Electricity Privatisation in Australia
A Briefing Note

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1. Original rationale for government ownership and provision of electricity infrastructure remains strong

The original case for continuing public ownership and delivery of electrical generation, transmission, distribution and retail assets remains entirely valid. First, transmission and distribution electrical infrastructure has the characteristics of a natural monopoly, as it is more efficient for supply to be provided by a single investor (Walker 20011: 6). Put simply, it is inefficient for competitors to replicate transmission and distribution infrastructure to supply existing markets. The generation element of electrical infrastructure is highly capital intensive and subject to significant scale economies. For example, to meet normal demand levels lowest cost electricity is supplied by large base load generators. An important implication of this is that each generation unit contributes significantly to overall electrical energy output meaning each unit has a degree of price setting power rather than being just a price taker. In a country such as Australia, with a relatively small demand for electricity, the significant scale economies in generation capacity results in a concentrated oligopolistic industry structure, with a small number of suppliers in most jurisdictions and in some, a single supplier. Also limiting competition is the fact that electricity cannot be transmitted long distances without significant power loss. Almost uniquely as a commodity and energy source electricity cannot be stored and therefore requires large reserves of generation, transmission and distribution capacity to ensure reliable supply in the inevitable, but unpredictable, event of a partial system failure (ABARE 2002). The experience globally and in Australia to date is that private owners of electricity assets require significantly higher returns to invest in, and maintain, the large reserve capacity necessary to achieve best practice standards of supply reliability. There are also significant scale economies in the retailing of electricity, arising from high fixed costs in IT for customer billing systems; marketing; lower unit costs in purchasing electricity in bulk on the market and the benefit of having large and diversified assets to withstand the significant risks for retailers in a privatised electricity market. These characteristics of the electricity supply industry give rise to a concentrated market structure and therefore, market power for private owners to exploit electricity consumers. As the leading US researcher on the global electricity industry Paul Joskow (2008: 22) observes ‘market power is an issue that must be taken seriously since electricity markets have attributes that are conducive to exercising market power’. The key implication of this monopolistic and oligopolistic structure of the electrical industry is that it does not and cannot provide benefits that are argued to flow from textbook models of competition that underpin the case for privatisation. These models assume for example innumerable numbers of suppliers; absence of risk; costless entry and exit of suppliers and perfectly informed consumers.

Secondly, electrical supply is a networked infrastructure, as it requires the integration of several types of discrete infrastructure investment (generation, transmission, distribution and retailing) and as such is most efficiently supplied by a vertically integrated entity. Vertical integration, or the ownership and control of investment by a single entity, avoids problems in co-ordinating both short run demand and supply for electricity and long-range planning of investment decisions for expensive, long-lived integrated assets. It also avoids the inevitable litigation and cost-shifting that arises if unrelated and competing entities control separate parts of the electrical infrastructure. The strength of the economic logic for vertical integration is clear from the fact that when government electricity assets are privatised the global experience, including that in Australia, is that over time different firms owning discrete elements of the system, say generation and distribution assets, merge to realise a variety of efficiency gains. The vertical disintegration of public monopolies into competitive

units was an integral element in the Hilmer Report into national competition policy, which has informed subsequent government privatisation policy. (Report by the Independent Committee of Inquiry 1993: 218-220). Subsequent experience has demonstrated across multiple industries that this was a poorly conceived policy.[1]

Thirdly, electricity is an essential service for consumers, commerce and industry. Because of this and, also because there are few practical substitutes for electricity, it has a low price elasticity of demand. Consumers are prepared to pay for supply even when prices are raised to very high levels. This is another important factor creating market power for private owners of electricity assets. In addition, as an essential service electrical supply, at least in government ownership, is subject to universal provision - it is delivered nationwide even to regional and remote locations which would otherwise be uneconomic to service.

In summary, the electricity supply industry has the characteristics of a natural monopoly and oligopoly; there are large efficiency gains from vertical integration of supply; and there is a low price elasticity of demand for the final output. Inherent in a commodity with these characteristics is the potential for significant abuse of market power by private owners. Historically and to the present, the objective of government in the ownership of electricity infrastructure is to supply an essential service at a reasonable cost; its objective is not to maximise profits that can be generated by these assets. Ultimately, under government ownership and operation infrastructure monopolies, in terms of pricing, reliability and adequacy of investment, are subject to the political and democratic process.

