

The Performance of the NSW Electricity Supply Industry

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1. Introduction

Australian governments have placed considerable emphasis on microeconomic reform since the mid 1980s. The central aim of these reforms is to boost productivity growth by creating an environment in which resources are allocated to their most productive uses and firms use the most efficient methods of production – that is, to improve the productive and allocative efficiency of the economy. Reforms have initially focused on the finance sector and on liberalising those sectors of the economy which are involved in exporting or competing with imports (the traded goods sector).

With the policy framework for opening up the economy largely in place, policy makers are now focusing their attention on reform in those sectors of the economy which support the traded goods sector. This includes infrastructure service industries such as electricity, telecommunications, transport, and ports. In some respects this has been driven by the internationalisation process. As the economy opens up, concerns about competitiveness increase. This puts pressure on those sectors, or factors of production which provide inputs to the production of exports or import-competing goods. Industries which serve customers both here and overseas depend on top quality, least cost production inputs.

The Electricity Supply Industry (ESI), which is examined in this paper, provides a crucial input to production, and is therefore a priority sector for reform. In fact, recent work by the Industry Commission (1995) on the impact of implementing recommendations of the Hilmer Report and related reforms, indicate that electricity and gas sector reforms may account for up to 25 per cent of the total benefits of competition reform (New South Wales Government 1995).

2. Industry Reform Proposals

Over the past decade, governments both in Australia and overseas have implemented or foreshadowed sweeping reforms to their electricity industries aimed at improving economic performance. The reforms have taken the form of administrative changes (commercialisation and corporatisation), structural changes, pricing reforms, regulatory reforms, and privatisation. This section provides a brief outline of reforms in Australia to establish a national electricity market, as well as reforms to the New South Wales ESI.

2.1 The National Grid

In recent years, the Commonwealth and State governments have been cooperating to establish a national electricity market in Australia. The main aim is to operate the separate State and territory-based electricity systems in south-eastern Australia and the

Snowy Mountains Scheme as one national grid. The market will initially cover those States which are currently interconnected – namely New South Wales, Victoria, South Australia and the Australian Capital Territory – and will eventually be expanded to Queensland and Tasmania as new transmission links are established.¹ The ultimate objective is to have a market where:

- customers are able to choose their electricity supplier from a number of competing generators and retailer suppliers, removing the current restrictive arrangements whereby the market is carved up into regional monopolies;
- there is open and non-discriminatory access to the interconnected transmission and distribution network;
- there are no legislative or regulatory barriers to entry for new participants in electricity generation or retail supply; and
- there are no legislative or regulatory barriers to interstate and/or intrastate trade.

Although the starting date for the national market has been postponed several times, governments have maintained and renewed their commitment to a national market as recently as the April 1995 Council of Australian Governments meeting.

2.2 New South Wales

In the early 1990s, administrative reforms were made to the generation sector of the ESI as part of a broader commercialisation and corporatisation process that affected all government trading enterprises in the State. The result has been significant operating cost savings and efficiency gains. However, there is still considerable scope for productivity improvements, and further reforms are needed to prepare the industry for the commencement of the national market. Key features of proposed reforms include:

- *Generation*: A commitment to structural reform of the generating sector and to the establishment of effective competition between generators.
- *Distribution network and retail supply*: Amalgamation and restructuring of the 25 electricity distributors in New South Wales into a smaller number of distributors that will operate under a commercial framework.
- *Transmission*: Separation of responsibility for generation (a competitive sector) and transmission (a natural monopoly).

There are four criteria guiding the development of the new structural arrangements in New South Wales:

- the size of industry participants should be sufficient to retain or realise economies of scale;
- the organisations created should be able to earn a commercial return on assets, finance new investment and expand their operations as required;
- the number and relative size of market participants should ensure effective competition, with each participant facing pressure to improve productivity in order to remain viable (rather than being able to increase or distort prices); and

1. The transmission distances to Western Australia and the Northern Territory preclude their involvement in the national market.

- under the new market structure, non-traditional generation and end-use technologies should be able, as far as possible, to compete on an equal basis with the current stock of coal-fired thermal generation and end-use appliances.

The reforms within New South Wales do not involve the transfer of assets from public to private ownership. The government has argued that it is the *structure* of the market rather than the *ownership of assets* that drives efficiency improvements.

3. Productivity Measurement

The performance of private firms is usually assessed by looking at their profits, share price and output. However, for publicly-owned utilities, many of which have monopoly power and regulated prices, this is not appropriate. Rather, it is necessary to utilise measures of economic efficiency (Kay 1992).

