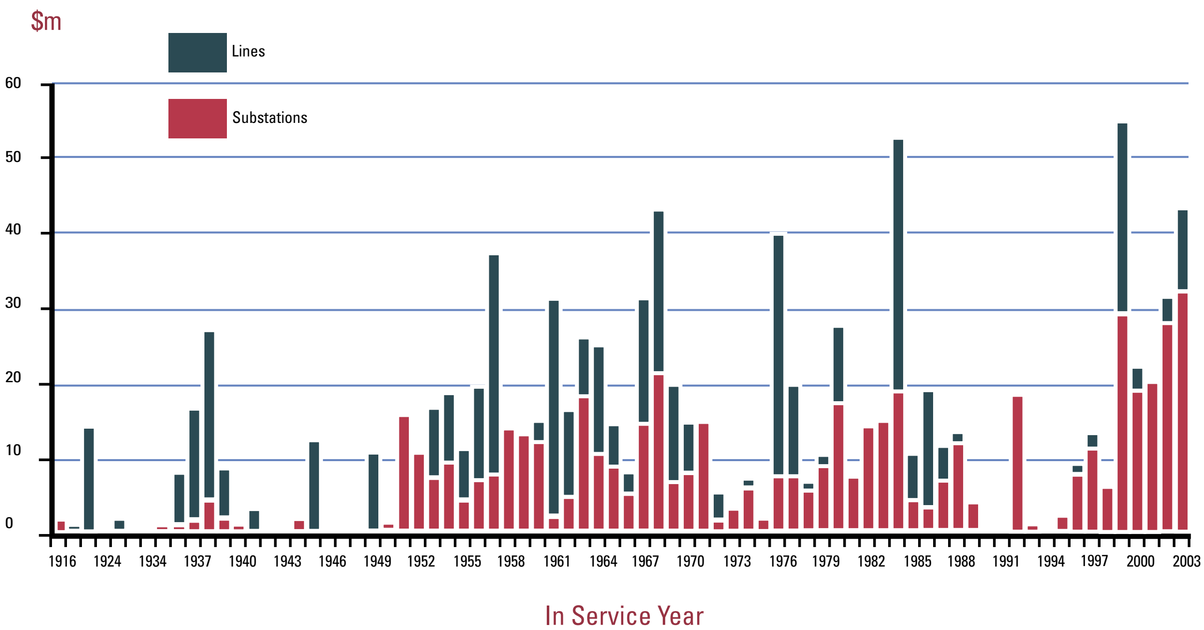
The nature of Transend's transmission system is a crucial factor when comparing the costs of providing transmission services. Section 1.5 presents a comparison of Transend's cost with other Australian TNSPs.

### 1.4 Upgrading and modernising the network

Historically the Tasmanian electricity supply industry placed greater emphasis on hydro-generation development than on transmission expenditure. During the 1990s it was recognised that the transmission network required new investment to upgrade and replace an ageing asset base.

The issue of an ageing asset base is common to many electricity network businesses, where there have been relatively short periods of significant network development several decades ago. Figure 1.4 shows that Transend is no exception.

**Figure 1.4: Age Profile of Transend's assets (in 2002-03 $m)**



While Transend's capital expenditure program is not age-driven, a comparatively old network raises issues of reliability and cost that cannot be ignored. Inevitably, the 'lumpy' nature of historic investment will have implications for the future pattern of renewal investment, and, as key elements of the network grow older, may contribute to declining network performance.

Concerns about network performance led the Government Pricing and Oversight Commission (GPOC) to comment in its August 1996 report as follows[2]:

> The HEC has significant needs for cash in the future to finance capital expenditure for refurbishment of current assets, particularly for upgrade of the transmission and distribution networks. Capital expenditure of more than $100 million per year is forecast for the foreseeable future.

The process of disaggregating the HEC further highlighted the comparatively poor condition of the transmission network. This matter was raised in the Tasmanian Parliament during debate on the formation of Transend. In particular, the then Leader for the Government commented that[3]:

> The generation and power generation unit is in pretty good shape and will assume a quantity of debt which will allow it to operate functionally and service the people of Tasmania well and be a viable, robust business opportunity. The recommendation from the consultants, First Boston, is that the transmission, because it needs a considerable amount of money spent on it to bring it to a stage of comparedness [sic] to be a robust separate entity in the commercial market providing a level of service and a certainty of service and a security of service to the people of Tasmania, will need to have more money invested in it in the future…

Transend has responded positively to the challenge of upgrading its network. In each year since its inception in 1998, Transend has completed major capital projects and undertaken management initiatives to improve the security and reliability of the network. Major capital projects have been subject to competitive tender to ensure that efficiencies are achieved.

The following summary highlights a number of Transend's major projects since the company's formation.

Major projects for transmission lines over the last five years have included:

- The 80 kilometre Liapootah to Palmerston 220 kV line, completed in 1998-99 at a cost of $24m. This line significantly improved the security of the State's electricity supply.
- A new Hadspen–Trevallyn 110 kV transmission line, completed in June 2000 at a cost of $3.5m. This project strengthened the link between the Hadspen and Trevallyn Substations and upgraded security of supply to Launceston.
- A program for eliminating substandard conductor to ground clearances on transmission lines, started in 2000-01 and continuing into 2003-04, with a program cost of more than $20m.