Given these characteristics the global and Australian experience of privatised electricity markets is not a textbook model of competition, instead, there is an oligopolistic market dominated by 2-4 principal regional players, each exercising considerable market power. Households are in no position to bargain with oligopolistic suppliers. Moreover, as occurs in many other highly concentrated industries such as insurance, financial services and telecommunications, offers to consumers from suppliers are difficult to compare and intended to obfuscate. [2]

Given these industry characteristics privatised electricity markets, in Australia and globally, are subject to government regulation. Ironically, much of the regulation is designed to replicate the type of co-ordination of supply and demand; forward planning and standardisation of infrastructure design and investment that existed under direct vertically integrated public ownership and provision. Moreover, such regulation is intrusive and costly to administer. It is also only partially effective. This is due to a number of factors. First, responsibility for regulation is spread across a number of different agencies, states and territories. Second, as occurs in all regulated private oligopolies, private owners know more about the state of their asset base and their true costs of production, productivity and

[1] The Western Australian government recently announced it would move to re-integrate its publicly owned electricity assets.

[2] In the UK the government consumer advocate concluded that after 10 years of electricity privatisation the notion of informed consumer choice remains illusory as many consumers make the decision to switch suppliers 'on the doorstep with little or no useful information'. They also found that 'large numbers of consumers who switch supplier do so to more expensive energy deals;...42 per cent of electric customers did not achieve a price reduction when switching supplier in response to a doorstep sales pitch' (Consumer Focus 2011: 4). The complexity in comparing electricity prices across different retailers has been identified in numerous studies; though to date none would appear to have investigated the extent to which consumers actually benefit from switching suppliers (Ernst & Young 2012; Consumer Affairs Victoria 2012).

profitability than regulators. Experience to date is that Australian regulators are constantly having to play regulatory 'catch-up' with agile, entrepreneurial firms that have the resources to constantly test and litigate, where necessary, the boundaries of regulatory control. The Australian Energy Regulator (AER) is highly critical of the behaviour of participants in the electricity market, accusing them of abusing their inherent market power. For example, the regulator finds that generators withhold supply to drive up prices in periods of peak demand and use 'strategic pricing' to exclude new competitors from entering the market (AER 2011). The only instrument the Regulator has to encourage firms to invest in new supply capacity (when it can be otherwise in their interest to limit supply) and meet other targets, such as reliability of supply, is to ensure that electricity prices are sufficiently high to generate revenue equal to or above the private 'hurdle rate' of return. The private rate of return is substantially higher than that required by government. Private owners of electricity assets and some governments are pushing strongly for complete deregulation of electricity supply markets.

These and other issues arising from privatisation are outlined in this short briefing note.

2. Retention value of electricity assets in government ownership greatly exceeds sale value.

Numerous studies have shown that the returns to the taxpayer in retaining public ownership of electricity assets greatly exceed returns from sale of the assets (Walker and Conn Walker 2008; 2011b).

Direct financial returns to the taxpayer are comprised of several elements. The first are profits made by utilities plus several other payments to government that are required to be identified under the 'competitive neutrality' provisions of national competition policy. These are intended to level the playing field between government and private businesses competing in the same industry. These separate payments include income tax equivalents (to offset the fact that government trading enterprises pay no company tax); loan guarantee fees (to compensate the state government for acting as guarantor on debt raised by utilities) and an equivalent to the interest rate differential between the lower interest rate actually paid by government electricity entities compared to the higher rate paid by privately owned electricity firms. The latter offsets the advantages public sector entities have in raising capital from private financial markets compared to the costs incurred by private firms competing in the same capital market. These separate payments made under competitive neutrality rules are really profits paid to government under a different description.

First, State government electricity assets are highly profitable and make a significant contribution to state revenues. In 2010-11 the direct financial return to the NSW government was $1.54bn, comprised of net profit of $1.05bn and $.49bn in tax equivalent payments (derived from NSW Commission of Audit 2012: 190-194). The net assets of NSW government electricity entities in 2010-11 were valued at $9.4bn, so that the return on net assets is 16 per cent. This rate of return is likely to be 'conservative...because of the way that NSW government businesses have valued plant and equipment assets by reference to current replacement values rather than historical cost - as is customary for listed public companies' (Walker and Conn Walker 2011b: 8-9). Aside from the large magnitude of these payments an important feature of these returns is that these 'cash flows from the State's electricity businesses are relatively stable (and increasing) – in contrast to the volatility of the State's revenues from property taxes – and hence actually enhance the State's capacity to borrow for new investment in infrastructure' (Walker and Conn Walker 2011b: 12).