The earliest approaches to productivity measurement used partial-factor measures – that is, the ratio of output to one input, often labour. However, while partial measures provide useful information, they can provide a misleading picture of overall performance if viewed in isolation. To determine the overall productivity of a firm, a measure is needed that can simultaneously take account of all the inputs to production in relation to output – that is, a measure of total-factor productivity. A wide variety of useful analytical techniques have been developed in recent decades which can be used for making comparisons of overall efficiency and productivity. The two most widely-used techniques are:

- index number methods, commonly referred to as total-factor productivity (TFP) measures; and
- the estimation of frontier production or cost functions either using a mathematical programming approach called data envelopment analysis (DEA) or an econometric approach (stochastic frontiers).

Index number methods, or TFP measures, are used to measure technical efficiency. In brief, TFP is measured by taking a ratio of output quantity to input quantity. Aggregation of the diverse inputs used and outputs produced into single measures of input and output quantity is achieved by using indexing procedures. In the aggregation process, inputs are weighted according to their share of total costs and outputs are weighted according to their share of total revenue.²

DEA uses information on the observed inputs and outputs of a number of productive units to calculate a production frontier which is defined by the most efficient producers in the data set. The relative efficiency of each unit is determined by its position in relation to the efficient frontier. Units on the frontier are those which are the most efficient within the data set. DEA provides more comprehensive measures of efficiency than TFP because it is able to distinguish between technical efficiency (that is, minimising the amount of inputs needed to produce a unit of output) and allocative efficiency (that is,

2. The TFP studies in this paper use the Tornqvist translog index for comparisons of a single firm over time, and the translog multilateral index advocated by Caves, Christensen and Diewert (1982) for comparisons of a number of firms over a number of time periods. The multilateral index produces a relative measure of the productivity of each organisation in the sample in relation to a sample average.

combining inputs in a way which minimises the cost of production). It can be also be used to decompose technical inefficiency into three sources – pure technical, scale inefficiency, and congestion of inputs – and provide each unit in the data set with a list of relevant role models. However, the drawback of DEA is that a much larger number of observations is needed than for TFP measurement (London Economics 1994).

4. Productivity of the New South Wales ESI

A number of empirical studies are reviewed to assess the performance of the ESI in New South Wales. These studies utilise both TFP and DEA efficiency measurement techniques. In interpreting these studies, it is important to bear in mind that the electricity industry is highly capital intensive and that capital comes in large, bulky increments which are larger than are needed to satisfy demand when first commissioned. This makes large variations in productivity in the electricity industry unavoidable in the short term. Therefore, it is best to assess performance on the basis of trends rather than year-to-year performance. We present trends in productivity performance of the generation, distribution and transmission sectors of the ESI.

4.1 Generation

Over 90 per cent of the demand for electricity in NSW is met by Pacific Power, a State government trading enterprise. The remainder is provided by the Snowy Mountains Hydro Electric Authority and a few small independent generators. Pacific Power currently has generating plant capacity of 12,150 MW.³ This is by far the largest generation capacity of any State. The next largest is Victoria (with 7,155 MW).⁴ Pacific Power accounts for almost half of the installed capacity in the south-east States of Australia that are currently interconnected.

4.1.1 Performance between 1978/79 and 1987/88

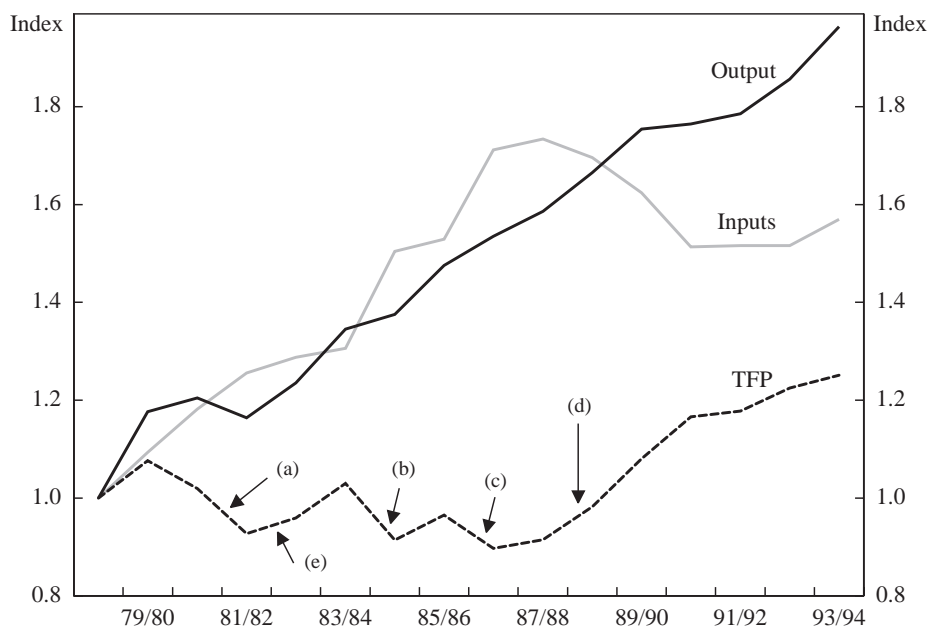
Figure 1 shows Pacific Power's TFP, input and output indices between 1978/79 and 1993/94. The results are based on unilateral TFP studies undertaken by Pacific Power. The period between 1978/79 and 1987/88 can be described as the pre-reform era. As summarised in Table 1, during this period, Pacific Power's TFP declined at an annual average rate of just under 1 per cent, resulting in a total decline for the period of 8.5 per cent. Significant additions made to generating capacity during the period, combined with lower-than-expected growth in electricity demand and a major plant failure, contributed to this decline.

