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The Costs of Market Experiments:

Electricity Consumers Pay the Price for Competition, Privatisation, Corporatisation and Marketization.

Discussion paper

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January 2019

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ISSN: 1836-9014

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Summary

Australia's Energy Security Board recently acknowledged that 'the National Electricity Market is not in the best of health'. For consumers who have faced escalating power prices, and never-ending uncertainty about the security and sustainability of electricity supply, that statement surely ranks as a gross understatement. Continued lurches in energy and climate policy by the Commonwealth government ensure that this atmosphere of crisis will continue.

For the past generation, the electricity industry has been a key testing ground for neoliberal economic philosophy: namely, the idea that industries function most efficiently, and can best meet the needs of consumers, when the role of government is minimised, and key decisions regarding investment, technology, and pricing are left up to private, for-profit companies. Given the radical extent of the market-driven policy experiments which been applied in Australia's electricity industry, one would think the sector would today be a paragon of efficiency, stability and consumer well-being. But in fact, the reverse has been true. Prices for electricity have soared faster than almost any other major consumer item. The core economic efficiency of electricity production and distribution has performed worse than any other industry since these market experiments began. And Australia has proven incapable of addressing the fundamental challenges of climate change and pollution control in this crucial sector, so carbon emissions from electricity generation continue to grow in defiance of our international commitments. In short, the electricity industry seems to provide a textbook study in how *not* to manage the economy. .

Why do we face a seemingly endless state of crisis two decades after the neoliberal reforms that were supposed to 'fix' electricity? Political leaders fixate on specific villains and scapegoats – driven more by short-term political optics than real economic understanding. This includes blaming renewable energy sources for higher prices and supply disruptions (despite mounting evidence that renewables are now both cheaper and more reliable than conventional fossil fuel generation). Curiously, the rhetoric of the Commonwealth government, supposedly committed to the same market-based philosophy that guided electricity privatisation in the first place, has now taken on a populist, anti-corporate tone – with the Prime Minister himself blaming individual corporate executives for the mess, and threatening to intervene with a 'big stick' to force still more fragmentation and incoherence in the industry's structure and direction.

This paper takes a deeper look at the core structure and operation of the electricity sector, and finds that the crisis cannot be ascribed to the actions of one or two villains.

Rather, the inefficiency, rising costs and unaccountability of this industry are the natural and predictable result of the private market structure which was imposed on this industry, beginning in the mid-1990s. This grand experiment in privatisation, competition and marketization, inspired by faith in the supposedly all-knowing efficiency of market forces, has in fact created an industrial structure marked by fragmentation, duplication, and waste.

The paper presents evidence to show how the core economic make-up of the electricity industry has been fundamentally changed following the privatisation trend, and has driven the rapid increase in the relative price of electricity. For example, in 1998-99 23 per cent of the cost of electricity was the cost of fossil fuels consumed in generation. By 2014-15 that share had fallen to 7 per cent -- not because of a fall in fossil fuel prices, in fact fossil fuel prices increased, but because other costs rose dramatically. Finance costs during the same period increased from 3 to 10 per cent of the total value of output – more than the industry now spends on fossil fuels.

Another unique contribution of the paper is our examination of the occupations that go towards making electricity, based on unpublished custom ABS data. There has been a moderate increase in total employment in electricity over the two decades of data considered. However, sales staff have increased almost 400 per cent. Following the decision to create competing retailers and generators, as well as the NEM, there was suddenly a need for sales and marketing functions – not to mention staff to oversee 'playing' the NEM . There are now just 5.8 non-managerial workers employed in electricity for every manager, compared with 13.7 twenty years ago. In other words, the bureaucratic overhead in the industry has become more than twice as large, as a share of total employment.

Based on two estimates of the excess labour resources allocated to these unproductive sales, management, and administration functions, along with average wages for employees in electricity supply, we generate estimates of the total deadweight cost of these unproductive functions associated with the industry's marketization. For 2015-16 we estimate a total cost of these wasteful activities as between $1,030 million and $1,940 million; that is a minimum estimate of the real resource costs required for all the competition, privatisation, corporatisation, and marketization activities that have been introduced to the industry by this grand ideological experiment. On top of those estimates, should be added various non-wage costs that are also associated with the employment of all this excess labour in wasteful marketing and administration.

These are conservative estimates of the costs of the new functions in electricity supply for the new occupations required; there are many other costs we could not quantify. But the order of magnitude of our estimates is confirmed by information from annual

reports of electricity companies, which indicate total costs of $100-200 per customer for marketing, advertising and other wasteful activities. One cannot help wondering if the architects of privatisation, corporatisation and marketization would have persisted if they had advance warning that each customer would be paying $100-200 for the privilege of being hounded with advertising and marketing for a basic service – electricity – which they all know they need.

Dragged down by these wasteful market-driven activities, the productivity of electricity production has been dismal under privatisation. This is exactly contrary to the promises of the architects of the neoliberal model: namely, that efficiency would be maximised by private market forces and incentives. Real output per employee fell by 37.8 per cent between 2000 and 2018, precisely because of the excessive allocation of wasted labour to sales and other activities associated with privatisation. Electricity and other utilities constitute the worst-performing industry grouping in the whole economy, according to productivity growth.

Genuinely stabilising electricity prices, and achieving a sensible long-run supply base for electricity (including addressing environmental requirements), will ultimately require addressing these huge inefficiencies and wastes associated with the grand experiment in privatisation, competition and marketization. Transparent, optics-driven 'tough talk' aimed at a couple of big companies, emanating from politicians fearful of the understandable anger of Australian consumers, will not fix those deeper, structural inefficiencies and irrationalities.

Introduction

The Energy Security Board begins its 2017 report with a rather unsurprising assessment: 'The National Electricity Market is not in the best of health'. In bureaucratic language that is equivalent to a tabloid announcing 'crisis'. The ESB points to 'immediate symptoms' of increasing reliability risks, unaffordable electricity bills and uncertain greenhouse gas policies (Energy Security Board 2017).

The report's fact sheets remind readers that the National Energy Market is one of the world's longest interconnected power systems, stretching from Port Douglas in Queensland to Port Lincoln in South Australia, and across the Bass Strait to Tasmania (AER 2017 p. 22). It covers five states—Queensland, NSW, Victoria, SA and Tasmania. The ACT is included in NSW region.

Over 300 registered generators sell electricity into the NEM, a wholesale spot market in which prices are determined by supply and demand. The NEM's transmission grid, amounting to 40,000 kms of transmission lines and cables, carries the power from electricity generators to large industrial energy users and to local electricity distribution networks. In principle market players in Port Lincoln and Port Douglas are connected in the transmission network.

At the end of all that the electricity retailers act as market intermediaries, buying electricity from the NEM and packaging it with transmission and distribution network costs for sale to almost 10 million residential, commercial and industrial energy users.

The National Energy Market (NEM) does not include WA and NT, although they signed up to many of the associated national competition policy principles. Hence the NEM accounts for some 84 per cent of electricity consumed in Australia.[1]

While all of this is true, and could be gleaned from any school project on electricity, the missing aspect of the story is the dominant role played by private megacorps: the large corporations that today dominate the Australian economy and, in the present case, extract enormous profit out of a mature utility. Among those are AGL, EnergyAustralia and Origin. But it was not always that way, and so we begin our report with an examination of earlier chapters in the history of electricity production in Australia.

[1] Calculations apply to 2014-15 the latest figures from Department of Industry, Innovation and Science (2016).

The Ascendance of Public Ownership[2]

EARLY YEARS: BEFORE 1960

In this section we outline the main tendencies that led to the (almost) full public ownership of electricity by the early 1960s. Subsequent sections will discuss the later periods.

In the late nineteenth century and beginning of the twentieth century, many of Australia's electrical undertakings were owned by small-scale private enterprise. Government involvement was effected through safety standards, and defining the scope and operations of private producers. However, larger undertakings were eventually needed for the electrification of the tram systems, and these tended to be owned and operated by the public tramways operators. The 1956 Australian yearbook observes that:

> A trend towards public ownership commenced during the 1914-18 War and became more pronounced after the 1939-45 War. By 1955, all major generating stations supplying the public were, in varying degrees, under the control of State statutory organizations, constituted with the object of unifying and co-ordinating the generation and distribution of electricity supplies within the various States. There are, however, still a large number of small private and municipal enterprises generating power for supply to country towns, but, where practicable, central authorities are extending supply to these places. (ABS 1956, p 390)

Public involvement was also necessitated by the

> very large capital investments which were required for continued expansion, the need for long-term planning, and the public demand for electricity to be available in areas outside cities and towns which the existing supply undertakings could not profitably supply, all began to place great strains on the existing supply undertakings. The result was that State governments stepped in to transform the electricity supply industry into a public enterprise, owned by the various governments through the agency of statutory authorities (Appleton, 1983).

[2] A good deal of this section relies on data and discussions from the ABS Yearbooks for various years.

While most states had shown parallel interest in public ownership by the early post-war period, electricity production nevertheless remained fragmented across independent state-based systems. Connections between the state grids were mostly limited to some localities near state borders (Chisholm 1958). However, in many areas the practice remained of central authorities selling power in bulk to local distributing organizations, sometimes private and sometimes owned by local governments, which undertook reticulation (ABS YB 1960 203). Of course in all periods numerous firms generated power for use in their own establishments, particularly mining firms in remote locations.

Commonwealth involvement was limited to the establishment in July, 1949, of the Snowy Mountains Hydro-electric Authority. It had a public interest mandate to generate electricity, to supply electricity to the Commonwealth for defence purposes and for consumption in the Australian Capital Territory. After those priorities were met, it was intended that any surplus would be used to supply NSW and Victoria.

New South Wales

Local governments in country towns were the first movers toward public ownership, with Tamworth Municipal Council generating and reticulating electricity beginning in 1888. In Sydney there were five small private operators before 1904 supplying electricity mainly for lighting. But with the introduction of electric tramways the Department of Railways opened a power station in Ultimo in 1899. Later the Sydney Council opened its own power station in Pyrmont. This pattern continued with the establishment of larger stations in Sydney, Newcastle and Lithgow. Private supply was limited to small operators supplying small parts of the metropolitan area. Local government bodies entered as bulk purchasers buying from either the Department of Railways, the Department of Public Works or the Sydney Municipal Council. Those local government bodies then reticulated electricity among their customers. The development of long distance high tension links led inevitably to the need for state coordination, which led eventually to the establishment of the Electricity Commission in 1950.

When the Commission was established, 93 per cent of the State's power requirements were generated by four bodies—the Sydney County Council, the Department of Railways, Southern Electricity Supply (a division of the Department of Public Works) and the privately-owned Electric Light and Power Supply Corporation Ltd. The function of the Commission was the generation and transmission of electricity, which was then sold in bulk to mainly local government bodies throughout a large part of the State -- as well as to the government railways and tramways and to some large industrial consumers. As the major generating authority, it was also responsible for the development of new power sources. An important exception was the hydro-electric resources of the Snowy

Mountains region, then being developed by the Snowy Mountains Hydro-Electric Authority (ABS YB 1956).