Second, the net return to the state from sale of the assets will be quite modest due to the fact that most of the proceeds from a sale will be used to pay off debt accrued over the last decade to fund massive investment in electricity infrastructure. If retained under public ownership, over time, these investments will be paid off and the profits from the state entities will rise significantly. Indeed, under current regulated pricing arrangements within the national electricity market there is a guaranteed return on infrastructure investment (Garnaut 2011: 39-46). Despite failing to demonstrate how its figures were arrived at, Infrastructure Partnerships Australia, a lobby group promoting privatisation, estimates the sale of NSW government electricity assets would realise between $29 billion and $34 billion to NSW taxpayers (NSW Commission of Audit 2012: 206). However, this is just a gross return from sale of the assets as offsetting this is that the state government needs to repay liabilities of $22.4bn, mostly debt incurred to fund large scale infrastructure investment over the last decade. Accordingly, the net proceeds from sale of the electricity assets are only in the range of $6.6-$11.6bn. In other words, highly profitable electricity assets would yield in a range that is either substantially less than the net asset base or only marginally above it. Sale of the assets yields only very short term gains. Depending on the actual range of projected sale prices achieved it

would only take between 4.3 years and 7.5 years for the ongoing profits of the government electricity entities to exceed the net sale price. Expressed another way, if the NSW government electricity assets were a publicly listed company the owner would be prepared to sell these highly profitable assets for a price-earnings ratio (assuming the share price is equivalent to net assets and earnings are equivalent to net profits) in the range of just 4.3 to 7.5. The price earnings ratio of all shares on the Australian Stock exchange is currently around 15. Similar results obtain in other states. Quiggin (2002:12) found the fiscal impact on the Victorian government from electricity privatisation in the 1990s was more or less neutral as 'the interest savings realised by selling the assets were about equal to the earnings those assets would have generated under continued public ownership'

Third, it is argued that government needs to sell electricity assets to either repay debt or to 'release capital for pressing investment needs in other areas' (NSW Commission of Audit 2012: 206). It simply makes no sense to sell assets that are yielding at least 16 per cent profit to repay government debt when interest charges on this debt are less than one-third the rate of profit. For example, NSW Treasury Corporation issues Waratah Bonds to fund infrastructure and these yield just 4.25 to 5.10 percent depending on the term. Moreover, it makes even less sense to sell off highly profitable assets and invest the proceeds in what are in effect, loss making, though essential services, such as rail and road infrastructure. These should be funded through taxation and debt. It is important to note that all investment by state electricity entities is fully funded through its own revenue and they make no call to fund these investments on the states' taxpayers.

Fourth, related to the last point the large net asset base of the state's electricity entities, valued conservatively at over $9bn, contributes significantly to the assets side of the state's balance sheet making it easier for the state government to borrow at low interest rates and retain a favourable credit rating.

Finally, the State government is itself a major consumer of electricity, spending several hundred million dollars a year purchasing electricity from an entity which it not only owns but returns a profit to itself. For example, Rail Corp spent $72m on bulk electricity purchases in the last financial year (Rail Corp Annual Report 2010-2011: 75) and the NSW Department of Education spent $99m on 'utilities' (excluding 'telephone and postage') over the same period (NSW Department of Education Financial Statements 2010-11: 407). By retaining the assets government effectively internalises the expenditure and revenue to the direct benefit of taxpayers. By retaining the assets not only is government increasing its revenue base (by returning a minimum of 16 per cent of its electricity expenditures as profits) it is also adding significantly to growth in its net asset base by helping to pay off infrastructure investments.

3. Three fallacies of electricity privatisation

Proponents of the case for privatisation of electricity assets typically do not directly address the strong arguments for government ownership and operation of these assets; instead they focus on three separate arguments. These arguments are fallacies on both an empirical and theoretical level.