Major projects for substations over the last five years have included:

- A new $20m substation at Hadspen to improve supply reliability to Launceston. This substation reduced the reliance on the Trevallyn Power Station and reduced the risk of extended interruptions to the power supply to Launceston and north-east Tasmania.

[2] *Government Pricing and Oversight Commission,* Retail Prices Investigation, *August 1996, p. iii*

[3] *House of Assembly,* Hansard, *Wednesday 22 April 1998 – Part 2, p. 87*

- A $14.3m redevelopment of the Trevallyn Substation, completed in 2001. In effect, a brand new substation was built within the existing site, with new transformers and circuit breakers. This was part of a multistage program to upgrade the electricity supply to the Launceston area.
- The $8m redevelopment of the Creek Road Substation, completed in 2001-02. This project is the first stage of a program to upgrade the power supply in Hobart.
- A major upgrade of Risdon Substation over the last two years. Connection assets have been provided for the adjacent Pasminco zinc smelter together with complete replacement of the existing 110 kV substation infrastructure. The $16.5m project provides a more robust supply to the Pasminco smelter and to a large part of greater Hobart.
- The redevelopment of Smithton Substation will result in a new substation with improved reliability and extra capacity to cater for projected load growth in the area. Total costs are expected to be $8.9m and the project is expected to be completed by June 2003.
- Work on the Waddamana Substation, with costs of approximately $4.6m, is expected to be completed in November 2003.

Despite these significant achievements in the relatively short period since Transend was formed, many challenges remain. The System Controller's *2002 Planning Statement*[4] summarises the potential impact of constraints in the present system as follows:

- Farrell - Sheffield 220 kV circuits

  An outage of one Farrell - Sheffield 220 kV circuit will overload the remaining circuit by about 10% when the west-coast generators are operating at full capacity to supply the winter peak load, and by about 30% when operating at full capacity to supply the summer peak.

- Liapootah - Palmerston 220 kV circuits

  An outage of the Liapootah - Palmerston 220 kV No. 2 circuit during northern generation and peak-load conditions (summer or winter) will overload the Tungatinah-Lake Echo-Waddamana and Waddamana-Palmerston 110 kV circuits by up to 80%.

- Gordon - Chapel Street 220 kV circuits

  An outage of one Gordon - Chapel Street 220 kV circuit will overload the other circuit when all three Gordon [power station] machines are generating at full capacity.

- Chapel Street - Risdon and Creek Road-Risdon 110 kV circuits

  An outage of one 110 kV circuit supplying Risdon Substation from either Chapel Street or Creek Road will significantly overload the other circuit during peak-load conditions in summer or winter.

- Gordon [power station] generation (summer)

  Because of the thermal rating of the Gordon - Chapel Street 220 kV transmission lines, Gordon generation is constrained during summer when there is no wind.

[4]*Transend Networks Pty Ltd, System Controller* 2002 Planning Statement*, pp. 13-14. For a detailed discussion also see pp. 94-95.*

- Gordon generation

  When one Liapootah - Chapel Street 220 kV circuit is out of service for maintenance or after an outage of one of the circuits, Gordon generation is 'constrained on' to meet the southern Tasmanian load and to maintain system security.

- West-coast generation

  When one Palmerston - Hadspen or Hadspen - George Town 220 kV circuit is out of service for maintenance or after an outage of one of these circuits, west-coast generation is 'constrained on' to meet the north-east load.

Transend's capital expenditure program, presented in Chapter 6 of this submission, takes account of the issues raised in the System Controller's *2002 Planning Statement*.

### 1.5 Performance comparisons with other TNSPs

It is important to consider two aspects of performance – cost and service. Conceptually, there is a trade-off between cost and service; an apparently excellent performer on cost may be providing a lower quality or inferior product. Conversely, one possible explanation for an apparently high-cost performer is that it is providing a better service than its peers. In either case, it is pertinent to consider whether the mix between price and service is optimal – providing the best value for money for customers.

The conceptual trade-off between cost and service is further complicated in electricity transmission principally for the following reasons:

- Robust comparisons of cost between companies depend on 'raw costs' being normalised to take account of legitimate differences in TNSPs' operating conditions. In Transend's case, the normalisation should account for the additional costs arising from hydro-based generation, and diseconomies of scale, as these are operational circumstances that Transend cannot control.
- Service is a multi-dimensional concept – including aspects such as supply availability, quality of supply, plant availability, and system security. Inevitably, comparisons of service performance between companies are fraught with difficulty unless a composite measure of 'service' can be determined.

The difficulty of comparing companies was recognised by the Tasmanian Government in its submission to the 1999 electricity pricing investigation, which commented[5]:

> The Government believes that it would be totally inappropriate if the price controls arising from this investigation resulted in pricing signals to electricity users which did not appropriately reflect actual conditions in the Tasmanian ESI [electricity supply industry]. The Government sees no advantage in the Regulator establishing controls for Tasmanian electricity prices, which deliver price outcomes consistent with those in other mainland States if this is unsustainable given the underlying conditions in the Tasmanian ESI.

Notwithstanding the practical limitations in comparing companies, 'benchmarking' company performance is an important feature of regulation in Australia and internationally. Transend commissioned Benchmark Economics and Pacific Economics Group to advise on Transend's comparative performance.