Demand for electricity in NSW had been growing strongly since the 1950s; growing on average at about 9 per cent per annum in the 1950s and 1960s, and about 6 per cent per annum in the 1970s. In response to these historical growth rates, and on the expectation of the 'resources boom' during the 1980s, significant investments were made in upgrading and expanding the generation facilities in New South Wales during the 1980s. Unfortunately, contrary to these expectations, there was a general downturn

3. Excludes New South Wales' share of the Snowy Scheme and dry stored capacity.

4. Excludes its Snowy entitlement.

Figure 1: Pacific Power TFP, Inputs and Output (1978/79-1993/94)



- Notes: (a) Major plant failure at Liddell, economic downturn and opening of new plant.
 (b) Eraring.
 (c) Bayswater.
 (d) Labour reductions, improved output and plant retirement.
 (e) Labour reductions and plant retirement.

Table 1: Productivity of Pacific Power (1978/79-1987/88)

	Annual average change %	Total change %	Average cost share %
TFP	-1.0	-8.5	—
Inputs	6.3	73.4	—
Outputs	5.3	58.6	—
Capital productivity	-3.2	-25.3	47
Labour productivity	3.5	36.7	20
Fuel productivity	0.6	5.6	25
Other productivity	-0.8	-7.0	8

Source: Pierce, O'Brien and Farah (1992).

in economic activity in the early 1980s, so that expected demand for electricity was not realised. In order to get full understanding of the consequent fall in productivity, it is useful to look at the productivity of the individual factors of production:

- *Capital productivity* had the largest affect on overall TFP, given that it accounted for almost half of all input costs over the period. It fell by around 25 per cent as a result of the commissioning of a substantial amount of new generating plant, combined with much lower than expected demand for electricity.
- *Labour productivity* fell between 1978/79 and 1981/82, with labour numbers increasing by 24 per cent. However, after 1981/82, it rose steadily at an average annual rate of 3.6 per cent, serving as an important offset to the declining capital productivity.
- There was a fairly substantial fall in *fuel productivity* up to 1981/82, with nominal fuel costs doubling between 1979/80 and 1981/82. A major plant failure forced Pacific Power to employ older plant which was considerably less fuel efficient. The older plant was decommissioned in 1985/86 improving both capital and fuel productivity.
- The productivity of '*other*' inputs (that is, operating and maintenance costs other than labour and fuel) fell by an average rate of almost 1 per cent per annum as a result of the substantial maintenance needed at the failed plant and the increased operating expenditure on recommissioning older plant.

4.1.2 Performance 1987/88 to 1993/94

This period has seen quite substantial changes at Pacific Power, as the NSW government has initiated reforms to the NSW ESI to improve economic efficiency. The reforms during this period focused on administrative reforms within Pacific Power.

Table 2: Productivity of Pacific Power (1987/88-1993/94)

	Annual average change %	Total change %	Average cost share %
TFP	5.4	36.8	—
Inputs	-1.6	-9.5	—
Outputs	3.6	23.8	—
Capital productivity	6.8	48.1	52
Labour productivity	15.0	131.5	13
Fuel productivity	0.2	0.9	26
Other productivity	-0.7	-4.0	9

Source: Pierce, O'Brien and Farah (1992) and Steering Committee on National Performance Monitoring of GTEs (1995).