The retail sale of electricity to the public was, in general, carried out by separate electricity supply authorities, and that pattern persisted to very recent times. At 30 June 1975 there were 41 retail supply authorities throughout the State, comprising 34 electricity county councils (consisting of groups of shire and/or municipal councils), 2 city councils, 1 municipal council, 2 shire councils, and 2 private franchise holders. (ABS 1975-76)

Victoria

As in NSW there were initially various small private operations, but in the 1890s the government entered the field supplying electricity for municipal purposes and for the electric trams. These government operations gradually displaced the private operators. By early in the twentieth century electric trams operated in Melbourne, Geelong, Ballarat and Bendigo.

The State Electricity Commission of Victoria was established in 1919. Its main impetus seems to have been to assess and develop the brown-coal fields of the Latrobe valley. However, it had wider powers over the coordination of electricity and various associated regulatory functions. The 1956 Year Book describes those powers:

> Their powers authorized them to erect and operate electrical undertakings ; to supply electricity in bulk to any corporation ; to supply electricity to any person outside any area in which there was an existing undertaking ; to carry on any business associated with an electrical undertaking ; to make regulations as to precautions to be adopted in the use of electricity and arrange for the licensing of wiremen (powers which were subsequently extended to include the registration of electrical contractors, and the testing and approval of electrical appliances); and to establish and operate State coal winning projects. In addition to these powers, the Commissioners were to enquire into and report to the Government as to the steps which should be taken to co-ordinate and concentrate all electrical undertakings in Victoria; to secure the efficient inter-connexion of such undertakings by adopting the necessary standards of plant, voltages, etc.; to encourage »nd promote the use of electricity for industrial purposes ; to report to the Government on the prospects of establishing new industries in Victoria requiring large quantities of electrical energy; and to carry out investigations of coal deposits or hydro-potential that could be used for the generation of electrical energy (ABS 1956).

In 1920 construction of the Yallourn power station commenced, that being one of the main reasons for the establishment of the State Electricity Commission. From around that time until recently, the history of the industry in Victoria has been one of increasing state control, the development of ever more power stations, and the extension of supply to more towns and rural areas.

Queensland

The development of electricity supply and customer use were slower in Queensland which 'presents a sharp contrast with the two States to the south' (Chisholm 1958 p 375). The ABS attributes this lag to 'some extent to the absence, prior to 1938, of a central statutory authority constituted to undertake the functions of co-ordinating, unifying and controlling the production and transmission of electric power' (ABS Yearbook 1953). However, Brisbane city council performed some of that role within its own boundaries.

The Queensland Government set up a Royal Commission to look at the generation and distribution of power in the state. The Commission recommended a publicly-owned generation and power supplier similar to the State Electricity Commission of Victoria. The State Electricity Commission was established in 1938 as a controlling authority rather than an operating authority. The ABS indicates that continued load growth led naturally to the interconnection of regional systems, and by this means the production of electricity became concentrated on the cheapest sources of power. Another outcome of the Royal Commission was the establishment of Regional Boards. That reflected the view that Queensland's backwardness was due to the absence of centres large enough to support large economic facilities as well as the inability of local government or other bodies to raise the necessary capital.

The state commission and the boards were regarded as significant landmarks in the development of electricity in Queensland. Later the boards themselves were consolidated into grids. For example, the three northern Regional Electricity Boards (Cairns, Townsville and Mackay) were consolidated into one interconnected grid.

In the south the supply systems of the Southern Electric Authority, the Brisbane City Council, the Wide Bay-Burnett Regional Electricity Board, and the Dalby Town Council also form an interconnected grid. The central Queensland network, which was operated by the Capricornia Regional Electricity Board, was for a long time not yet connected with either the northern or southern grids. The natural sequel to the interconnection of regional supply systems has been the separation of the production and distribution functions. For the northern grid the Northern Electric Authority is responsible for the operation of generation and main transmission facilities, with the Cairns, Townsville and

Mackay Regional Electricity Boards buying in bulk and acting as distributing authorities. In the south the Southern Electric Authority was responsible for generation and transmission, with the other authorities purchasing in bulk and performing the distribution function. However, the Southern Electric Authority also distributes over a large rural area surrounding Brisbane, and the Wide Bay-Burnett Board generates on a small scale. The Capricornia, Townsville and Cairns Boards operate a number of small isolated diesel generating stations.

By 1967 the ABS could report that all electricity undertakings in Queensland were then publicly owned, and with the exception of the Southern Electric Authority were controlled by representatives of local authorities within the areas concerned. Further interconnections and amalgamations within the electricity supply industry were to be effected as soon as they could demonstrate greater efficiency and lower costs to consumers (ABS 1967).

In 1976 the Queensland Electricity Generating Board was established and made responsible for generation and transmission of electricity.

South Australia

Like other states the very early electricity developments were privately operated. In the early years electricity was dominated by the Adelaide Electric Supply Co Ltd (AESCO), which ran a virtual monopoly that persisted long after the other states established publicly owned operators. The government was concerned at the excess profits of AESCO, and further motivated by the need to 'provide an adequate supply of electricity at reasonable rates to the public' and with a 'view to encouraging the development of industry' (ABS 1967).

The South Australian takeover of AESCO is interesting. A biography of the long-serving Premier of SA at the time, Thomas Playford, summarises the episode:

> When the Adelaide Electric Supply Co. Ltd proved resistant to pressure to extend its services to country districts and to use Leigh Creek coal to power its turbines, Playford compulsorily acquired its assets, transferring them to a new statutory authority, the Electricity Trust of South Australia. Several LCL members in each House denounced Playford and voted against the legislation but, with Labor support, it passed [1946] (Howell 2012).

While this is not inaccurate, some additional background is useful. AESCO was owned and controlled from London and was apparently very profitable (Quiggin 2001). South Australia's electricity supply during and immediately after the war was very precarious, as AESCO ran on coal that was shipped from NSW where the mines were inefficient and

plagued by industrial strife (Cockburn 1991). At one time coal supplies were ordered from South Africa in desperation and at Playford's behest. The frustration he experienced while dealing with the AESCO would later prove the undoing of the company as the Premier took action against it (Cockburn 1991). In the meantime, Playford had been passionately developing the Leigh Creek coal fields which were the only source of coal in SA. Gradually many small industrial and domestic users took Leigh creek coal to provide thermal power. AESCO had no intention of using Leigh Creek coal, claiming its existing generation plant was not suitable for brown coal. Its coal supplies were still obtained mostly from New South Wales (Klassen 1996). But in fact Leigh Creek coal was indeed suitable for power. On several occasions the Municipal Tramways Trust, burning only Leigh Creek coal, had been able to supply temporary power and prevented blackouts in Adelaide when AESCO was unable to supply Adelaide.

Playford needed to control AESCO, which was the biggest user of coal in SA but refused to use SA coal. To justify his next actions Playford stated that the company's policies would lead to increased prices for electricity and slow down the process of industrial expansion. To protect South Australians from exploitation, he appointed a Royal Commission to investigate the company's operations. The Royal Commission reported in August 1945, 'that the public interest might be better served by public ownership of the electricity supply than by a private company' (Klassen 1991). Playford set out to achieve this 'socialistic' objective and thus guarantee a future for Leigh Creek coal supplies. He introduced his Electricity Trust of South Australia Bill on 11 October 1945, but was promptly defeated by his own side in the conservative Legislative Council by the casting vote of its President.[3] When the bill finally passed on a second attempt, it did so with a majority of only one vote, a change of mind on the part of one member. Finally the Electricity Trust of South Australia (ETSA) would carry on the operations of AESCO using Leigh Creek Coal.[4] The 1946 legislation also provided for ETSA to take over the assets of AES and unify and coordinate the bulk of the state's electricity supplies. ETSA was to also given authority to develop Leigh Creek coal which was used to supply a Port Augusta power station which transmitted electricity to the metropolitan area. That left ETSA with a virtual monopoly apart mainly from the Municipal Tramways Trust which operated a power station to power the trams. Of course there had also been various small electricity suppliers in the regional and remote areas that had to wait until the Playford reforms began to improve the coverage.

[3] At the time the Legislative Council in SA restricted voting to wealthy landowners.

[4] As an interesting aside after the Governor's assent, both AESCO's office in London, and representatives for the stock and shareholders lodged petitions with the Dominion Office in London urging King George VI, not to give Royal assent.

We are not aware that anyone has done an assessment of Playford's strategy with regard to Leigh Creek coal and electricity generation in SA. Table 1 attempts to provide that assessment, by estimating how SA fared in electricity prices relative to the rest of Australia – where the changes in industry ownership and structure were perhaps less dramatic. Table 1 is based on ABS data for electricity volumes and values before and after the nationalisation of AESCO.

Table 1: SA and Australia compared: Electricity production and values

	Electricity production; Million kWh		Value of production (£'000)		Cost per unit (£'000 per million kWh)	
	SA	Australia	SA	Australia	SA	Australia
1939-40	270	5,180	1,488	13,577	5,511	2,621
1949-50	594	9,509	2,788	30,512	4,694	3,209
1962-63	2,335	29,279	9,897	135,570	4,239	4,630

The Australia Institute Research that matters. Source: ABS Year books 1953 and 1962-63.

Over the period examined in Table 1, SA electricity production increased by 765 per cent (from 270 to 2,335 million kWH), while in Australia as a whole production increased by 465 per cent (from 5,180 to 29,279 million kWH). SA may have had a lot of catching up to do. However, the really interesting aspect is that in SA prices fell 23 per cent over this period, while Australian prices overall rose 77 per cent. Put differently, in 1939 South Australians paid over twice the Australian average price, but in 1962-63 South Australians were paying 92 per cent of the Australian average price. These statistics suggest Playford's nationalisation was very successful.

Western Australia

Early electricity development in WA was small-scale and fragmented among a number of local authorities and private organisations.

Perth was supplied with power from 1894, with the operation taken over by the Perth City Council in 1912; the state government later entered the field with an operation administered by the Commissioner for Railways for transport purposes. Arrangements were also made with other local government bodies such as the Fremantle Municipal Tramways and Electric Lighting Board. Outside Perth Kalgoorlie was supplied with power from 1895 for both municipal use and of course mining.

In 1945 the Government established the State Electricity Commission. The Commission was given power to secure the ultimate co-ordination of all State or other electrical undertakings in the State, to construct and operate power stations and transmission

lines and purchase and operate other supply authorities. The Commission pursued a consolidation program right from its establishment.