Benchmark Economics examined the cost structures of the Australian transmission networks and identified major cost drivers, including network scale. Using the findings from this analysis, the report concluded that Transend is one of Australia's lowest cost performers. In reaching this conclusion, Benchmark Economics highlighted the following five findings:

1. Transmission networks must meet two capacity requirements:

    • on the supply side — enough capacity to enable generators to access the market

    • on the demand side — enough capacity to meet the peak demand required by end-users.

2. It has been standard practice in analysing transmission costs to consider only the requirements of peak demand rather than those of generation. In comparing thermal-based systems with one another, this approach is reasonably sound. However, it will bias results against hydro-based systems, which need substantially more generation capacity for a given level of peak demand (see Figure 1.3).

3. The difficulty identified in Finding 2 can be overcome by using 'connected generation capacity' as the driver for network costs.

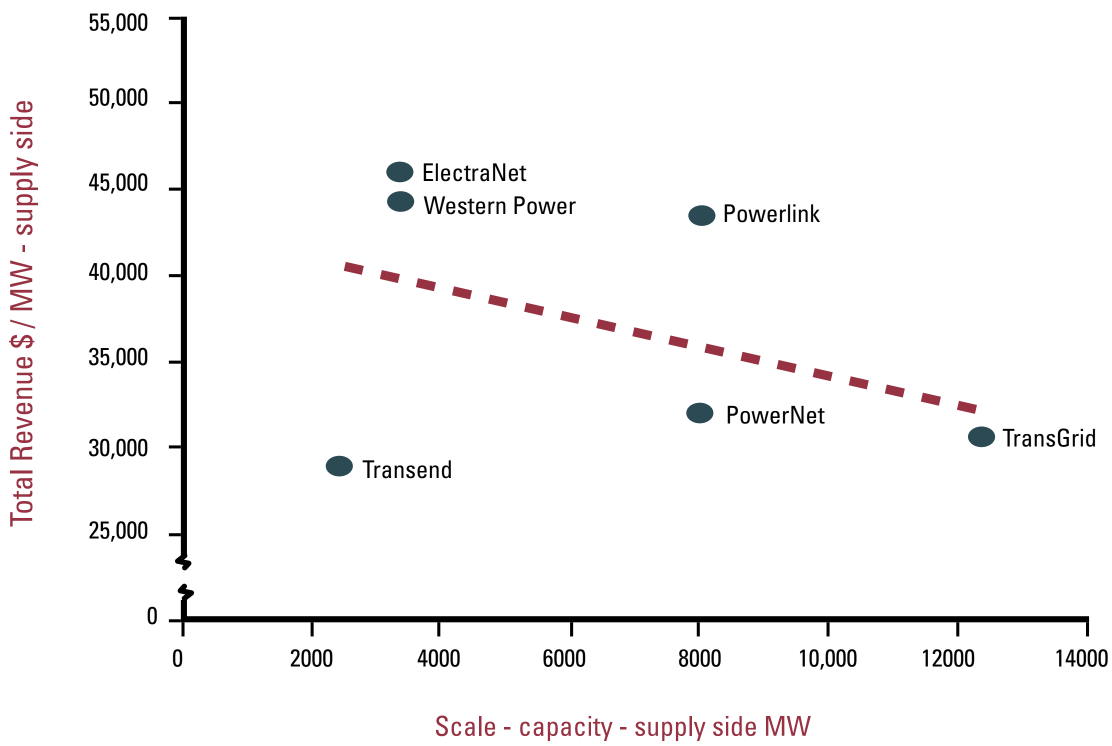
4. As the transmission 'product' is basically network capacity and length of connection, it is appropriate to measure cost on the basis of $/MW capacity, or $/network length. However, measuring cost on the basis of $/MWh, measures only the use of the system, that is, the energy transported over the network.

    To judge the cost efficiency of a road construction company by the number of cars using the road would seem illogical. It is no less so for networks and energy.

5. Transmission networks exhibit significant economies of scale. However, cost comparisons typically take into account only scale effects (for example, by comparing $/MW costs) rather than economies of scale. It is important to consider economies of scale in comparing company costs.

Benchmark Economics conducted a number of cost comparisons to assess Transend's relative cost performance. Figure 1.5 illustrates the low-cost nature of Transend's business.