As shown in Table 2, TFP rose rapidly at an annual average rate of 5.4 per cent for a total increase of 36.8 per cent over the period. This reflected significant cost savings which were being achieved as a result of new management policies associated with the commercialisation process. Capital, labour and fuel inputs were all substantially rationalised resulting in productivity gains in these partial factors:

- *Capital productivity* rose consistently, increasing at an annual average rate of almost 7 per cent. This improvement resulted from the decommissioning of inefficient plant, and the transferral of 132kv transmission assets to the distributors. Reflecting improved capital productivity, the reserve plant margin (RPM) fell to a low of 36.2 per cent in 1991/92.⁵ However, it had risen to 48.2 per cent by 1993/94 with the commissioning of new plant.
- The dramatic rise in *labour productivity* reflected the significant labour reforms undertaken during this period. Employee numbers fell from around 10,500 in 1987/88 to below 5,900 in 1992/93 and award restructuring resulted in the introduction of more productive work practices and reduction of industrial disputes.
- *Fuel productivity* rose steadily from 1986/87 to 1992/93, increasing at an average annual rate of 1.1 per cent. This resulted from the increased utilisation of new plant and improved operating practices and was reflected in improved thermal efficiency and plant reliability during the period.
- In contrast, the productivity of 'other' inputs fell by 4 per cent between 1987/88 and 1993/94, with major falls in the two years to 1990/91. This resulted from increased refurbishment works and preventative maintenance expenditure. However, as these expenditures had a beneficial effect on plant reliability, the decline in 'other' productivity facilitated improvements in capital productivity.

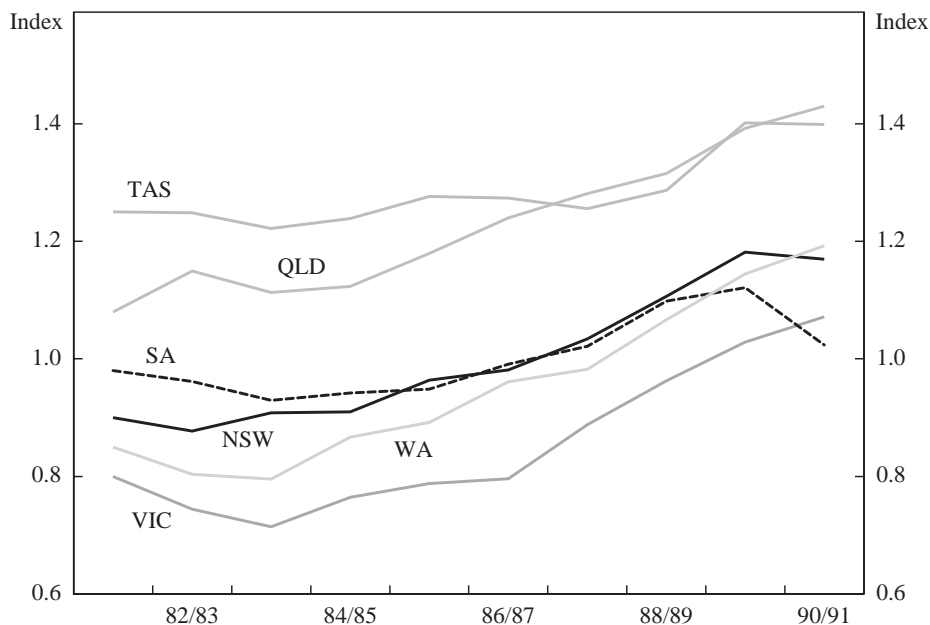
4.1.3 Comparisons and prospects

Figure 2 shows a comparison of the total-factor productivity of the New South Wales generation sector against other Australian States between 1982 and 1991. The differences in generation TFP between the States are largely due to the different fuel types used in each State. Victorian generation displays the lowest TFP as it uses brown coal (which is least efficient) and Tasmania displays the highest as it mostly uses hydro generation systems. Of the States which predominantly use black coal generation (including New South Wales), Queensland has consistently achieved the highest levels of productivity. This has been a result of strong demand growth in that State, investments made in fuel and technically-efficient power stations, significant reductions in its permanent workforce and efficient maintenance systems.

While differences in generation performance are largely due to the type of fuel usage, an important question is the role played by economies of scale. In a study commissioned by the New South Wales Treasury, London Economics (1994) has recently completed a study on economies of scale in the generation and distribution sectors. Using data for 1991/92, the study set out to determine the minimum efficient size (MES) of electricity

5. Reserve plant margin is an indicator of the level of excess capacity. It is calculated as total plant capacity less peak demand in a period, expressed as a percentage of peak demand. The RPM margin includes Pacific Power's entitlement to the Snowy Mountains Hydro Electric Scheme.

Figure 2: Generation Sector Multilateral TFP, Comparison of States (1982-1991)



Source: Derived from London Economics and ESAA (1993).

and distribution firms using two different techniques:

- a non-parametric modelling approach – using data envelopment analysis; and
- a parametric modelling approach – involving an econometric estimation of the relationship between total output and total costs using a translog cost function.

The performance of a large number of generators from 11 countries was compared. The analysis indicated that the minimum efficient unit size for generation businesses is in the region of 1,000 MW to 5,000 MW. The average size of generators displaying constant returns to scale is 3,100 MW. The generation entities in Queensland, Victoria, South Australia and West Australia are at a size most likely to exhibit constant returns to scale. While Pacific Power in New South Wales operates close to constant returns to scale, it could be separated into up to three businesses and still maintain scale efficiency.