On 1 July 1975 the Government of Western Australia formed a new organisation known as the State Energy Commission of Western Australia. The new Commission was specifically charged with responsibility for ensuring the effective and efficient utilisation of the State's energy resources, and for providing its people with economical and reliable supplies of electricity and gas. By this time an electricity supply with uniform tariff was provided from these stations through an interconnected grid system to the Metropolitan Area, the South-West and Great Southern Areas, including an area extending eastward to Koolyanobbing and northwards as far as Ajana beyond Northampton. The Commission also owned and operated diesel power stations at Port Hedland, Halls Creek, Roebourne, Kununurra, Esperance and Onslow. Small electricity supply systems too remote to be connected to the grid system or supplied from the Commission owned diesel stations were still controlled by local government authorities were are being absorbed in a leasing arrangement whereby the local generating plant and distribution system were operated by the Commission under an arrangement known as the Country Town's Assistance Scheme (ABS 1975-76).

Tasmania

Tasmania established the Hydro-Electric Department in 1914 in order to take over the power part of the Hydro-Electric Power and Metallurgical Company – which was originally established to process complex ores using electrolytic treatment. This company was struggling to raise capital and the state Government took over the electricity part and included it in its Hydro-Electric Department. That Department was soon supplying other smelters. Much of the power was also being used for lighting and trams. The Hydro-Electric Commission was formed in 1929 to take over all the Tasmanian Government undertakings. The 1958 Australian Encyclopaedia bragged that 'Tasmania remains, electrically, one of the most developed areas of the world' (Chisholm 1958 p379). The importance of electricity as industry policy is reflected in an estimate that in 1980-01, just 13 companies (including smelters and other major users) consumed two thirds of all electricity produced in Tasmania.

Australian Capital Territory

From very early on the ACT was part of the embryonic NSW electricity grid. With the development of the Snowy Mountains scheme, it was intended that the Commonwealth defence and other establishments would have first call on the electricity generated. Surplus power was then to be offered to NSW and Victoria.

ACT Electricity Authority took over the functions of the Canberra Electric Supply Branch, Department of the Interior, on 1 July 1963.

Northern Territory

The electricity industry in the Northern Territory has long been characterised by small local suppliers in Darwin and the regional centres. The NT Electricity Commission was established in 1978 with responsibility for all public supply of electricity in the territory. Nevertheless, supply was largely confined to Darwin, Alice Springs, Katherine and Tennant Creek, with no interconnected supply system because of the challenging geography.

THE 1960S TO THE 1990S

From the 1960s until the mid-1990s, this pattern of expanding public ownership was consolidated and reinforced. The pattern was established soon after the war, and Australia began to enjoy a period of rapid economic growth and some of the lowest electricity prices in the world. Energy-intensive industries such as mineral smelting flourished. Between 1960-61 (the farthest back statistics are available) and 1995-96, Australian consumption of electricity grew by 616 per cent from 89.3 to 639.4 PJ (DIIS 2016), for an average growth of almost six per cent per annum.

The Market Counter-Revolution: 1990s to the Present

The initial post-war era was marked by the gradual consolidation of large-scale electricity operations that were almost entirely in government hands. The history to that point had made it clear that horizontal and vertical consolidation was critical for the successful operation of electricity generation and supply. Moreover, the experience in SA had shown that while consolidation was important, private ownership could still hold the state hostage to predatory pricing. AESCO's massive profits and seeming indifference to supply problems and power outages undermined the legitimacy of private ownership (Quiggin 2001). Unfortunately, however, these lessons were to be forgotten by the 1990s.

As described above, for most of Australia's history each state constituted an independent electricity market, with interconnection confined to towns close to state borders; a notable exception was the interconnection between NSW and Victoria that resulted from the Snowy Mountains Scheme. The possibility of a national energy market would have to wait for more interconnections. In the meantime, a Commonwealth *Committee of Inquiry into Electricity Generation and the Sharing of Power Resources in South-East Australia* (known as the Zeidler Committee) advised that only limited extensions of the grid between SA and Victoria were likely to be economically feasible. As Prime Minister Malcolm Fraser put it, 'there is no financial justification for the establishment of a strongly integrated grid in the 1980s' (Fraser 1981). In particular, the report rejected the idea of a cable to Tasmania from the mainland.

Lynne Chester has observed, 'In 1990, the Australian electricity sector essentially comprised 34 government-owned vertically integrated electricity businesses. That sector is unrecognisable today' (Chester 2015). Quiggin (2001) refers to a system of statutory authorities [and] the 'major authorities were controlled primarily by engineers, and pursued objectives defined in terms of meeting the needs of households and business for a reliable supply of electricity, with prices being set to cover average costs'.

By 1990 however, economic philosophies premised on the supposed superiority of private market forces had become ascendant, and pro-market spruikers were calling for the government to vacate any and all functions that could be performed by the private sector. For a while that debate seemed to by-pass electricity. On the one hand, electricity was associated with little in the way of community service obligations that might argue for continued public ownership. On the other hand, the electricity sector was not associated with any serious problems, and Australians still enjoyed both low electricity prices by world standards and stable and reliable supply. On top of all that, electricity was widely considered to be a natural

monopoly;[5] Even Milton Friedman, the intellectual leader of neoliberalism, acknowledged that in the case of a natural monopoly 'there is only a choice among three evils: private unregulated monopoly, private monopoly regulated by the state, and government operation' (Friedman 1962). Under a private unregulated monopoly the community is potentially held to ransom by an individual or corporation, forced to pay much more than the cost of delivering the service (including a modest return on capital). This delivers excess and unjustifiable profit to the firm in a position to exercise economic power. At least in the case of government ownership, management is not expected to maximise profit at the expense of consumers. That was the option Friedman favoured among the above 'evils'.

Nevertheless, in 1993 the Federal Labor Government urged the states to adopt the national competition policy – with one of its first steps being the development of a competition policy for the electricity industry. The idea, informed by assumptions about the superiority of markets, was that sustainable reductions in prices would be achieved by injecting more competition into the market. A national energy market (NEM) was to be established; the vertically integrated monopoly structures in each state were to be disaggregated; and a national body, then called the National Electricity Market Management Company (NEMMCO), would become responsible for market operation. Other elements of the plan included:

- Transmission to be given to multiple network corporations.
- A competitive market to be established among generators selling into a national pool.
- Generators to be broken up into smaller units.
- New generators to be given access to the network.
- A retail function to be established independent of the distribution function.
- Retailers to make purchases from the pool.
- Customers to be able to choose between retailers.
- A generator or distributor could own a retail operation but must keep it at 'arms' length' (Brady 1996).
- Government entities would be subject to competitive neutrality principles (see below).

It was hoped that the natural monopoly elements of the electricity industry, the networks, could be separated from other parts that could be organised on a competitive basis, and that non-discriminatory access to the (monopoly) networks would be allowed. The NEM commenced in December 1998. WA and NT were not part of the NEM because of the distances between their load centres and the interconnected electricity network in the southern and eastern states, but both jurisdictions committed to the other electricity changes. The increasing integration

[5] A 'natural monopoly' is an industry marked by such powerful returns to scale that supply can be most efficiently undertaken by just one, or a very few, large producers; see discussion below.

between the other states was another important characteristic of the NEM. Hence Tasmania was able to join the NEM once its interconnector was completed.

The OECD, also strongly influenced by market-based economic philosophies, praised this system: 'This vertical separation has facilitated the introduction of competition into generation and retail sectors, and provided access to the natural monopoly elements of transmission and distribution systems on a non-discriminatory basis' (OECD 2002).

The objective of the competitive neutrality principles mentioned above are that 'Government businesses should not enjoy any net competitive advantage simply as a result of their public sector ownership' (NCC 2007). Hence governments were expected to apply the equivalent of the company tax to state-owned entities that would not normally attract Commonwealth taxation for constitutional reasons.

Given the natural monopoly features of electricity supply, the application of national competition policy principles to this industry was always going to be problematic. The characteristics that make it a natural monopoly are the economies of scale and scope which respectively mean that:

- Unit cost falls as the scale of operation increases (scale); and
- Unit costs also fall when related activities are included in the one organisation (scope).

In addition, electricity is delivered over networks, and genuine competition would involve replicating networks which is obviously inefficient.

In the late 1990s privatisation became part of economic policy, most radically in Victoria and SA where the electricity assets are now almost fully privatised.[6] While being a late mover towards public control, SA was a first mover toward privatisation – ironically under a government of the same political persuasion as the Playford Government that originally nationalised electricity. Economic elites may have favoured privatisation, but community and trade union opposition prevented privatisations in NSW and Queensland for another decade (Chester, 2015). Mention might also be made of the political consequences for the Tasmanian Government in 1998, the failure of the NSW Liberal Opposition in 1999 and the Newman Queensland Government in 2015: those are just some of the governments and opposition parties that encountered political difficulties after privatising, or promising to privatise, electricity.

Having considered the historical evolution of the electricity industry up to the advent of privatisation and competition in the 1990s, we now turn to a consideration of the economic performance of the industry since that time.

[6] SA has more recently commissioned new publicly-owned electricity infrastructure and storage.

The Performance of the Electricity Industry Under Privatisation and Competition

Each year the ABS publishes estimates of the main features of the performance of Australian industry in fairly fine detail (ABS 2017a). The publication is based on:

- Data directly collected from the Economic Activity Survey (EAS) by the ABS, and
- Business Activity Statement data collected by the Australian Taxation Office from Australian businesses.

The publication excludes the public and finance[7] sectors, but does include public non-financial corporations. Hence this publication focuses on the performance of commercial corporations in Australia.

'Electricity' is one of the industries defined in this survey, and this allows us to compare the performance of the electricity sector with the rest of Australian industry. This comparison is made in Table 2 which compares electricity with other industries in a number of important aspects.

Table 2: Electricity industry features

The Australia Institute Research that matters.	Electricity	All industries
Income as share of sales receipts (income) %	23	13
Wages share of sales and other income %	8	17
Wages share of Value added %	24	50
Earnings Before Interest. Tax, Depreciation and Amortisation; share of value added %	76	50

Source: ABS (2017a)

Table 2 clearly shows that the electricity industry differs substantially from the norm in Australia. Business income earned as a share of revenue is almost twice the Australian

[7]The exclusion of financial corporations reflects the important differences between these and businesses in the real economy.

industry average, while the compensation of workers is less than half (expressed as a share of sales). Similarly, the wages share of value added is much lower (24 versus 50 per cent), while the profit share[8] is much higher.

The ABS input-output tables treat electricity as two industries; 'electricity generation' and other activities ('electricity transmission, distribution, on selling and electricity market operation'). In earlier years, both parts were lumped together under the heading 'electricity supply'. The input-output tables allow us to examine the inputs into electricity production and distribution, and compare the changes over time. The latest figures published by the ABS are for 2014-15. The earliest figures we can retrieve electronically are for the year 1998-99. Some of the main features of the basic structure of the industry are compared in Table 3, which presents the inputs and other costs that go to make up the total value of Australian production of electricity services in those two years. There are over one hundred supplying industries in the input output tables, so Table 3 below includes just those few categories likely to be of most interest. The ABS separates the electricity industry into generation and the rest, but these are combined in Table 3.