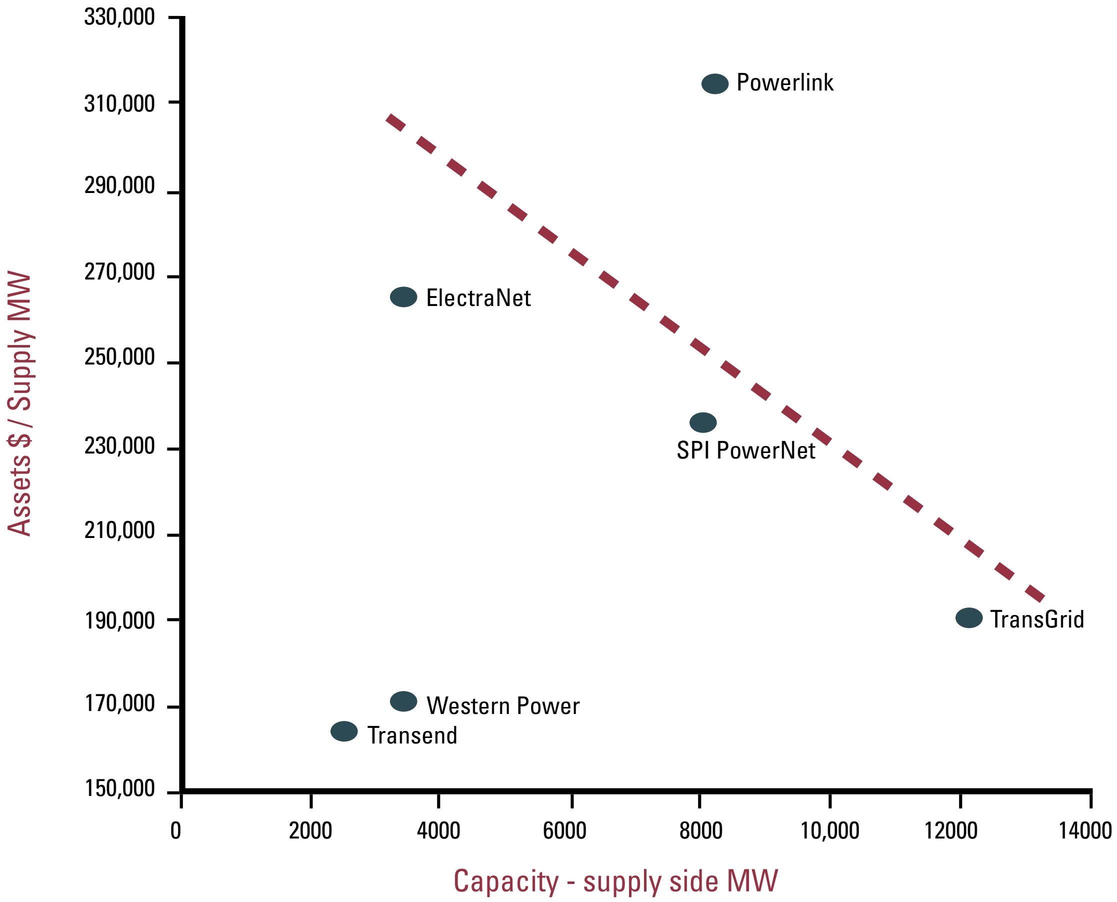
**Figure 1.5: Measuring cost performance — accounting for economies of scale**




*Source: Benchmark Economics*

In Figure 1.5, the downward sloping dotted line shows the relationship between costs and size. As expected, companies such as Transgrid, with larger supply-side capacity, exhibit lower costs as measured on a $/supply capacity basis. However, Transend is substantially below the trend line — indicating that its costs are well below those that might be expected of a company of its size.