Turning to expectations of future performance, it is unlikely, that the substantial productivity growth achieved through labour reforms will continue, even though past experience shows that overall productivity does not depend on the productivity of individual inputs in isolation, but also on the way in which inputs are used together. Nonetheless, it appears that excess capacity is likely to be a persistent problem in New South Wales, even with the introduction of the national electricity market.⁶

6. In modelling the effects of implementing the National Competition Policy, the Industry Commission (1995) assumed that competition is likely to lead to a reduction in excess reserve plant margins for all States from 8 per cent to 4 per cent. Within NSW, however, it is assumed that the excess capital stock will remain at around 10 per cent.

4.2 Distribution

For the moment, there are 25 distributors in New South Wales. The distribution sector is dominated by the four metropolitan electricity distributors which account for 80 per cent of electricity sales. However, as discussed earlier, the NSW government has signalled its intention to substantially reduce the number of distribution firms through amalgamations and restructuring. The productivity of the distribution sector of the New South Wales ESI has been examined on the basis of TFP and DEA studies of metropolitan distributors conducted for the New South Wales Government Pricing Tribunal by London Economics and the ESAA (1993, 1994a). The TFP results have been updated to 1993/94 by NSW Treasury.

Each metropolitan distributor in New South Wales has achieved an overall increase in TFP between 1981/82 and 1993/94 (Figure 3 and Table 3). The combined TFP of the metropolitan distribution authorities rose at an annual average rate of 3.6 per cent, resulting in total TFP growth of 53 per cent over the period. There has been some variation in TFP performance, with two distributors experiencing declining TFP in the first half of the 1980s, and the TFP growth of *all* the distributors generally slowed or fell in the early 1990s:

- *Capital productivity* has been consistently low in comparison to the productivity of other inputs. This has had a significant impact on the distributor's TFP given that capital inputs account for around 40 per cent of their costs. The sharpest declines in capital productivity occurred in the first half of the 1980s. Between 1981/82 and

Figure 3: NSW Metropolitan Distributors TFP, Inputs and Output (1981/82-1993/94)

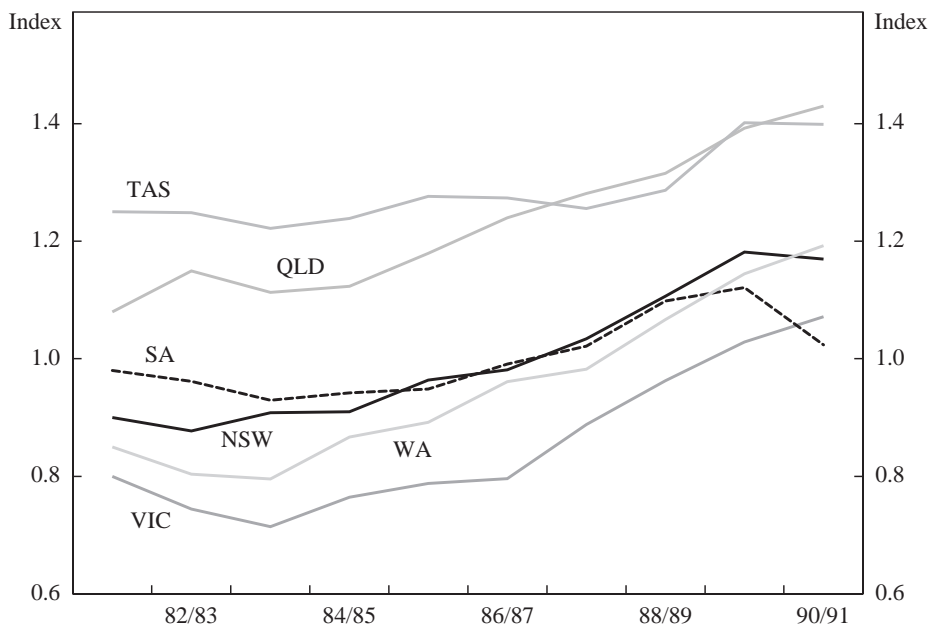


Table 3: Productivity of NSW Distributors (1981/82-1993/94)^(a)

	Annual average change %	Total change %	Average cost share %
TFP	3.6	53.2	—
Inputs	-0.2	-2.4	—
Outputs	3.4	49.5	—
Capital productivity	0.2	2.9	40.1
Labour productivity	8.1	154.8	36.3
Other productivity	3.7	53.7	23.7

Note: (a) Excludes rural distributors.

Source: London Economics and ESAA (1993) and London Economics (1994a).