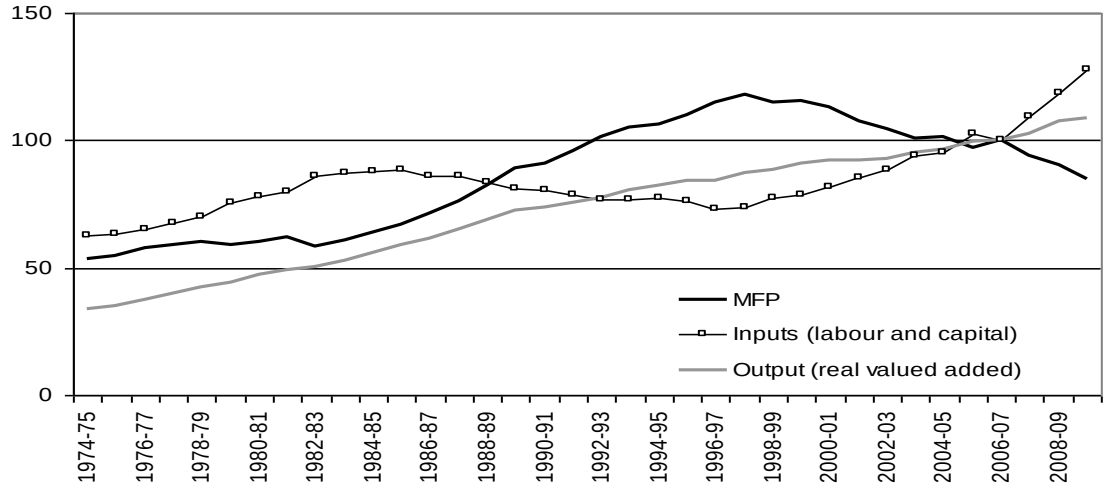
Productivity 'miracle' of the 1990s and lower prices

The privatisation of government electricity assets in states such as Victoria over the 1990s is held up as an outstanding example of the productivity enhancing benefits of micro-economic reform (Moran 2002; NSW Commission of Audit 2012). There was indeed a large rise in productivity over the 1990s, but it is also evident the 'productivity miracle' was a temporary aberration that collapsed over the course of the 2000s (Figure 1). Researchers with the Productivity Commission (Topp and Kulys 2012) investigated these productivity trends and found that large investments by government over the 1980s prior to privatisation created large reserve capacity that allowed subsequent private owners to significantly cut capital expenditure over the 1990s. There were also large reductions in employment and maintenance expenditures as the newly privatised firms were under enormous financial pressure to repay high debts incurred in purchasing the public assets. Productivity is defined as the ratio of inputs to outputs and measured productivity increased over the 1990s as annual increases in electricity output were able to be met despite private owners significantly cutting capital and labour inputs.

Inadequate maintenance and aged distribution infrastructure were found to be important factors in the Victorian bushfires of February 2009 'when five of the 11 major fires that began...were caused by failed electricity assets; among the fires was that at Kilmore East, as a result of which 119 people died' (Victorian Bushfires Royal Commission 2009: 148).

However, over the 2000s there has been large increases in capital investment and employment in the electricity sector. This was required to compensate for delayed spending on maintenance and for reliability and capacity improvements. (This is evident in the large rise in capital and labour inputs over the last decade). Due to this surge in necessary inputs without a corresponding surge in electricity output over the last decade there has been a sustained decline in productivity. (The level of multi-factor productivity is now at the same level it was in the mid 1990s). It is also evident from Figure 1 that the rate of productivity increase over the course of the 1990s, a period of intense privatisation, was no greater than that in the 1980s, prior to privatisation.