**Figure 1.6: Measuring cost performance — assets per MW of capacity**

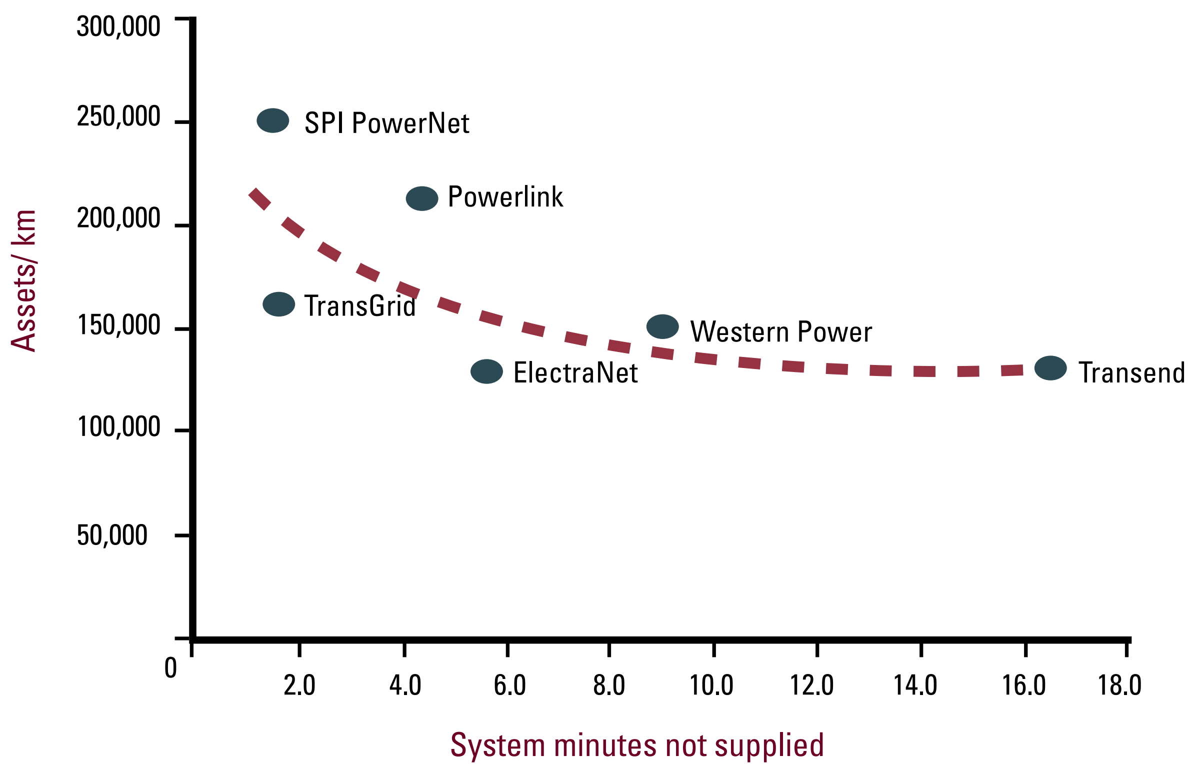



*Source: Benchmark Economics*

Figure 1.6 shows Transend's relatively low asset value per MW of supply capacity.[6] This reflects Transend's lower asset value, resulting from an ageing network and a range of environmental factors. For instance, Transend's network tends to be less 'meshed' and have more radial lines than other Australian networks. With less asset redundancy there are fewer assets (and a lower asset value) for a given supply capacity. This finding, together with the exceptional low-cost performance (Figure 1.5) has implications for service performance – the subject of Figure 1.7 below.

*[6] As these comparisons use data for the year ending June 2003, the asset base used in Figure 1.6 is based on Transend's previous asset base valuation, rather than the new valuation applying to the forthcoming regulatory period. In Figure 1.6, applying Transend's new valuation still leaves Transend below the trend line.*

**Figure 1.7: Measuring service performance**




*Source: Benchmark Economics Note: As reliability can vary substantially between years, the 'System minutes not supplied' figure is a five-year average for 1997-2001.*

Figure 1.7 shows that service measured in terms of 'system minutes not supplied' indicates that Transend has the least reliable network among the TNSPs sampled. The implication from Figures 1.5, 1.6 and 1.7 taken together, is that Transend's very low cost structure can be achieved only at the expense of service levels. Independently of this study, Transend has fully recognised that service levels need to be maintained and improved through a targeted program of capital and operating and maintenance (O&M) expenditure. These expenditure plans are explained in detail in Chapters 6 and 7 of this submission.

To ensure that Transend continues to adopt best practice in network management and cost efficiency, it participates in two major benchmarking activities. These are :

- the biennial International Transmission Operations and Maintenance Study (ITOMS)
- the CEO Transmission Forum Benchmarking Group study (the 'CEO study'), published by the Electricity Supply Association of Australia.

Transend's principal aim in participating in these activities is to gain an understanding of current work practices, processes and technologies used by other transmission companies, and to adopt and refine those processes and technologies to apply in Tasmania, where they would make Transend's operations more efficient.

A secondary benefit is that Transend's participation in these activities provides some information about the efficiency of Transend's operations and maintenance practices, compared with other transmission companies.

**Figure 1.8: ITOMS composite measures of service and cost**

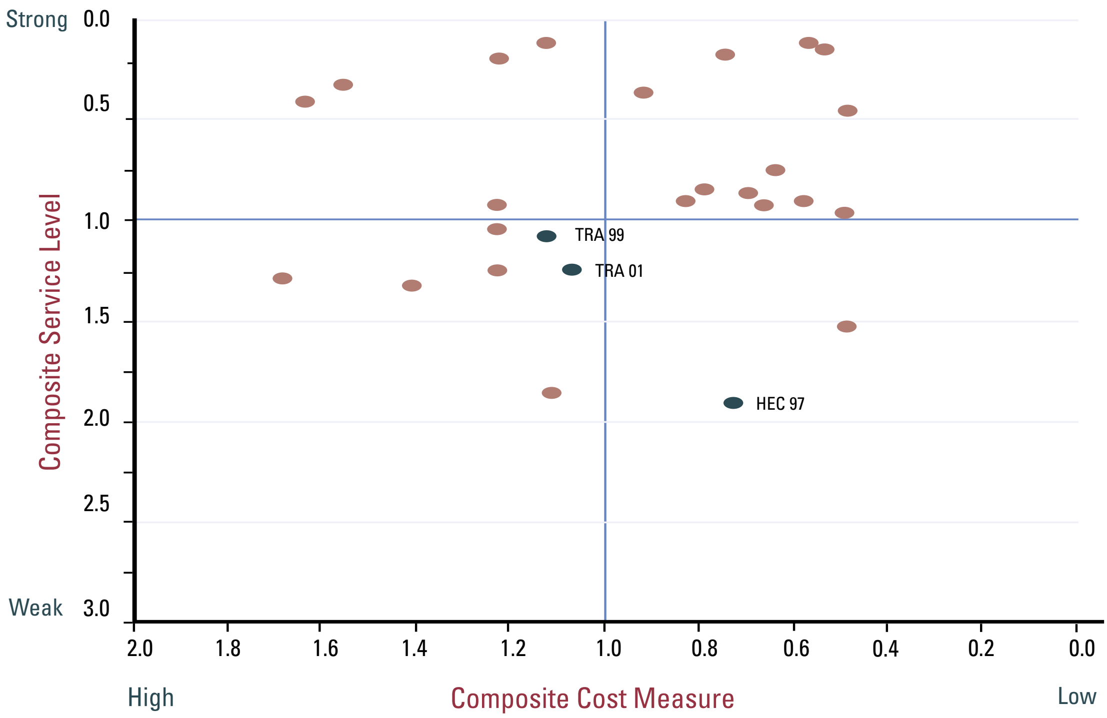



Figure 1.8 shows Transend's performance in ITOMS against the composite measures of service and cost. It shows that compared to HEC's performance in 1997, Transend has improved service performance at the expense of costs, which have increased. In 2001, Transend is shown to be slightly below the average performer in the group.