1985/86, the combined capital productivity of all the distributors fell at an average annual rate of 2.2 per cent, for a total fall of 8.3 per cent (London Economics and ESAA 1993).⁷

- However, distributor's *labour productivity* grew at an annual average rate of 8.1 per cent between 1981/82 and 1993/94, for a total increase over the period of almost 155 per cent. This provided a significant offset to the low capital productivity, as labour accounts for roughly the same share of input costs as capital.
- There was considerable volatility in the 'other' operating inputs, although, in aggregate, 'other' input productivity rose by almost 54 per cent between 1981/82 and 1993/94.

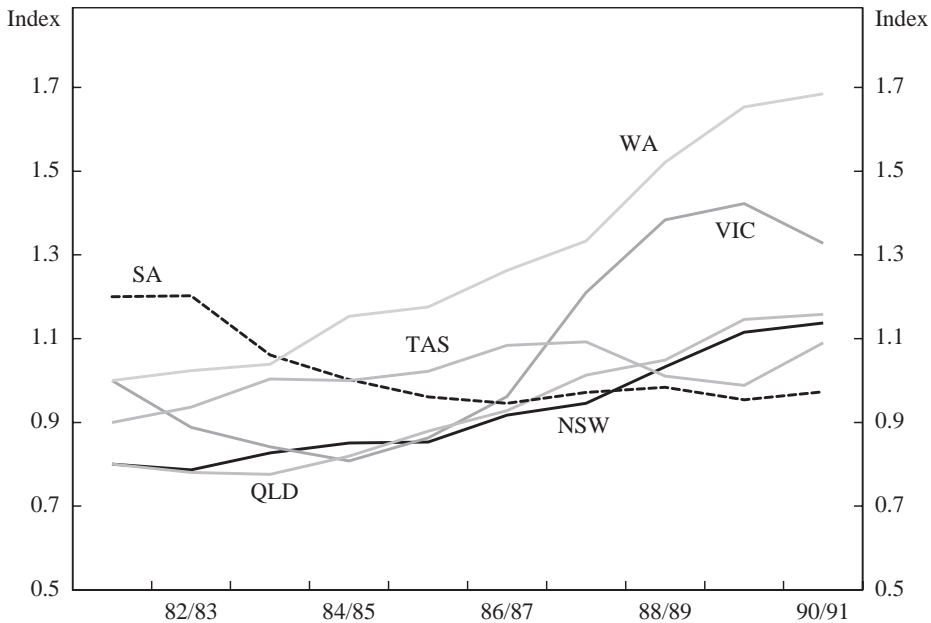
4.2.1 Comparisons and prospects

Figure 4 shows a comparison of the total-factor productivity of the New South Wales distribution sector against other Australian States between 1982 and 1991. The New South Wales distribution sector has consistently performed below the TFP levels of the other States. However, since 1988/89, TFP growth has risen above that of Tasmania and South Australia. A comparison of the input productivities between the States indicates that the NSW distributors clearly need to make improvements to their capital productivity. Comparisons of overall distribution costs between New South Wales, Victoria and Queensland indicate that there is a 20 to 25 per cent gap between New South Wales and the other two States (Government Pricing Tribunal 1994). For example, the Victorian distribution sector has achieved significant productivity growth due to resource rationalisation, superior distribution and higher customer density than in New South Wales and Queensland.⁸

7. Factors that have contributed to the poor capital-productivity performance include the increasing use of more expensive underground wires and the transfer of Pacific Power's 132 kv sub-transmission assets to the distributors in 1989/90.

8. Customer density (that is, customers per circuit kilometre) was 13.9 in Victoria, 10.1 in New South Wales, and 8.6 in Queensland in 1992/93.

Figure 4: Distribution Sector Multilateral TFP, Comparison of States (1982-1991)



Source: Derived from London Economics and ESAA (1993).

The New South Wales metropolitan electricity distributors have also been benchmarked against a sample of distribution utilities in the United Kingdom and United States over 1990/91 to 1992/93 (London Economics 1994b). The study found that the distributors' performance had improved over time. However, it was estimated that the distributors could achieve another 20 to 60 per cent reduction in inputs, delivering significant cost savings. The main source of the distributor's inefficiency was in relation to their labour, and operating and maintenance inputs.

Based on the economies of scale study undertaken by London Economics (1994), it appears that the minimum efficient size for distributors is between 12,000 GWh and 30,000 GWh of sales per annum (although the range for distributors displaying constant returns to scale went as low as 2,000 GWh per annum). In terms of customers, the minimum efficient size was between 0.5 million and 1.25 million (although again the range for constant returns to scale distributors went as low as 94,000 customers). In the distribution sector, customer density and output density (determined by average consumption) were found to be the major determinants of scale efficiency. The study supports a reduction in the number of rural distributors in New South Wales.