Table 3: Electricity supply – major inputs as share of total production %

The Australia Institute Research that matters.	1998-99	2014-15
Intermediate inputs		
Coal, oil and gas and products of each plus gas supply	23	7
Finance etc	3	10
Other intermediate inputs	24	45
Total intermediate uses	50	62
Other components of final price		
Compensation of employees	12	11
Gross operating surplus & mixed income	36	24
Taxes less subsidies on products	1	0
Other taxes less subsidies on production	1	3
Australian Production	100	100

Source: TAI calculations based on ABS (2017b) and ABS (2004)

Table 3 clearly shows that the economics of electricity supply have fundamentally changed in the wake of the grand experiment with privatization, competition and marketization. The most dramatic change is the significant fall in the value of the fuels used in producing electricity: which declined from 23 to 7 per cent of the value of the

[8] Profit share here is represented by Earnings Before Interest. Tax, Depreciation and Amortisation.

product. The latter is worth bearing in mind given that natural gas prices in particular have been blamed for a good deal of the higher prices experienced in Australia. At the same time the finance industry has vastly increased its importance in total costs, going from 3 to 10 per cent of final cost.

Over the same period covered by Table 3, the share of renewables in electricity generation increased marginally from 10.1 per cent to 13.7 per cent.[9] That cannot explain the change in cost structure visible in the two years reported in Table 3.

Table 4 provides a more detailed breakdown of costs, separately considering electricity generation industry and the rest of the electricity industry. In column 4 of Table 4 we adjust for the sales of transmission, distribution, on-selling and market operation within the sector (that is, from one electricity firm to another). For example, there are considerable cross-sales within the 'poles and wires' segment of electricity distribution that we can safely ignore here; we are more interested in examining the structure of costs purchased from industries outside the overall electricity sector.

[9] These statistics are available from 1998-99 to 2014-15 based on data from Office of the Chief Economist (DIIS 2016).

Table 4: Inputs into electricity generation and the rest of the industry

	Electricity Generation	Electricity Transmission, Distribution, On Selling and Electricity Market Operation	Adjusted transmission etc
	%	%	%
Coal mining	9.59	-	-
Oil and gas extraction	3.96	-	-
Petroleum and Coal Product Manufacturing	1.45	0.20	0.31
Electrical Equipment Manufacturing	2.44	1.40	2.17
Electricity Generation	0.85	0.40	0.62
Electricity Transmission, Distribution, On Selling and Electricity Market Operation	23.78	35.56	-
Gas Supply	2.06	-	-
Construction Services	2.45	3.96	6.14
Wholesale Trade	1.16	0.54	0.84
Finance	7.46	3.36	5.22
Auxiliary Finance and Insurance Services	8.92	3.50	5.43
Rental and Hiring Services (except Real Estate)	1.00	0.73	1.14
Professional, Scientific and Technical Services	2.11	1.31	2.03
Employment, Travel Agency and Other Administrative Services	1.12	0.70	1.09
Other Repair and Maintenance	0.80	0.50	0.78
Total Intermediate Use	**76.99**	**55.55**	**31.03**
Compensation of employees	7.40	12.37	19.19
Gross operating surplus & mixed income	16.70	26.43	41.02
Taxes less subsidies on products	0.91	0.08	0.12
Other taxes less subsidies on production	(2.01)	5.57	8.64
Australian Production	**100.00**	**100.00**	**100.00**

Source: ABS (2017b), for the 2014-15 year.

Table 4 clearly shows the differences between generation and the rest of the electricity industry. One obvious difference is the large amount generators pay for fuels. However, the biggest difference is in the intensity of purchases of intermediate goods and services. For generators, 77 per cent of the value of the product is spent on fuels and other intermediate goods. However, the corresponding figure for the rest of the electricity industry is only 31 per cent. The share going to wages is higher at 19 per cent compared with 7 per cent in generation. And then profits (gross operating surplus) is 17 per cent in generation compared with 41 per cent in the rest of the industry. At least for 2014-15 (the year covered in Table 4), the most profitable sectors were outside generation, including the distribution networks and electricity retailing. In other words, if we are concerned with excess profits in the electricity sector, the core problem does not seem to be located in electricity generation. Rather, it is in the ancillary functions, mostly related to private market operation, where the biggest profits are being captured.

Another way of examining the electricity industry is to disaggregate revenues according to its vertical structure. We place retail at the 'top' of the supply chain: it is the section that deals directly with the customers. Beneath that is the network: the transmission and distribution sections that respectively deliver the high voltage and stepped down voltage for suburban networks. Finally, at the 'bottom' are the generators that actually produce the electricity. Based on the national accounts input output-tables, Table 5 illustrates this structural split in revenues between retail, networks and generation.

Table 5: Vertical disaggregation of electricity sector sales, 2015-16

	$ million	Share %
Retail: Electricity margin on supply	20,945	26
Networks: Electricity transmission, distribution, on selling and electricity market operation	43,176	54
Generators: Electricity generation	16,104	20
Total	80,225	100

Source: ABS (2017b)

These figures indicate that total costs are divided across these major segments as follows: around 26 per cent go to retail, 54 per cent to the network, and just 20 per cent to generation. These figures are comparable to data quoted by the ACCC (2017) and Australian Energy Regulator (2017). Once again, it seems that the huge market apparatus associated with on-selling, distribution, and retailing of electricity has come to account for the lion's share of total costs.

In the next section we examine the changing composition of the workforce and what that tells us about the changing economic nature of the electricity industry since privatisation and marketization.

The Costs of Privatisation, Corporatisation and Marketization

Under commercialisation and privatisation, electricity suppliers have changed their workforces in some interesting ways. This change is illustrated in Table 6.

The Australia Institute (TAI) requested unpublished data from the ABS regarding the occupational breakdown of electricity employment. Those figures are summarised in Table 6. Our measures of "managers" in Table 6 includes several related ABS categories, namely "contract, program and project administrators", "office managers" and "practice managers". Likewise "sales workers" includes "advertising and marketing professionals" and "call or contact centre workers". To avoid double-counting, appropriate adjustment is made to the "professional" category in Table 6. Later in the report we consider a more detailed breakdown of employment in the electricity industry; for the moment we are interested in the broader changes visible in Table 6.

Table 6: The electricity workforce

The Australia Institute Research that matters.	Nov-96	Nov-16	Increase %
Managers	2,669	8,473	217
Sales workers (broadly defined)	607	3,008	396
Professional (excluding advertising and marketing professionals)	6,865	11,115	62
Other (includes tradespeople, technicians, labourers, administrative staff among others)	29,047	35,085	21
Total	39,188	57,681	47

Source: Author's calculations based on ABS unpublished data.

Table 6 shows that there has been a 47 per cent increase in total employment over the two decades of data summarised here.[10] However, the number of sales staff increased almost 400 per cent. That was considered an entirely unproductive activity twenty years ago; nobody was required to sell electricity. Electricity sold itself and only required managers to understand how to produce and distribute it. However, with the decision to create competing retailers and generators and the NEM, there was suddenly a new

[10] That approximately matches the overall growth in employment in Australia in this time, so by that measure total employment growth in electricity was typical of the economy as a whole.

need for sales and marketing activities, as well as real resources dedicated to 'playing' the NEM .

The next highest growth in Table 6 is in 'managers', which increased 217 per cent. There are now 5.8 non-managerial workers for every manager compared with 13.7 twenty years ago. Much of the increase in the 'professional' workers category also seems questionable. Going further into the detail, we find that there have been large increases in accountants, undefined professionals, training and development professionals, and so on. We also do not doubt that large firms need these skills; but by splitting organisations into fragmented parts, the new organisations each need their own accountants, HR managers, and so on. The result of all this duplication is to considerably reduce the efficiency of the sector as a whole.

Employment growth among the tradespeople, technicians, labourers and other classifications most directly associated with the real production and distribution of electricity has been much more modest: just 21 per cent over the 20-year period. In other words, the problem of bloated bureaucracy evident in the industry is clearly not associated with those who are doing the direct work of generating and distributing power. Rather, it is the functions associated with private operation and competition that have expanded dramatically.

We can estimate the additional costs that must eventually be passed on to consumers as a result of this swollen market, sales, and administrative apparatus. First we note that official figures show that overall productivity has in fact fallen in electricity – primarily as a result of the growth of these ultimately unnecessary market-oriented functions. For the combined utilities sector (including electricity, gas, water and waste services),gross value added per worker fell by 30.6 per cent from its peak in 2000-01 (as private market operation was being fully implemented) up to 2015-16 (most recent comparable data available). Over the full 20-year period covered by Table 6, productivity fell by 25.1 per cent (ABS 2017c). Based on the figures in Table 6, that means that there are 14,150 more workers than would have been required if aggregate productivity had remained at 1995-96 levels. A second method for estaimting the additional costs associated with these various marketing and administrative costs is based on the growth in managers and sales workers. If the growth in these two categories of employment had been restricted to the same rate as the 'others' (namely, those occupations most directly associated with the production and distribution of actual electricity), then 7,517 fewer jobs would have been created. Costing those two estimates of excess employment using the average wage for employees in electricity supply in 2015-16[11] gives a total cost of $1,940 million using the first method or $1,030 million using the second. These estimates do not

[11] Figure calculated at $137,300 pa based on ABS (2017a).

include additional 'on-costs': that is, the various non-wage costs that are also incurred as a result of employment (such as superannuation contributions, benefits, and other payroll costs).

In other words, we have estimated that unproductive activities associated with privatisation, commercialisation and marketization impose additional deadweight costs of between one and two billion dollars per year, all as a result of new functions electricity organisations had to take on as a result of the industry's new private market structure (along with costs resulting from the needless duplication of management structures and corporate functions).

In addition, retailers and generators have to operate in a market involving buying and selling skills. When retail electricity was still regulated in NSW, we commented on an April 2013 decision of the Independent Pricing and Regulatory Tribunal allowing retailers to increase prices by an average of three per cent. In their reasoning they cited 'increased retail operating costs, including the costs of acquiring and retaining customers in an increasingly competitive market' (Independent Pricing and Regulatory Tribunal 2013). In essence, that amounts to the regulator saying 'We are going to let you charge customers more because you want to spend more on advertising to them'. It would be interesting to know how many NSW residents would be happy with that arrangement. Consumers are expected to pay for the additional costs of operating in a deregulated and competitive market, and our estimates suggest these costs are considerable.

The ABS estimates there were 9.2 or 9.3 million households in 2015-16 (ABS 2015). This implies that the cost per household of additional labour costs following from the new functions of electricity companies in the era of privatisation, corporatisation or marketization amount to $111 to $209 per annum. Of course, some of the charges will be borne by business customers in the first instance; but most if not all such charges are ultimately passed on to final consumers, together with associated on-costs that are not included in our estimates above.