Transend's performance according to ITOMS contrasts markedly with Benchmark Economics' report, which indicates that Transend is a very low-cost performer compared to its Australian peers.

To clarify the implications of the ITOMS survey, Transend commissioned Pacific Economics Group (PEG)[7] to independently review the ITOMS survey. In addition, PEG also examined the results of the CEO benchmarking study noted earlier.

PEG's report[8] examines the methods and results of the ITOMS and CEO benchmarking studies of partial indicators. The analysis contained in the PEG report describes some of the limitations and issues in using partial indicators to compare the performance of different companies that face different business conditions. PEG's report concluded that:

[7] Pacific Economics Group *is an independent economic consulting practice that has extensive experience in conducting benchmarking studies of regulated network businesses in the United States and Australia.*

[8] PEG, *Benchmarking Transend's Cost Performance: Analysis and Evidence, April 2002.*

> Relative to the seven TNSPs in Australia & New Zealand (ANZ), Transend registers approximately average performance on most indicators presented in the CEO study. The company is in the middle of the pack on both O&M cost indicators and on the circuit availability measure of reliability...
>
> The company's performance on ITOMS is qualitatively different. While Transend is an approximately average performer compared with the entire ITOMS sample, it is at or near the bottom amongst the ANZ TNSPs...
>
> We believe the differences between Transend's performance on the CEO and ITOMS studies may be explained, in part, by the methodologies employed in ITOMS. ITOMS undertakes a number of adjustments and normalizations that are designed to promote 'apples to apples' comparisons among sample companies. However, some of these adjustments and normalizations are questionable and may exacerbate cost differences rather than ameliorating real variations in business conditions that are beyond company control.

Transend's view is that some of the issues that PEG raised about ITOMS have been addressed in the report prepared by Benchmark Economics. However, it is likely that any benchmarking analysis — based on partial indicators of cost — will be subject to shortcomings.

Transend continues to find ITOMS valuable in exploring differences between TNSPs, and in ensuring that best-practice techniques are adopted. However, it is questionable whether ITOMS is the best benchmarking tool for setting revenue for a transmission business.

The crucial findings shared by both ITOMS and the report from Benchmark Economics is that while Transend's benchmarked costs are not high, service levels lag behind its Australian peers. The main difference between the two studies is that Benchmark Economics strongly implies that, to improve this situation, future expenditure will need to rise. This conclusion accords with the views of Transend's Board of Directors.

### 1.6 Future developments

Sections 1.2 to 1.5 described Transend's development since it was formed in July 1998. It is essential to understand this information to assess the implications of the challenges facing the company in the forthcoming regulatory period. However, as Transend responds to market demands for transmission services, it is possible that the future challenges facing the company will be significantly different to those it has experienced to date.

To anticipate these challenges, Transend has identified three major developments that will significantly affect the transmission network in Tasmania:

- Basslink
- reticulation of natural gas
- growth in wind generation.

Each of these developments is discussed in turn.