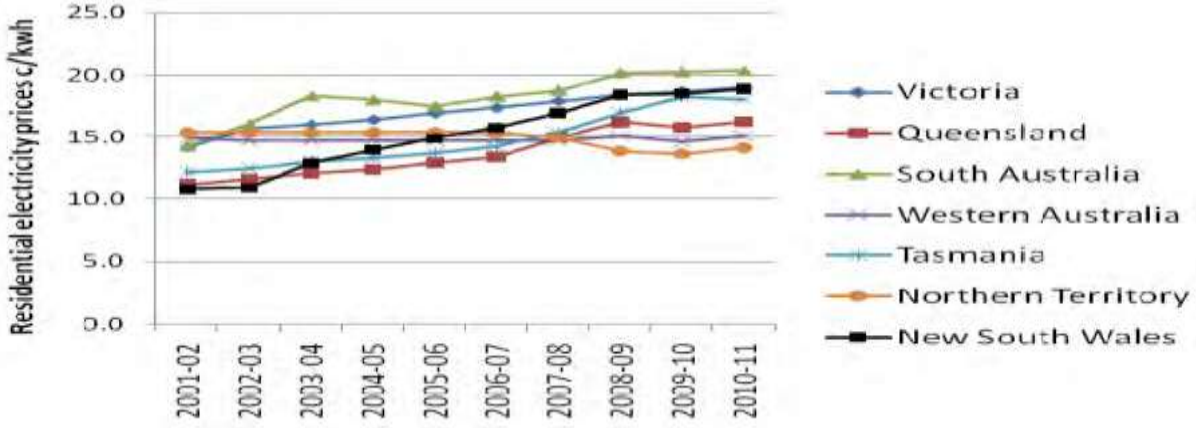
Figure 1 : Electricity supply: inputs, output and multifactor productivity, 1974-75 to 2009-10 Index 2006-07 = 100



(Topp and Kulys 2012: xx)

It is simply not the case that states in which electricity assets have been wholly or substantially privatised have significantly lower electricity prices. For example, over the 2000s residential electricity prices in Victoria were over one third higher than in NSW at the beginning of the decade and a substantial divergence was maintained until the end of the decade (Figure 2). NSW electricity prices increased largely due to a massive increase in capital expenditure from the mid 2000s. South Australia, which has a fully privatised electricity industry, has the highest prices of all states.

Figure 2: Residential electricity prices X state 2001-2011



Source: NSW Commission of Audit (2012:196)

Again, contrary to the advocates of privatisation, Simshauser et al (2010: 2) has shown that under public ownership 'the history of power prices in NSW has been one of continual downward trend over the last 50 year period between 1955 and 2004...This reflects a range of factors common to the east coast of Australia including technological advances of power generating systems, substantial increases in the scale of plant...and improvements in the aggregate system load factor arising from mining and manufacturing sector loads'. The real

(inflation adjusted) price of electricity was 346 per cent higher in 1955 compared to 2004. The price per Megawatt in 1955 (expressed in 2004 dollars) was $267 compared to $77 in 2004.

Reduce High State Debt

A key reason advanced for privatisation is to use the sale proceeds to reduce high state debt. This is an unsound basis for public policy as Australian state government debt 'levels are miniscule in comparison to those of many developed countries in the OECD with an average of net debt to GDP of more than 62%' (Walker and Conn Walker 2011: 2). Australian Commonwealth government debt to GDP was just 11% in 2010 (OECD 2012). NSW Government Budget Papers reveal that NSW General Government net debt as a ratio of Gross State Product was just 3.0% in 2011-12 and this will at peak of 4.1 per cent in 2013-14 before easing to 3.9% in the following year (NSW Government 2012: 10). The suggestion that state governments are burdened by excessively high debt levels that require the sale of profitable assets is a fallacy. It was shown in the previous section that the returns to the taxpayer from retaining electricity assets exceed by a considerable margin returns from sale.

Excessive risk to taxpayers in continued public ownership

It is also suggested that in a market that is both substantially privatised and subject to competition the risk to government in retaining electricity assets is unacceptably high (Smith 1997: 48). This argument is fundamentally flawed for a number of reasons. First, even if government disposes of all its electricity assets and the system is fully privatised the state cannot remove itself from the 'risk' of assuming responsibility for continuity of supply of this critical economic input. For example, in the event of the bankruptcy of major private electricity providers which threatened electricity supply the state would be required to either buy back the assets in full or become a temporary lender of last resort to the bankrupt firm to ensure the 'lights stay on'. This is no idle possibility; over the last decade in the UK the taxpayer provided billions in soft loans to the privatised entity British Energy, which supplies 20 per cent of the market, when threatened with bankruptcy.
(http://www.telegraph.co.uk/finance/2864759/Deal-keeps-lights-on-at-British-Energy.html).
Within Australia, a private transmission company as a result of the 2009 Victorian bushfires is facing a class action potentially running into billions of dollars.
(http://www.mauriceblackburn.com.au/areas-of-practice/class-actions/current-class-actions/bushfire-class-action.aspx). By retaining these assets the government can better manage the risks.