In this context, it is interesting to note that AGL's latest annual report (AGL 2018) reveals that part of their costs are the 'cost to grow per customer account' which it reports is $101 per annum per customer – consistent with our estimate above. AGL defines this cost item as follows: 'Cost to Grow per account includes the consumer operating costs related to acquiring and retaining customers divided by the number of customers acquired and retained'. Now, stripping the euphemisms out, this is saying to customers that $101 is what we make you pay for the cost of advertising to you and your mates. That is about 5.4 per cent of the customer's bill.

Naturally AGL covers the advertising cost with its high prices. So AGL customers are paying $101 per annum for the cost of retail competition. While this seems outrageous, we can hardly blame AGL for this cost. Advertising and marketing operations are driven by the commercial logic inherent in an industry which has been subordinated to a philosophy of marketization and private competition. The whole logic of past and present government programs of privatisation, marketization and commercialisation assumed that AGL and other retailers would incur costs associated with competition. Obviously, those costs would ultimately be passed on to consumers – but there seems to be no evidence that any of the proponents of neoliberal electricity policy foresaw the scale or effect of those costs .[12]

Origin (2018) also presents similar data regarding its marketing expenses, and it is worth comparing the two companies (see Table 7). Together AGL and Origin call these the 'costs to serve customers', and they are divided into two categories:

- 'Cost to maintain' which includes billing, payment processing, debt recovery and similar functions, and
- 'Cost to acquire and retain' customers, which includes the costs of advertising and marketing to try to hold and increase customer numbers.

These figures are given in Table 7.

Table 7: Costs related to consumers: $ per average customer

The Australia Institute Research that matters.	Origin	AGL
Cost to maintain	124	83
Cost to acquire/retain	46	101
Total costs to serve	184	170

Source: Author's compilation from company reports.

Table 7 is very interesting. While the total 'cost to serve' is similar in the two companies, the cost to maintain is higher for Origin, while the costs to acquire and retain are higher in AGL. There is no obvious reason why the cost to maintain should be so much higher

[12] Perhaps the authors of the privatisation, marketization and commercialisation policies were not aware that the orthodox economic theory they used assumes perfect knowledge and so there would be no need to advertise.

in Origin; it is possible that there are definitional differences in the two companies that might account for the discrepancies.

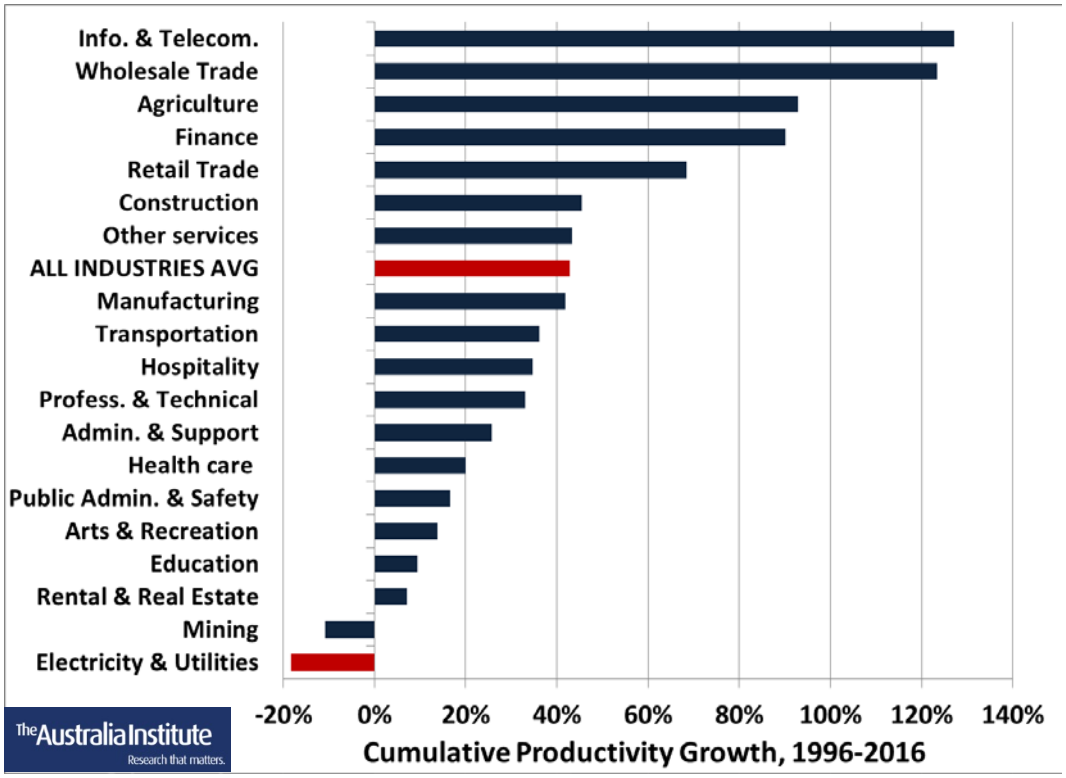
FALLING PRODUCTIVITY

We mentioned earlier that productivity performance in electricity has been very poor under the regime of privatisation and competition. That conclusion was based on ABS industry-wide data, which measures output per worker in the aggregate utilities sector (including electricity, gas, water and waste). The decline in output per worker since 2000 was used to generate one of our two estimates of the deadweight cost of the excess sales and administration burden that has been created in the privatised electricity industry. In fact, those ABS statistics confirm that electricity and other utilities have in fact demonstrated the *worst* cumulative productivity performance over the past generation of any broad industry in Australia's economy.

Figure 1 illustrates the cumulative change in real value-added per employee in the 19 broad industries tracked by the ABS, along with an economy-wide average, from 1996 through 2016 (the same comparison period used in the preceding estimates of excess sales and administration costs). For the whole economy, productivity advanced 43 per cent over that 20-year period – or an average improvement in efficiency of 1.8 per cent per year. Some industries demonstrated even faster productivity growth, including information and telecommunications and wholesale trade (which more than doubled their productivity over that period). Electricity and other utilities (including gas, water, and waste services) experienced a cumulative decline in productivity of 18 percent from 1996 through 2016 (and an even larger decline, as noted earlier, since the turn of the century). That is the worst performance of any sector of the economy. Only one other sector, mining, experienced negative productivity growth over the whole period.[13]

[13] Negative productivity in mining reflects the declining returns commonly experienced in the production of non-renewable resources, whereby initial resources can be extracted more efficiently, but more distant or hard-to-access resources require more input. There is no equivalent underlying explanation for the deterioration of productivity in the electricity industry.

Figure 1. Cumulative productivity growth by industry, 1996-2016

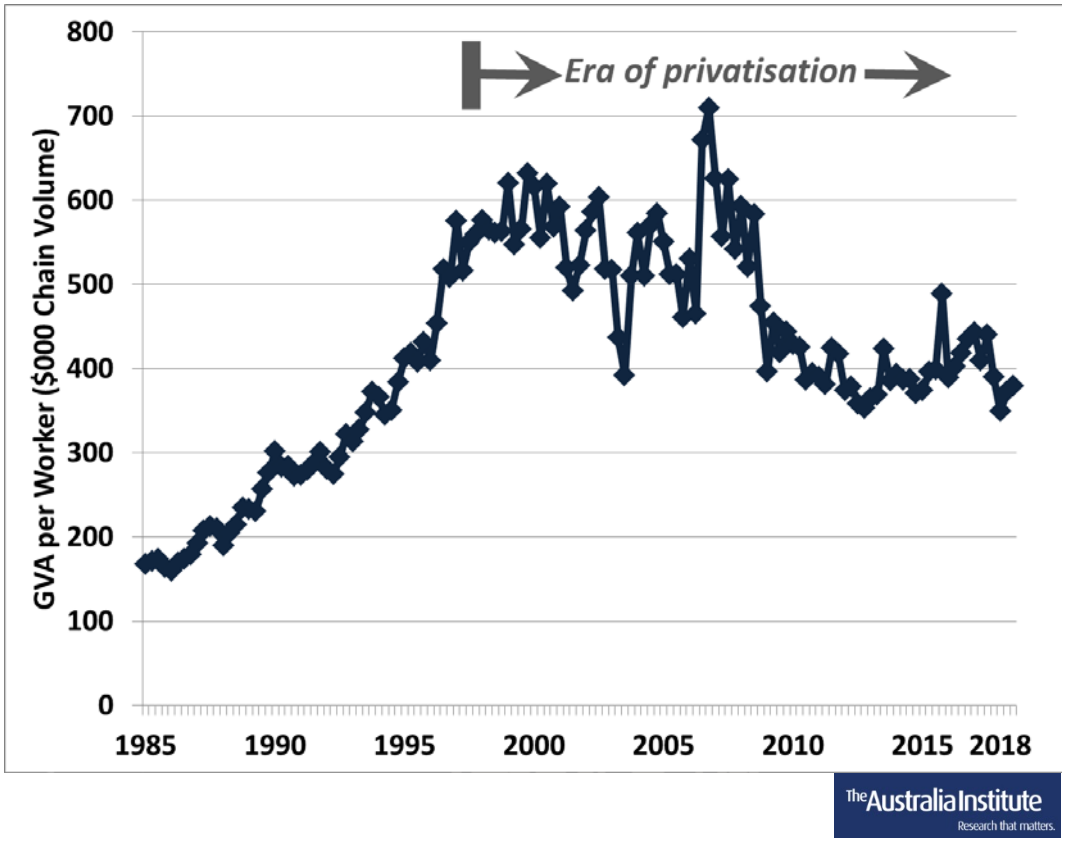


Source: Author's calculations from ABS Catalogue 5204.0, Table 15.

We can also drill down to focus more precisely on productivity performance in the electricity sector (rather than the data for the aggregate utilities industry reported above). We do so by combining two different ABS series: the national accounts statistics (which provide real output by different sub-industries) and the labour force survey (which provides detailed employment estimates at the sub-industry level). Comparing value-added output (in real, chain-linked terms) with employment in each industry provides a measure of its productivity growth over time.[14] Incidentally these data sources also allow us to examine productivity trends over a longer period of time, from well before the implementation of policies oriented around competition, corporatisation, privatisation and marketization. This allows analysis of the impacts of that policy shift on the industry's productivity. The evolution of productivity in the electricity industry is illustrated in Figure 2.

[14] While the industries identified as electricity in the two series may differ slightly any difference is likely to be consistent over time and so should not unduly concern us here.

Figure 2: Annual gross value added (chain volume estimates) per employee in electricity ($'000)



Source: Calculations from ABS Catalogues 5206.0 (Table 6) and 6291.0.55.003 (Table 6).