It appears that there is potential for significant productivity improvements in the NSW distribution sector. The TFP studies indicate that there is scope for at least a minimum growth rate of 5 per cent per annum in distributor's TFP. The Government Pricing Tribunal (1994) considers that NSW distributors could achieve 20 to 30 per cent reductions in their operating costs through efficiency gains.

4.3 Transmission

In February 1995, responsibility for the high voltage transmission system was removed from Pacific Grid, a subsidiary of Pacific Power, to an independent body, TransGrid. The New South Wales grid consists of 13,000 km of network including 86 substations, which link the major power stations and distribution authorities. The network is also linked to networks in other States, and is large by world standards.

TFP has grown significantly in the transmission sector between 1981/82 and 1990/91, rising at an annual average rate of almost 7 per cent, for a total increase of 81 per cent (see Table 4). TFP declined at the start of the 1980s, and productivity fell in all input categories, largely as a result of the expansions to the high voltage network being undertaken to connect new power stations.

Capital productivity also slowed between 1984/85 and 1988/89 as a result of the construction of an interstate link. However, capital productivity subsequently rose reflecting the completion of major capital works and the transferral of the majority of the 132 kv network to the New South Wales distributors. Equipment utilisation improved in the later half of the 1980s, while system losses fell.

However, the greatest input productivity improvements were associated with labour. Labour productivity rose at an annual average rate of 12 per cent, resulting in total labour-productivity growth of 178 per cent between 1981/82 and 1990/91.

Table 4: Productivity of NSW Transmission Sector (1981/82-1990/91)

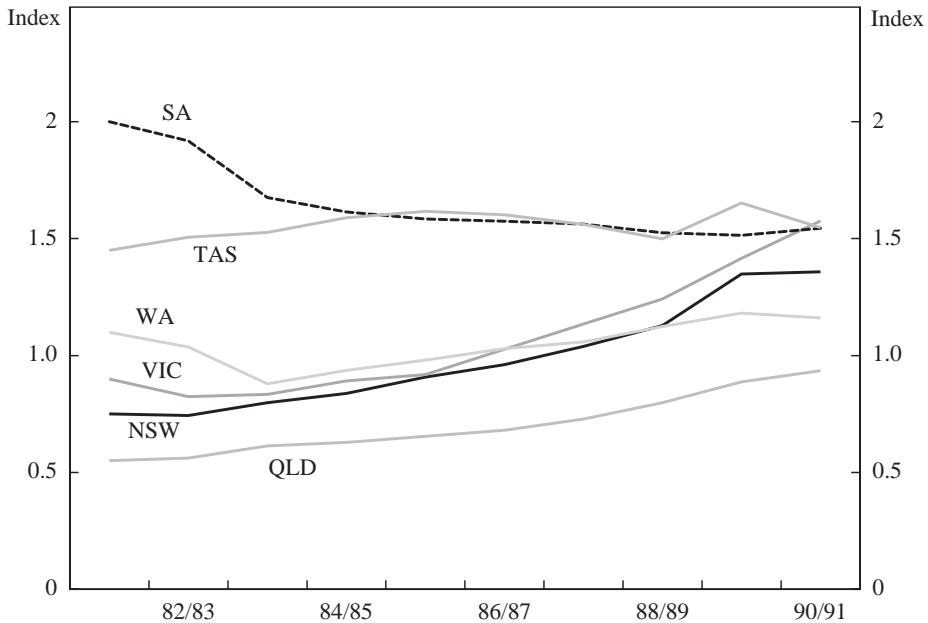
	Annual average change %	Total change %	Average cost share %
TFP	6.8	81.1	—
Inputs	-2.5	-20.1	—
Outputs	4.2	44.6	—
Capital productivity	2.3	22.7	49.8
Labour productivity	12.1	178.3	24.3
Other productivity	8.3	105.5	25.9

Source: London Economics and ESAA (1993).

4.3.1 Comparison with other States

Figure 5 shows a comparison of the total-factor productivity of the New South Wales transmission sector against other Australian States between 1982 and 1991. Its performance has been significantly worse than that of other States. However, the two main factors which effect the costs of transmitting electricity are the size of the grid relative to the number of customers and the level of voltage that can be transmitted. Customer concentration in the transmission sector is in the low range in New South Wales at 3.8 customers/sq km, compared to 8.3 in Victoria and 5.3 in South Australia. Queensland has the lowest concentration at 1.3 customers/sq km.

Figure 5: Transmission Sector Multilateral TFP, Comparison of States (1982-1991)



Source: Derived from London Economics and ESAA (1993).