Second, whilst the degree of financial risk to all parties, including consumers and taxpayers, has increased under privatisation, there is no demonstrable offsetting benefit to taxpayers and consumers arising from either greater efficiency of the sector or lower prices.

Third, advocates of privatisation simply do not explain why the private sector is better placed than the public sector to withstand financial risks. The public sector can borrow from private capital markets to fund electrical infrastructure and other investments much more cheaply than the private sector. This is an unambiguous signal that private financial markets regard the public sector as much better placed to manage financial risk (Quiggin 2002).

Privatisation has significantly elevated the degree of risk for producers, consumers and government. There are a number of source of elevated risk in the current system. The first

risk arises from the high level of indebtedness of private owners. Under public ownership the value of the assets of electricity entities significantly exceeded debt required to fund infrastructure investment. In other words, there was substantial net equity and debt levels were not only easily funded from customer revenue but the entities paid substantial dividends to the government. When purchased by private firms the full value of these assets plus a margin for future revenue stream is converted to debt. These high debt levels expose private owners to a variety of elevated financial risks. (Some of these are detailed below). Another factor that imposes higher risks and, therefore, costs on private entities seeking to raise debt or equity for investment in the electricity industry is that '*private investors may expect additional returns as compensation for 'regulatory risk, that is, the possibility that the rules of the National Electricity Market may be changed in a way that reduces their profitability. Under public ownership, regulatory risk is 'internalised'. That is, if a government directs a public enterprise to keep prices low, it bears both the costs, in the form of lower earnings, and the benefits, in the form of lower prices to electricity users, who are also voters or employers*'. (Quiggin 2002).

Second, in the period under full public ownership electricity supply prices were managed through long-term fixed price supply contracts between entities under a single ownership structure. This meant there was no incentive or scope for one party, such as a generator to attempt to gain at the expense of an unrelated party, such as a retailer. Under the current system pricing is far more volatile as retailers have to purchase electricity from the wholesale spot market on which prices fluctuate greatly over short periods, However, the prices retailers charge consumers, in most jurisdictions, are set periodically by state regulators. (Wholesale prices are set on the spot market every five minutes). Trading of electricity supply through the wholesale market exposes retailers to the prospect of bankruptcy in the event that the contracted supply price with customers is significantly different from wholesale price. The latter can arise from sustained spikes in wholesale prices caused by excess demand (due to unseasonal weather) or a physical system failure. Another cause of price volatility identified by the Australian Energy Regulator is price manipulation by market participants. (This is examined later). To try to limit their risk exposure retailers have recourse to hedging, but this is both an additional cost to the system and does not eliminate risk altogether. (As revealed by the GFC, hedging and derivatives can actually increase systemic risk). Private owners are also replicating the previous pattern of vertical integration under public ownership by merging generating and retail assets (and fuel suppliers) to reduce the risk of price volatility.

Third, the risk of physical failure of electrical infrastructure was lower under public ownership as there was considerable political imperative to 'keep the 'lights on' and, consequently, sufficient reserve generation and transmission capacity to withstand reasonably foreseeable failures. Quiggin (2002) argues that 'whereas the spare capacity maintained by public infrastructure enterprises may have been excessive, private enterprises tend to maintain too little capacity, reflecting the fact that most of the costs of systems failure are borne by the Community as a whole'. Another reason for the preparedness of the public sector to ensure high levels of reserve capacity was that, to a degree, it could control the level of demand for electricity in the economy to ensure that over time supply capacity was not too excessive. It could do this, for example, by encouraging the development of energy intensive industries, as occurred over the 1980s in NSW and Victoria, where large public investment in new generation capacity was co-ordinated with large private investment in aluminium and other minerals processing industries. Private entities are not similarly able to promote and co-ordinate this pattern of economic development.