Figure 2 tells a dramatic and counter-intuitive story. Through the 1980s and early 1990s, before the implementation of neoliberal competition and privatization policies, productivity growth was very rapid in the electricity sector. However, inspection of the graph shows that from the late 1990s productivity growth stopped, and productivity actually started to decline (with a temporary but short-lived rebound around 2006). From 2000 through 2018 (first 3 quarters) average output per worker fell from $589,700 to $366,800. That represents a decline in output per worker of 37.8 per cent since the turn of the century. That is in dramatic contrast to the pervious period: output per worker increased from $169,100 in 1985 to $589,700 in 2000, a 249 per cent increase in output per worker over those 15 years (or a sustained average rate of 8.7 per cent per annum). Hence Figure 2 dramatically indicates electricity industry productivity before and after competition, corporatisation, privatisation and marketization. Contrary to promises, that agenda took electricity from a high productivity growth industry, to its opposite.

2016 CENSUS

An additional perspective on the deadweight costs of unproductive marketing and administration is provided by ABS census data, which allows us to consider a more detailed breakdown of occupations in different parts of the electricity industry. In theory a census provides a full and exact depiction of employment in each occupational category; in contrast, the analysis above was based on ABS's surveys which are necessarily subject to sampling error (considered to become worse for smaller subgroups).

Table 8 reports all the occupations in electricity which account for at least one per cent of the industry's total workforce. Overall there are 235 different occupations in electricity; Table 8 includes the top 21 of those occupations.

Table 8: Occupations in the electricity industry by number of workers.

The Australia Institute Research that matters.	Number	%
Electricians	5,839	10.9
Electrical Distribution Trades Workers	5,208	9.7
Electrical Engineers	2,695	5.0
Contract, Program and Project Administrators	2,206	4.1
Chemical, Gas, Petroleum and Power Generation Plant Operators	1,777	3.3
Electrical Engineering Draftspersons and Technicians	1,742	3.2
Information Officers	1,291	2.4
General Clerks	1,187	2.2
Metal Fitters and Machinists	1,034	1.9
Accountants	1,015	1.9
Call or Contact Centre Workers	1,015	1.9
Other Specialist Managers	983	1.8
Management and Organisation Analysts	943	1.8
Accounting Clerks	891	1.7
Inadequately described	711	1.3
Advertising, Public Relations and Sales Managers	636	1.2
ICT Managers	621	1.2
Human Resource Managers	590	1.1
Purchasing and Supply Logistics Clerks	560	1.0
Sales Representatives	557	1.0
Professionals, nfd	551	1.0

Source: TAI calculations based on 2016 Census.

As might be expected, the electricity industry contains a large number of electricians and related occupations. Indeed, of the top six occupations, five are electricians, electrical distribution trades workers, electrical engineers, plant operators and electrical engineering drafters and technicians. These five together make up 32.2 per cent, or almost a third of the total employment.

It is important to also consider in which part of the industry the various occupations work. The census data disaggregates the electricity industry into eight components; total employment is assigned to these respective sub-industries as shown in Table 9 below.

Table 9: Employment by electricity sub industries

	Number	Share %
Electricity Distribution	26,094	48.6
Electricity Supply, nfd	8,954	16.7
Fossil Fuel Electricity Generation	8,015	14.9
On Selling Electricity and Electricity Market Operation	5,824	10.9
Electricity Transmission	2,666	5.0
Hydro-Electricity Generation	1,095	2.0
Other Electricity Generation	794	1.5
Electricity Generation, nfd	212	0.40
Total	53,654	100.00

Source: TAI calculations based on 2016 Census. Nfd = not further defined.

Table 9 shows that the bulk of employment is in distribution, at 48.6 per cent of all jobs; transmission accounts for only 5.0 per cent. On-selling of electricity involves 10.9 per cent of the work force, while generation sums to just 23.8 per cent. A further 16.7 per cent of electricity employees work in unidentified segments of the industry.

Another finding from Table 9 is that if we consider just the generation of electricity, there are 8,015 workers in fossil fuel generation out of a total of 10,116 in generation. So fossil fuel accounts for 79.2 per cent of employment in generation while the rest, 20.8 per cent, is in other forms of generation (primarily renewables). However, renewables accounted for only 14.8 per cent of total generation in 2015-16 (Department of the Environment and Energy 2017); this suggests that renewables are relatively more labour intensive than fossil fuel generation. However, given the year of the census, 2016, it is likely that renewables would have included a good deal of construction activity.

A very important issue here is where the 'electricians' are employed. This breakdown is given in Table 10 below. Here we use the following ABS categories:

- electrical and electronic engineers
- electrical and electronic engineering draftspersons and technicians
- electrotechnology and telecommunications trades workers nfd
- electricians
- electronics and telecommunications trades workers nfd

- electrical distribution trades workers, and
- electronics trades workers.

The biggest of these categories of employment are the Electricians and the Electrical Distribution Trades Workers.

Table 10: Electricians in electricity supply and sub divisions.

	Electricians	Share of workforce %
Electricity Supply, nfd	3,428	38.3
Electricity Generation, nfd	42	19.8
Fossil Fuel Electricity Generation	1,349	16.8
Hydro-Electricity Generation	166	15.2
Other Electricity Generation	123	15.5
Electricity Transmission	906	34.1
Electricity Distribution	9,802	37.6
On Selling Electricity and Electricity Market Operation	256	4.4
Total	16,072	30.0

Source: TAI calculations based on 2016 Census. Nfd = not further defined.

Overall 16,072 people identified themselves as falling in one of these categories of electricians in the census. These people constituted 30 per cent of the total workforce in electricity supply. Table 10 shows that the proportion of electricians in the workforce is much higher in transmission and distribution than elsewhere in the industry – although there is a similar proportion in the 'not further defined' category. Of course, on-selling and other market operation accounts for a very small number of electricians.

In Table 11 we then consider how manager and sales staff are allocated across the various electricity subsectors.

Table 11: Managers, sales and marketing staff in electricity subsectors.

	Managers	Non-managerial workers per manager	Sales and marketing staff
	Number	%	Number
Electricity Supply, nfd	989	8.04	713
Electricity Generation, nfd	55	2.85	8
Fossil Fuel Electricity Generation	984	7.14	181
Hydro-Electricity Generation	203	4.39	54
Other Electricity Generation	180	3.41	88
Electricity Transmission	394	5.75	124
Electricity Distribution	3,079	7.46	2,033
On Selling Electricity and Electricity Market Operation	1,120	4.19	1,676
Total	7,004	6.65	4,877

Source: The Australia Institute calculations based on 2016 Census. Nfd = not further defined.

Table 11 reveals that 7,004 people told the census collectors they were managers in the electricity industry. This implies that there were just 6.65 non-managers for every manager in the industry overall – indicating a relatively high degree of 'management intensity' in this industry. This ratio ranged from a very low 3.41 in 'other generation' to a high of 7.46 in 'electricity distribution'.[15] The final column in Table 11 confirms our earlier impression that the electricity industry is employing a growing number of sales workers and similar occupations, with 4,877 employees in total; the biggest share of these (over 40 per cent) are in the distribution segment of the industry. These statistics are consistent with our earlier findings that there has been enormous growth under privatisation and marketization in the importance of managers, marketers, sales agents, and other occupations not directly related to the production and distribution of electricity; moreover, the data consistently indicates a large decline in the number of workers managed by each 'manager' – another indication of the deadweight cost and waste associated with this market structure.

It is worth reflecting on the large increase in the number of managers. Most workers in Australia know that their workplace seems to operate quite acceptably when the managers go on leave, or their jobs are temporarily vacant. One instructor at a business school has written that no-one really knows what managers are doing and whether they

[15] Higher still was 'Electricity Supply, nfd' but it is not clear how this should be interpreted – perhaps as an indication that many of these 'managers' do not even know what part of the electricity industry they are employed in!

are good at it and, indeed, whether they increase the productivity of those they manage at all (Parker 2018).

Using the census data, we can go into a good deal of detail about the composition of this growing class of managers. For example, we know that the electricity industry employs 63 economists – with 35 of those in electricity distribution, and 15 in 'on selling electricity and electricity market operation'. In the appendix to this report, we list all of the occupations that have at least one representative in the electricity industry.

While the costs of having to 'sell' electricity are relatively easy to identify, there are also additional costs associated with vertical separation. While governments structurally separated the energy supply industry in the 1990s, many retailers later reintegrated with generators to form 'gentailers' that own portfolios in both generation and retail. Three retailers—AGL Energy, Origin Energy and EnergyAustralia—supply 70 per cent of retail electricity customers in the NEM. These same entities expanded their market share in NEM generation capacity from 15 per cent in 2009 to 48 per cent in 2017.

Vertical integration allows generators and retailers to insure internally against price risk in the wholesale market, reducing their need to participate in hedge (contract) markets. Vertical integration also avoids the need to engage in legal contract management between, for example, retailers and generators who would have to enter into and manage contracts if they operated at arm's length.

Danny Price (2018) has argued that vertical integration makes sense for suppliers, because vertical integration allows them to 'manage their risks in a more sophisticated way'. Further:

> Vertical integration allows businesses to respond to a fast-changing environment by creating the capability to fluidly renegotiate the internal pricing between the wholesale and retail arms of the business, rather than negotiating and renegotiating clunky exchange-traded and bilaterally negotiated hedging contracts.
>
> This flexibility to constantly reallocate and reprice their risk management positions allows vertically integrated businesses to be more competitive. Their competitiveness then allows them to invest in new generation. It has been vertically integrated businesses that have sponsored or built virtually all the new generation in the market.

The implication is that there are large additional costs to be borne with the vertically separated model that has been constructed under the neoliberal competition agenda. These contract management and related transactions costs are not directly observable,

but we note that the electricity industry now includes 63 economists (already mentioned). The new sorts of functions electricity businesses now have to undertake would keep busy the various other occupations we now find in electricity, such as: Financial Brokers, Financial Dealers, Actuaries, Mathematicians and Statisticians, ICT Business and Systems Analysts, Judicial and Other Legal Professionals, Solicitors, Accounting Clerks, and more. It goes without saying that few of these occupations actually have anything to do with the production of electricity. Instead, these are the occupations required when electricity producers are broken up into small, duplicating entities that have to deal with each other, aggressively recruit customers, enter into complicated financial arrangements, and other ultimately wasteful tasks. The cost of these unnecessary administrative and marketing tasks is impossible to measure, but is certainly significant.

Conclusion

Our brief consideration of the history of electricity production in Australia demonstrated that soon after the application of electricity became practical it was incorporated into public utilities. Tramways had no alternative but to build their own generators if they wanted to electrify. Public undertakings were able to take advantage of strong economies of scale and ample networking opportunities. By the early postwar years, Australians enjoyed some of the cheapest electricity in the world.

By the 1990s, however, economic policy-making was captured by the neoliberal assumption that we are better off leaving everything to the market. Core structural features of the electricity industry (such as networking arrangements and the need for only one grid) stalled the application of leaving-it-to-the-market principles. It was hard to apply standard philosophies of market competition to an industry that appeared to be a natural monopoly. Nevertheless, neoliberal zealots soon worked out ways of hiving off bits of the industry (such as generation and retail) which could then operate within an artificial market under private ownership or corporatised public ownership.