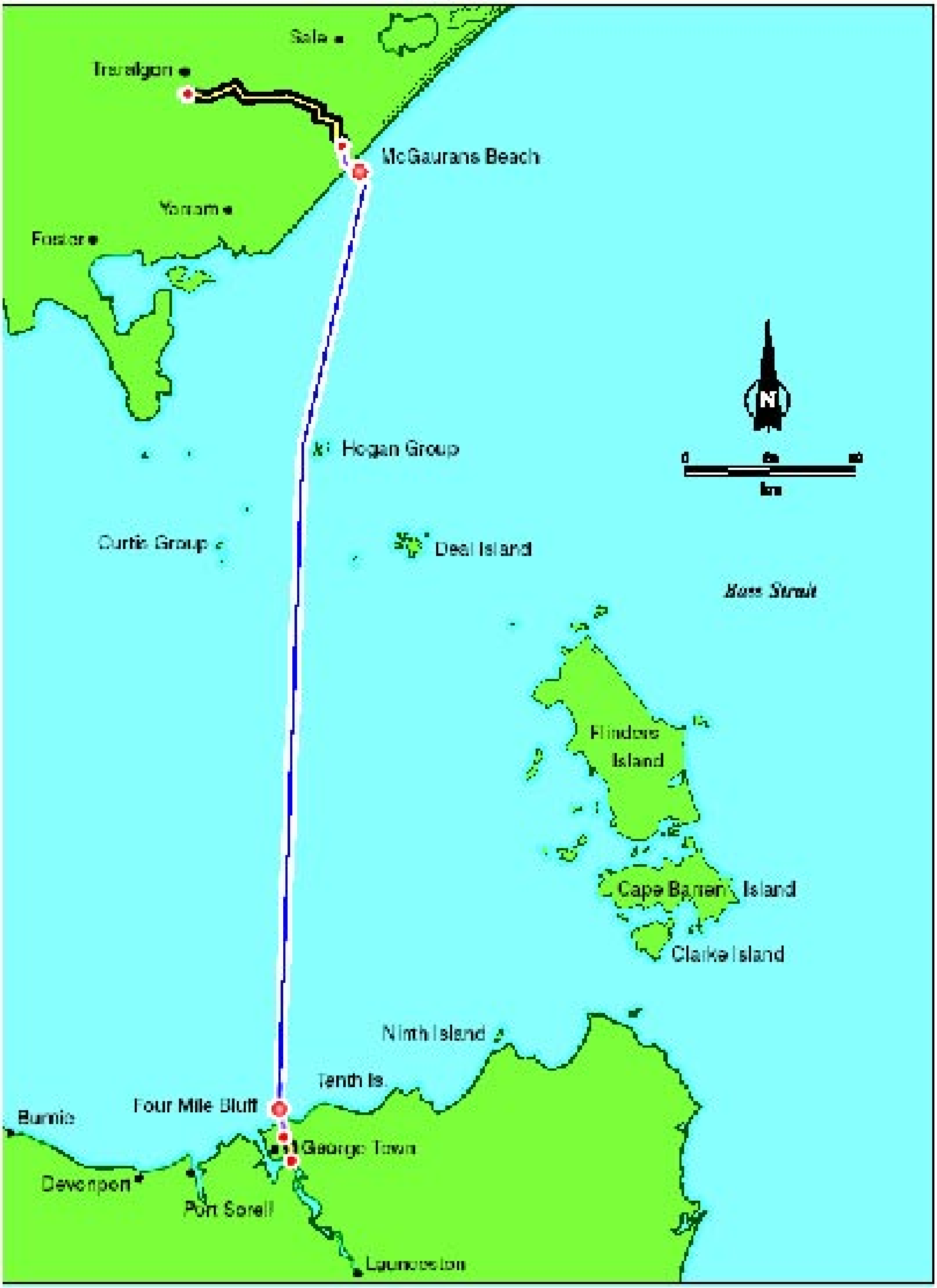
#### 1.6.1 Basslink

Tasmania's entry to the NEM is conditional on completion of the Basslink project. Basslink involves the installation of a direct current (DC) interconnector cable from Loy Yang Substation in Traralgon, Gippsland, Victoria, across Bass Strait to George Town in northern Tasmania.

Tasmania is expected to join the NEM in May 2005, six months before Basslink's expected completion in late November 2005. NEM entry itself raises many challenges, which are addressed in subsequent chapters of this submission.

Figure 1.9 provides an indicative diagram of the Basslink connection in relation to the Tasmanian transmission system.

**Figure 1.9: Basslink connection**




*Source: Basslink Pty Ltd*

Basslink will have the capacity to export up to 630 MW from Tasmania for up to 10 hours after pre-cooling, and will be able to operate at 480 MW continuously. Import to Tasmania is likely to be constrained by system security considerations, but will be at least 300 MW.

This additional import and export capacity is considerable, compared to the existing maximum demand on the Tasmanian system of about 1,600 MW. The Basslink Joint Advisory Panel, which conducted an integrated environmental assessment, approved Basslink in 2002, subject to a number of conditions.

The Basslink project provides a flexible means of alleviating the risk of energy constraints or surpluses in Tasmania. Removing the energy constraint will enable businesses to expand, boost business confidence and send a strong positive signal to potential investors in Tasmania.

Basslink is one of the most significant developments for the power system in Tasmania. In addition to market and regulatory impacts, it will have significant technical impacts on the performance of the Tasmanian power system. The precise requirements that Basslink will place on the transmission system are not yet known with certainty. Nevertheless, in the year 2000 the System Controller reviewed the initial Basslink proposal and concluded that when Basslink is completed, the following transmission constraints could arise[9]:

- overload of the Palmerston–Liapootah 220 kV No. 1 circuit, with an outage of the Palmerston–Liapootah 220 kV No. 2 circuit, under peak summer loads and when exporting 630 MW with a southern generation schedule
- by 2015, possible voltage instability after the loss of a Farrell–Sheffield 220 kV circuit during summer peak load while exporting 630 MW through Basslink
- overloading of one Sheffield–George Town 220 kV circuit, with an outage of the other circuit, during both winter minimum and summer peak load conditions with northern generation
- voltage instability with the loss of a Sheffield–George Town 220 kV circuit during winter peak load while exporting 540 MW through Basslink
- overloading of one Palmerston–Hadspen 220 kV circuit and the Palmerston–Hadspen 110 kV circuits with an outage of the other Palmerston–Hadspen 220 kV circuit
- under some northern generation scenarios the sudden loss of the Sheffield B Bus may cause a major system disturbance.

In response to these concerns, and to manage some of the risks associated with Basslink, Transend is currently working with Basslink Pty Ltd to install a system protection scheme (SPS). This will ensure the security of the Tasmanian power system in the event that (a) Basslink loses its import or export mode or (b) there is loss of transmission circuits relevant to Basslink transfers. Without the SPS funded by BassLink Pty Ltd, Transend's capital expenditure requirements would be appreciably higher.

### 1.6.2 Reticulation of natural gas

As shown in Figure 1.10, the Tasmanian Natural Gas Pipeline sources gas from Esso Australia Resources Pty Ltd and from BHP Petroleum (Bass Strait) Pty Ltd in Victoria. Gas is transported by a 735 km pipeline from Longford in Victoria to George Town in Tasmania and then to Port Latta and Hobart. The pipeline was completed in 2002.