5. Overview of New South Wales ESI Performance

Overall, the New South Wales ESI has enjoyed consistent and quite substantial productivity growth since the early 1980s. Multilateral TFP comparisons undertaken by Swan Consultants and extended by the Bureau of Industry Economics (1994) show that as a result of productivity improvements, the total New South Wales ESI achieved the second highest productivity level amongst the Australian states (after Queensland) by 1991/92. Further productivity improvements have also been achieved in New South Wales since 1991/92, with notable improvements in labour productivity and power plant performance. For example, Pacific Power’s TFP has grown by 6.2 per cent over the two years between 1991/92 and 1993/94.

The New South Wales ESI’s productivity growth has come from both rising output and reduced input usage. The amount of electricity generated and energy sales have risen by 18 per cent over the six years to 1993/94. At the same time, NSW has been one of only two States (the other being South Australia) to reduce input usage. The most substantial reductions have occurred in labour employed directly in the industry. However, despite these improvements, international benchmarking studies indicate that there is still significant scope for further improvement in the New South Wales ESI. In 1991/92, the estimated gap in overall productivity between the New South Wales ESI (the generation,

distribution and transmission sectors), and US investor owned utilities, was 24 per cent (Bureau of Industry Economics 1994).

An international benchmarking study by London Economics and the ESAA (1994b) which used DEA to compare the Australian ESI against electricity utilities in the United States, the United Kingdom, Japan, Canada, New Zealand, South Africa, Ireland, Taiwan, Greece and Thailand, also provides evidence of the scope for productivity improvement. That study estimated that in 1990/91, the Australian generation sector was 8 per cent, the distribution sector was 27 per cent, and the transmission sector was 25 per cent less technically efficient than international best practice.

In particular, there appears to be considerable scope for improvement in the distribution sector. The New South Wales Government Pricing Tribunal (1994) considers that distributors could achieve productivity improvements in the range of 20 to 30 per cent. It has indicated that further savings are also achievable in the generation and transmission sectors. The magnitude of the savings actually delivered will be determined by industry reforms (in particular, opportunities for new market share within the national market), coal sourcing strategies, and the effectiveness of asset management practices.

The largest productivity gains are likely to be associated with capital inputs, given their substantial share of costs in the industry. Excess capacity in the New South Wales generation sector is still very substantial. In 1993/94, the reserve plant margin stood at 48.2 per cent, which is high by international standards. It has been conservatively estimated that the present value cost of excess generating capacity in New South Wales is more than \$1 billion, despite the fact that the investment decisions that led to the excess were made over a decade ago. The structural reforms underway and the movement towards a national grid should assist in delivering efficiency improvements in New South Wales.

6. Conclusions

It is clear that there have been substantial productivity gains in the electricity sector in New South Wales that have been driven in recent years by administrative reforms. The benefits of reforms which raise productivity and efficiency include: lower prices to consumers; improved international competitiveness for industries relying on electricity as an input; reductions in GTE debt; higher dividend returns to government; and improved reliability, quality and choice of goods and services. Already, in New South Wales, some of these benefits are evident in a 28 per cent real reduction in wholesale electricity prices since 1983/84, significantly higher dividend payments to the government, and substantial reductions in the utilities' debt levels.

However, at the same time, we cannot presume that the rest of the world has been standing still. To meet world best-practice productivity levels, a significant step increase in productivity improvement is needed by the Australian electricity industry. While administrative reforms have provided some gains, to maintain and extend productivity growth further structural reform is needed. Action is now being taken within Australia to introduce competitive wholesale and retail electricity markets. The Commonwealth and State governments have agreed to establish a national market in electricity and most State governments are undertaking significant structural and regulatory reforms to their

electricity industries to prepare for that market. These reforms are occurring in the context of a worldwide trend towards competitive market structures for electricity.

As with all industries, the electricity industry must adapt and evolve in response to changes in the external environment. As a provider of essential infrastructure, electricity has reached the stage of a mature industry in advanced economies like Australia. However, developments in technology affecting production choices, advanced control systems and the availability and cost of information have radically changed the basis on which electricity systems can be organised. From a centralised and highly integrated structure, the industry has progressively become more open, beginning with the separation of functions such as generation and transmission. Expanding the opportunities for customer choice is the next logical step. The major decisions that affect the level of resources used by the industry will be driven by the retail sector responding to consumer demands, rather than by centralised generation monopolies as has occurred in the past. This will improve the access afforded to more environmentally-sympathetic generation technologies and improve the incentives for demand management and energy conservation. Indeed, the technological development in these areas are making the present structure of the industry increasingly difficult to maintain.

The next leap in productivity will be obtained by establishing a commercial, highly competitive New South Wales electricity industry that can respond to the challenges of the national market to the benefit of consumers, the environment and the economic development of the State.

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