The benefits of competition were clearly oversold. In the meantime, we have flipped from a cheap electricity country to an expensive electricity country. None of the proponents of competition at the time even mentioned the costs of competing – including the thousands of workers now employed to advertise and sell something that every Australian already knows they need. By splitting each State's retail interface into a small number of competing retailers, the new players had to compete against each other; this competition involves spending on advertising, an ongoing sales effort, marketing and other ultimately unproductive functions. These costs are significant as we have seen here: at least $1-2 billion per year, or $100-200 per customer per year. Let's apply the 'pub test' to this arrangement: Should you have to pay electricity companies to cover the costs of advertising and marketing to you?

Not just the retail sector is involved. Generators and retailers must deal with each other and draw up contracts, make arrangements for settling disputes and so on; this myriad of functions used to be organised more simply and efficiently within the command chain of one organisation.

We do not necessarily blame the electricity companies themselves for this waste and expense. Under privatisation, corporatisation and marketization the various state and federal governments unashamedly turned the industry over to corporations motivated not by the public good but motivated by profit-seeking. For-profit generators and

retailers endlessly try to take advantage of each other; to protect themselves they must allocate enormous resources to contract negotiations and performance monitoring and/or enforcement.

On balance, we have initiated a sort of 'arms race' which is costly – yet none of the players come out on top, as their moves are subject to countervailing actions by their competitors. However, electricity is an essential commodity which people are forced to buy at almost any price. Hence it is relatively easy for the businesses to recover those costs, however large or unnecessary, from their customers.

When we examined the performance of the electricity industry since privatisation and competition were introduced in the late 1990s, our suspicions were immediately confirmed. Of course, almost all prices have increased over the last two decades. But there is no reason why electricity prices should have behaved much differently. Yet today, half the price we pay for electricity now reflects that increase in electricity prices *relative* to the rest of the economy. Ongoing fluctuations in fuel costs cannot explain these price changes; they now account for only 7 per cent of final electricity prices. In a subsequent study[16] we will examine more closely the high profits earned in the retail side of the industry; our conclusions are already highlighting the unnecessary costs of competition in this state of affairs.

Commercial logic obliges retailers to spend large amounts on advertising and marketing, something publicly-owned electricity authorities never had to worry about. Advertising is only part of the additional costs of operating in the new environment. The expense of maintaining overlapping and duplicate management and administration is another source of deadweight cost. It is not credible for political leaders, facing an understandable backlash from angry electricity consumers, to blame the price of fuel, the inevitable shift to renewables (which are now cheaper anyway), or the actions of particular corporate executives. The industry is responding to the incentives that were created for it, by policy-makers who accepted the assumption that 'the market knows best.' It is now time to question that starting assumption, and begin to develop ways of managing this essential industry that are more consistent with the goals of efficiency and sustainability.

[16] This report in intended as the first installment in a three-part review of the structure and performance of Australia's electricity industry,

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Appendix

Table 12: Electricity supply subdivisions and employment by occupation

INDP - 4 Digit Level	Electricity Supply, nfd	Electricity Generation	Fossil Fuel Electricity	Hydro-Electricity	Other Electricity	Electricity Transmission	Electricity Distribution	On Selling Electricity and	Total
OCCP - 4 Digit Level									
Managers, nfd	57	0	30	3	9	8	124	31	262
Chief Executives and Managing Directors	43	0	27	0	14	13	31	19	147
General Managers	57	3	57	12	11	16	124	47	327
Farmers and Farm Managers, nfd	0	0	0	0	3	0	0	0	3
Specialist Managers, nfd	61	0	38	8	10	11	136	55	319
Advertising, Public Relations and Sales Managers	95	8	46	24	28	30	206	199	636
Business Administration Managers, nfd	11	0	4	0	0	6	25	11	57
Corporate Services Managers	5	0	8	0	0	4	15	9	41
Finance Managers	51	9	45	12	22	18	142	84	383
Human Resource Managers	72	4	77	17	9	37	281	93	590

	Policy and Planning Managers	20	0	18	4	3	12	106	55	218
	Research and Development Managers	11	0	5	0	8	0	18	10	52
	Construction, Distribution and Production Managers, nfd	5	0	14	5	6	8	53	4	95
	Construction Managers	59	0	48	9	9	59	305	13	502
	Engineering Managers	55	6	88	29	10	30	200	30	448
	Importers, Exporters and Wholesalers	17	0	6	0	0	9	16	3	51
	Production Managers	15	3	41	8	0	8	41	17	133
	Supply, Distribution and Procurement Managers	50	0	36	4	0	17	205	31	343
	Health and Welfare Services Managers	6	0	0	0	0	0	3	0	9
	ICT Managers	82	4	44	20	0	40	292	139	621
	Other Specialist Managers	102	18	250	39	19	34	401	120	983
	Cafe and Restaurant Managers	5	0	0	0	0	0	0	0	5
	Retail Managers	10	0	4	0	0	3	25	41	83
	Call or Contact Centre and Customer Service Managers	42	0	28	4	3	9	133	83	302

	Conference and Event Organisers	0	0	5	0	0	0	19	3	27
	Transport Services Managers	5	0	9	0	0	4	38	0	56
	Other Hospitality, Retail and Service Managers	53	0	56	5	16	18	140	23	311
	Professionals, nfd	63	0	23	11	4	29	292	129	551
	Media Professionals, nfd	0	0	0	0	0	0	0	4	4
	Authors, and Book and Script Editors	0	0	0	0	0	0	7	0	7
	Journalists and Other Writers	10	0	7	0	0	0	20	8	45
	Business, Human Resource and Marketing Professionals, nfd	0	0	0	0	0	4	22	6	32
	Accountants	157	18	116	32	30	57	411	194	1015
	Auditors, Company Secretaries and Corporate Treasurers	24	0	13	6	0	17	184	16	260
	Financial Brokers and Dealers, and Investment Advisers, nfd	4	0	0	0	0	0	0	0	4
	Financial Brokers	18	4	20	18	0	0	21	52	133
	Financial Dealers	17	0	8	5	0	0	39	63	132

	Financial Investment Advisers and Managers	9	0	5	7	0	8	49	14	92
	Human Resource and Training Professionals, nfd	0	0	0	0	0	0	3	0	3
	Human Resource Professionals	30	0	60	14	0	25	229	68	426
	ICT Trainers	0	0	0	0	0	0	0	4	4
	Training and Development Professionals	33	0	15	9	0	13	126	43	239
	Information and Organisation Professionals, nfd	0	0	0	0	0	0	6	0	6
	Actuaries, Mathematicians and Statisticians	8	0	4	0	0	0	10	12	34
	Archivists, Curators and Records Managers	3	0	11	0	0	4	19	4	41
	Economists	4	0	4	0	0	5	35	15	63
	Intelligence and Policy Analysts	4	0	4	5	0	7	32	11	63
	Land Economists and Valuers	4	0	7	0	0	14	16	0	41
	Management and Organisation Analysts	103	0	39	25	3	38	455	280	943
	Other Information and Organisation Professionals	35	0	18	8	0	17	170	99	347

	Sales, Marketing and Public Relations Professionals, nfd	0	0	0	0	0	0	3	3	6
	Advertising and Marketing Professionals	35	0	16	3	15	6	106	112	293
	ICT Sales Professionals	0	0	0	0	0	0	0	9	9
	Public Relations Professionals	12	0	18	5	0	16	57	31	139
	Technical Sales Representatives	25	0	19	0	4	28	65	18	159
	Design, Engineering, Science and Transport Professionals, nfd	0	0	0	0	4	5	5	4	18
	Architects, Designers, Planners and Surveyors, nfd	9	0	8	0	0	0	43	4	64
	Architects and Landscape Architects	0	0	0	0	0	0	4	3	7
	Surveyors and Spatial Scientists	23	0	10	10	0	13	119	5	180
	Graphic and Web Designers, and Illustrators	10	0	0	0	0	0	19	6	35
	Interior Designers	0	0	0	0	0	0	3	0	3
	Urban and Regional Planners	6	0	0	4	0	4	12	0	26
	Engineering Professionals, nfd	48	0	51	10	11	27	106	34	287

	Chemical and Materials Engineers	0	0	17	0	0	0	3	7	27
	Civil Engineering Professionals	22	0	48	26	5	31	58	10	200
	Electrical Engineers	270	7	270	66	21	405	1523	133	2695
	Electronics Engineers	21	0	7	6	0	9	12	0	55
	Industrial, Mechanical and Production Engineers	37	4	192	27	13	25	98	24	420
	Mining Engineers	4	0	14	0	0	0	16	16	50
	Other Engineering Professionals	10	0	8	0	6	0	15	0	39
	Natural and Physical Science Professionals, nfd	0	0	0	0	0	0	0	3	3
	Chemists, and Food and Wine Scientists	6	0	33	0	0	0	3	0	42
	Environmental Scientists	13	0	46	20	3	18	86	19	205
	Geologists, Geophysicists and Hydrogeologists	0	0	3	7	0	0	0	17	27
	Other Natural and Physical Science Professionals	0	0	6	3	0	0	8	0	17
	Vocational Education Teachers (Aus) / Polytechnic Teachers (NZ)	11	0	12	0	0	3	86	11	123

	Education Advisers and Reviewers	0	0	0	0	0	0	7	0	7
	Occupational and Environmental Health Professionals	53	0	83	4	3	17	128	25	313
	Occupational Therapists	0	0	0	0	0	0	4	0	4
	Registered Nurses	0	0	10	0	0	0	0	0	10
	ICT Professionals, nfd	31	0	10	8	0	14	99	30	192
	Business and Systems Analysts, and Programmers, nfd	0	0	0	0	0	0	3	4	7
	ICT Business and Systems Analysts	53	0	20	19	0	27	235	79	433
	Multimedia Specialists and Web Developers	4	0	0	0	0	3	3	9	19
	Software and Applications Programmers	90	3	29	23	0	26	209	124	504
	Database and Systems Administrators, and ICT Security Specialists	64	0	36	9	4	30	177	41	361
	Computer Network Professionals	26	0	13	6	4	23	96	20	188
	ICT Support and Test Engineers	17	0	9	4	0	6	46	18	100
	Telecommunications Engineering Professionals	19	0	8	0	0	30	67	5	129
	Barristers	0	0	0	0	0	0	0	3	3

	Judicial and Other Legal Professionals	8	3	5	0	0	0	21	17	54
	Solicitors	16	0	9	12	7	9	49	27	129
	Counsellors	0	0	0	0	0	0	4	0	4
	Psychologists	0	0	0	0	0	0	3	0	3
	Social Professionals	0	0	0	0	0	0	3	0	3
	Welfare, Recreation and Community Arts Workers	0	0	0	0	0	0	4	0	4
	Technicians and Trades Workers, nfd	44	3	82	7	7	10	94	16	263
	Engineering, ICT and Science Technicians, nfd	4	0	7	4	0	8	16	0	39
	Agricultural Technicians	0	0	0	0	0	0	3	0	3
	Science Technicians	9	0	23	10	0	0	10	5	57
	Building and Engineering Technicians, nfd	10	0	23	3	0	7	36	4	83
	Architectural, Building and Surveying Technicians	55	0	30	3	19	27	266	9	409
	Civil Engineering Draftspersons and Technicians	3	0	3	0	0	9	23	0	38
	Electrical Engineering Draftspersons and Technicians	252	6	189	25	7	95	1137	31	1742