[9]*Transend Networks Pty Ltd, System Controller* 2000 Planning Statement, *p. 12.*

**Figure 1.10: The Tasmanian natural gas pipeline**


*Source: Duke Energy*

The introduction of reticulated gas in Tasmania will change usage patterns for the transmission network. In its *2002 Planning Statement*, the System Controller noted that more regular generation at Bell Bay after the Stage 1 conversion to gas will reduce the need for energy transmission from west-coast power stations to the north and north-eastern areas.[10]

Reticulated gas also brings potential and uncertain impacts on both economic activity and future electricity demand in Tasmania, as well as the possibility of further gas-fired generators.

### 1.6.3 Growth in wind generation

The prospect of Basslink's completion, together with the Commonwealth Government's Mandatory Renewable Energy Target (MRET) scheme, has created considerable interest in the development of Tasmania's world-class wind resource. For example:

- Hydro Tasmania has already started generating from Stage 1 of a potential 138 MW scheme at Woolnorth, in far north-west Tasmania.
- A wind generation project of 150 MW at Musselroe, in far north-east Tasmania, has been announced. In early January 2003, Hydro Tasmania lodged a preliminary connection enquiry for additional generation in the Musselroe area, bringing the total to 290 MW in the north-east of Tasmania.
- Several other wind projects are also under consideration; these are discussed in Chapter 6.

The impact of wind generation on the transmission system is difficult to estimate, given the uncertainty surrounding the likely capacity of wind generation during this forthcoming regulatory period. However, the technical characteristics of wind generation, and its tendency to be remote from load centres, raise particular challenges for the transmission system. It is important that the transmission system is planned to meet the requirements that wind-generation projects place on it.

### 1.6.4 Transend's approach

Each of these future developments places new demands on the transmission system and on the business. However, Transend's view is that in the forthcoming regulatory period it would not be prudent to plan network investments to cover all the possible requirements associated with Basslink, the reticulation of gas and potential new generation projects. Nevertheless, it is important to recognise the challenges arising from these future developments.

The company's approach in this submission is to take a balanced view of future costs. To support this approach, Transend has proposed a number of innovative regulatory mechanisms, which are intended to share risk appropriately between the company and its customers. These regulatory mechanisms are outlined in Chapters 6 and 7 of this submission and described in detail in Appendix 1.

## 1.7 Future goals

In terms of high-level objectives, Transend remains focused on its mission:

> To efficiently provide a reliable and secure electricity transmission service to consumers at a cost commensurate with appropriate and sustainable returns to shareholders.
>
> To facilitate the dispatch of generators and ensure power system security in Tasmania.[11]

[10] *Transend Networks Pty Ltd, System Controller* 2002 Planning Statement, *p. 73*

[11] *It should be noted that these objectives apply to both Transend's roles: as TNSP and as System Controller.*

To achieve this mission, Transend needs to continue to monitor its performance against peer companies and adopt best-practice techniques wherever possible. Transend's expenditure program for the forthcoming regulatory period will provide long-term improvements in service performance. Transend's capital and operating and maintenance (O&M) expenditure plans are explained in detail in Chapters 6 and 7 respectively.

Transend further recognises that commitments to improving service should be backed by appropriate financial incentives and penalties. To this end, Transend has developed service standards that provide this financial commitment. These standards are detailed in Chapter 5 of this submission.

These proposals reflect the company's ongoing commitment to meeting the future needs of Transend's customers and providing a cost-effective service. Transend's approach is a balanced one, which considers the interests of customers, consumers, employees and shareholders.

### 1.8 Structure of the submission

The remainder of the submission is structured as follows:

Chapters 2, 3 and 4 describe the regulatory arrangements for this review; Transend's efficiency gains during the first regulatory period; and the value of Transend's assets. In particular:

- Chapter 2 provides a description of the regulatory arrangements for this review.
- Chapter 3 discusses the issue of efficiency incentives.
- Chapter 4 describes the valuation of Transend's asset base, taking account of the principles adopted by the Commission in its draft *Statement of Regulatory Principles*.

Chapters 5, 6 and 7 explain Transend's requirements for capital and O&M expenditure. In particular:

- Chapter 5 sets out Transend's service standards and network security criteria, which are important drivers for future requirements for O&M and capital expenditure.
- Chapter 6 provides detailed analysis of Transend's future requirements for capital expenditure. In doing so, it distinguishes between development, renewal and non-network capital expenditure.
- Chapter 7 details Transend's requirements for O&M expenditure.

Chapters 8 and 9 outline the finance issues that must be addressed in determining Transend's revenue requirements. Thus:

- Chapter 8 presents Transend's views regarding depreciation, and in particular addresses the issues of stranded asset risk and re-optimisation risk.
- Chapter 9 provides a detailed explanation of the cost of capital issues, and proposes a cost of capital for Transend's regulated business.

Chapter 10 summarises Transend's revenue requirements for the forthcoming regulatory period.

In addition, there are seven appendices to this submission:

| | |
|---|---|
| Appendix 1 | Transend's proposed revenue control |
| Appendix 2 | Benchmark Economics benchmarking report |
| Appendix 3 | Issues relating to future asset valuations |
| Appendix 4 | Transend's performance incentive scheme |
| Appendix 5 | SKM's report on security criteria |
| Appendix 6 | Development capital expenditure projects |
| Appendix 7 | NECG's cost of capital report |