	Electronic Engineering Draftspersons and Technicians	14	0	3	0	0	4	13	0	34
	Mechanical Engineering Draftspersons and Technicians	0	0	9	4	0	0	14	3	30
	Safety Inspectors	7	0	6	0	0	3	34	0	50
	Other Building and Engineering Technicians	40	0	208	9	4	17	169	22	469
	ICT and Telecommunications Technicians, nfd	0	0	0	0	0	0	3	0	3
	ICT Support Technicians	51	0	37	17	5	28	147	47	332
	Telecommunications Technical Specialists	13	0	3	0	0	18	31	5	70
	Automotive and Engineering Trades Workers, nfd	3	0	29	0	0	0	13	3	48
	Motor Mechanics	14	0	52	0	5	4	47	4	126
	Sheetmetal Trades Workers	0	0	10	0	0	0	8	0	18
	Structural Steel and Welding Trades Workers	36	3	214	6	4	0	27	7	297
	Metal Fitters and Machinists	95	4	668	50	30	14	136	37	1034
	Precision Metal Trades Workers	16	0	3	0	0	4	82	0	105

	Carpenters and Joiners	7	0	14	0	4	0	3	0	28
	Painting Trades Workers	0	0	0	4	0	0	0	0	4
	Plumbers	8	0	32	0	8	0	133	14	195
	Electrotechnology and Telecommunications Trades Workers, nfd	98	4	37	0	0	10	191	4	344
	Electricians	1784	19	671	56	92	238	2919	60	5839
	Electronics and Telecommunications Trades Workers, nfd	8	0	3	0	0	0	29	0	40
	Airconditioning and Refrigeration Mechanics	8	0	8	0	0	0	9	0	25
	Electrical Distribution Trades Workers	963	6	124	9	3	145	3940	18	5208
	Electronics Trades Workers	18	0	36	0	0	0	24	7	85
	Telecommunications Trades Workers	30	0	8	0	0	23	117	0	178
	Greenkeepers	0	0	3	0	0	0	0	0	3
	Other Technicians and Trades Workers, nfd	0	0	5	0	0	0	0	0	5
	Miscellaneous Technicians and Trades Workers, nfd	0	0	4	0	0	0	4	0	8
	Chemical, Gas, Petroleum and Power	114	39	1046	70	71	31	283	123	1777

	Generation Plant Operators									
	Other Miscellaneous Technicians and Trades Workers	38	0	29	4	3	29	265	0	368
	Welfare Support Workers	0	0	10	0	0	0	6	6	22
	Fire and Emergency Workers	3	0	14	0	0	0	36	0	53
	Security Officers and Guards	15	0	31	0	0	0	20	5	71
	Tourism and Travel Advisers	0	0	3	0	0	0	0	0	3
	Other Personal Service Workers	0	0	0	0	0	0	3	0	3
	Clerical and Administrative Workers, nfd	10	0	0	0	0	0	17	0	27
	Office Managers and Program Administrators, nfd	4	0	0	0	0	0	18	0	22
	Contract, Program and Project Administrators	312	13	288	44	29	145	1182	193	2206
	Office Managers	90	8	41	10	15	20	166	34	384
	Practice Managers	0	0	0	0	0	0	4	0	4
	Personal Assistants	48	0	39	14	11	24	167	42	345
	Secretaries	17	0	12	7	0	10	26	3	75
	General Clerical Workers, nfd	0	0	0	0	0	0	4	0	4

	General Clerks	248	0	134	19	18	28	641	99	1187
	Keyboard Operators	90	0	24	0	5	13	351	39	522
	Inquiry Clerks and Receptionists, nfd	0	0	0	0	0	0	7	4	11
	Call or Contact Centre Information Clerks, nfd	0	0	0	0	0	0	3	9	12
	Call or Contact Centre Workers	94	0	9	0	3	5	503	401	1015
	Information Officers	171	0	34	18	0	23	650	395	1291
	Receptionists	22	4	17	3	6	14	39	14	119
	Numerical Clerks, nfd	0	0	0	0	0	0	5	0	5
	Accounting Clerks	151	5	78	17	10	35	419	176	891
	Bookkeepers	28	0	13	0	0	0	16	6	63
	Payroll Clerks	28	0	40	3	3	11	85	27	197
	Financial and Insurance Clerks, nfd	0	0	0	0	0	0	6	0	6
	Credit and Loans Officers (Aus) / Finance Clerks (NZ)	0	0	0	3	0	0	23	21	47
	Insurance, Money Market and Statistical Clerks	3	0	0	0	0	5	20	5	33
	Clerical and Office Support Workers, nfd	0	0	0	0	0	0	5	0	5
	Couriers and Postal Deliverers	3	0	0	0	0	0	0	0	3

	Filing and Registry Clerks	5	0	16	0	0	5	36	12	74
	Mail Sorters	0	0	0	0	0	0	5	0	5
	Switchboard Operators	0	0	0	0	0	0	15	3	18
	Other Clerical and Office Support Workers	124	0	12	3	0	11	123	6	279
	Logistics Clerks, nfd	5	0	0	0	0	0	9	0	14
	Purchasing and Supply Logistics Clerks	92	0	102	7	6	37	274	42	560
	Transport and Despatch Clerks	21	0	5	0	0	4	70	10	110
	Conveyancers and Legal Executives	6	0	0	0	0	3	13	0	22
	Debt Collectors	9	0	0	0	0	0	39	36	84
	Human Resource Clerks	27	0	13	5	4	7	147	14	217
	Inspectors and Regulatory Officers	112	0	17	0	0	7	199	11	346
	Library Assistants	0	0	0	0	0	0	5	0	5
	Other Miscellaneous Clerical and Administrative Workers	13	0	5	5	0	16	59	6	104
	Sales Workers, nfd	0	0	0	0	3	0	7	7	17
	Sales Representatives	131	0	19	0	16	15	157	219	557
	Real Estate Sales Agents	5	0	0	0	0	3	14	3	25

	Sales Assistants and Salespersons, nfd	0	0	0	0	0	0	13	13	26
	Sales Assistants (General)	83	0	10	5	12	5	149	177	441
	ICT Sales Assistants	0	0	0	0	0	0	6	13	19
	Motor Vehicle and Vehicle Parts Salespersons	0	0	5	0	0	0	0	0	5
	Retail Supervisors	0	0	0	0	0	0	9	8	17
	Service Station Attendants	0	0	0	0	0	0	4	0	4
	Street Vendors and Related Salespersons	25	0	0	0	0	0	24	11	60
	Other Sales Assistants and Salespersons	0	0	0	0	4	0	0	5	9
	Miscellaneous Sales Support Workers, nfd	0	0	0	0	0	0	0	4	4
	Models and Sales Demonstrators	7	0	0	0	0	0	0	0	7
	Telemarketers	31	0	0	0	7	0	73	93	204
	Other Sales Support Workers	0	0	0	0	0	0	0	4	4
	Machinery Operators and Drivers, nfd	16	0	21	3	0	3	36	0	79
	Machine and Stationary Plant Operators, nfd	0	0	3	0	0	0	5	0	8
	Machine Operators, nfd	19	0	44	3	4	5	16	3	94

	Industrial Spraypainters	0	0	5	0	0	0	0	0	5
	Plastics and Rubber Production Machine Operators	0	0	3	0	0	0	0	0	3
	Textile and Footwear Production Machine Operators	0	0	0	0	0	0	3	0	3
	Other Machine Operators	0	0	4	0	0	0	3	0	7
	Stationary Plant Operators, nfd	4	0	7	0	0	0	4	0	15
	Crane, Hoist and Lift Operators	28	0	22	0	3	4	91	0	148
	Drillers, Miners and Shot Firers	20	0	140	0	0	0	5	14	179
	Engineering Production Workers	6	0	4	0	3	0	0	0	13
	Other Stationary Plant Operators	16	0	57	0	0	0	12	10	95
	Mobile Plant Operators, nfd	0	0	3	0	0	0	0	0	3
	Earthmoving Plant Operators	33	0	41	0	0	0	9	0	83
	Forklift Drivers	25	0	13	0	0	4	39	0	81
	Other Mobile Plant Operators	0	0	0	0	0	0	4	0	4
	Road and Rail Drivers, nfd	0	0	0	0	0	0	6	3	9
	Delivery Drivers	10	0	0	0	5	0	8	15	38

	Truck Drivers	30	0	14	0	5	0	59	29	137
	Storepersons	103	0	73	0	5	18	145	15	359
	Labourers, nfd	20	0	25	0	3	0	15	0	63
	Cleaners and Laundry Workers, nfd	17	0	9	0	0	0	5	0	31
	Commercial Cleaners	35	0	67	0	4	0	22	0	128
	Domestic Cleaners	3	0	9	0	0	0	0	0	12
	Other Cleaners	0	0	0	0	0	0	5	0	5
	Construction and Mining Labourers, nfd	0	0	0	0	0	0	5	0	5
	Building and Plumbing Labourers	13	0	12	4	3	0	20	0	52
	Insulation and Home Improvement Installers	8	0	3	0	0	0	0	0	11
	Structural Steel Construction Workers	26	0	187	4	5	0	17	3	242
	Other Construction and Mining Labourers	0	0	13	0	0	0	9	0	22
	Factory Process Workers, nfd	0	0	0	0	0	0	7	0	7
	Food and Drink Factory Workers	3	0	0	0	0	0	0	0	3
	Packers	5	0	0	0	0	0	4	0	9
	Product Assemblers	24	0	4	0	0	5	0	0	33
	Metal Engineering Process Workers	0	0	8	0	0	0	0	0	8

	Product Quality Controllers	3	0	9	0	0	0	16	3	31
	Other Factory Process Workers	0	0	5	0	0	0	0	0	5
	Forestry and Logging Workers	0	0	0	0	0	0	7	0	7
	Garden and Nursery Labourers	5	0	3	0	0	6	18	0	32
	Other Farm, Forestry and Garden Workers	4	0	0	0	0	0	5	0	9
	Kitchenhands	0	0	3	0	0	0	3	0	6
	Handypersons	9	0	12	0	0	0	8	0	29
	Other Miscellaneous Labourers	95	0	112	7	11	5	151	7	388
	Inadequately described	116	4	105	15	12	33	324	102	711
	Not stated	15	0	9	0	0	0	20	4	48
	Total	8944	212	8007	1095	794	2660	26037	5816	53565