Remarkably, the Draft Energy White Paper acknowledges these and other risks, and the danger they represent to an efficient and reliable energy supply, yet it does not explain how these risks will be efficiently managed by private electricity entities- it simply assumes or hopes they will be (ASU 2011). For example, the White Paper notes that under the current system 'a properly functioning forward contract market is essential to the smooth functioning of Australia's electricity sector and helps participants manage risk. However, overall levels of exposure and risk resulting from financial transactions are not well understood'. It goes onto to observe the possibility of financial 'contagion and the spread of systemic risk' through these complex financial instruments and international financial crises like the GFC (Department of Resources, Energy and Tourism 2011: xxi). Despite the threat of systemic risk and the fact that these risks 'are not well understood' the Draft White Paper recommends complete privatisation of the electricity system. As noted above, government as an owner and provider of the electricity system is in a much better position to manage these financial risks given its capacity, if necessary, to raise revenue across the whole community through the tax system and to spread these financial risks across decades and indeed, future generations if needed.

The Draft Energy White Paper also notes the risk that under private ownership of electricity assets there will be inadequate investment in R&D and 'a failure to commercialise key technologies in a timely fashion' (Department of Resources, Energy and Tourism 2011: xxii). R&D and commercialisation 'is critical so that markets have access to an earlier and wider set of options. This can reduce the potential future cost of technology lock-in. We will also benefit from earlier understanding around key technologies so that policy-makers and business can plan ahead and adjust if required'. Despite these large benefits, it is well-established that private markets under-invest in activities such as R&D that is critical to improving the productivity of the industry. This is due to the inability of individual firms to retain for themselves the benefits of their investment in new knowledge and more efficient practices. (New knowledge is embodied in workers and workers are mobile; patent registrations are also an efficient means of transmitting new knowledge as well of protecting it). The solution of the White Paper is to shift the financial burden for undertaking R&D onto the taxpayer. It cites the following government R&D activities as central to ensuring an efficient privately owned electricity sector: 'future success in large part will entail research, development, adaption, demonstration and commercialisation of clean energy technologies. Initiatives such as the Australian Renewable Energy Agency, the Carbon Capture and Storage Flagships Program and the Clean Energy Finance Corporation will be essential to realising this' (Department of Resources, Energy and Tourism 2011: xxii). In other words, the taxpayer is expected to fund R&D that will directly benefit private firms by developing new cleaner and more efficient technologies. Under previous public ownership not only was the level of R&D substantially higher but the benefits of increased efficiency were passed onto consumers by way of lower prices and enhanced general government services funded through higher dividends (The topic of R&D is taken up in more detail later).

Finally, the White Paper notes that one method used by private entities to control risk is to vertically integrate. Retailers are merging with generators in order to limit the adverse effects of wholesale price volatility and 'vertical integration of positions' is occurring 'in the electricity and upstream gas markets'. Vertical integration of fuel suppliers and generators is a way of limiting demand risk for fuel suppliers (as they control the purchasing decisions of the fuel buyer) and a way of creating substantial market power for generators as they can source strategically priced fuel supplies and so out-compete generators that have to buy fuel on the open market.

Paradoxically, vertical integration by private entities in downstream and upstream electricity industry is replicating the vertical integration that existed under full public ownership and control. (State Electricity Commissions used to own coal mines to supply fuel for generators).[3] In other words, this is a clear demonstration of the economic superiority of the pre-existing model. However, under private ownership this market power is directed at profit maximisation, not the supply of an essential service at reasonable cost. (It was noted earlier the long run real price of electricity under public ownership had declined enormously). Indeed, the White Paper notes the considerable risk vertical integration of private electricity assets presents to the objective of increased competition. Vertical integration raises the barriers to new entrants investing in 'each of the market sectors – retail, generation, and gas exploration and production' (Department of Resources, Energy and Tourism 2011: xxii).

There is a considerable degree of incoherence in current public policy for the electricity industry. On the one hand it deliberately and knowingly increases risk by privatising electricity assets and creating a competitive environment, but it also endorses moves by private owners to limit these risks by vertically integrating and thereby limit the degree of competition and risk. Limiting the risk of private electricity providers increases the risk that market power will be abused. Joskow (2008: 35) notes the 'trade-off' regulators face in privatised electricity markets in condoning increased market concentration to limit the risk to firms but in so doing increasing the risk to consumers and overall market efficiency- 'if there is significant market power in the upstream or downstream markets, vertical integration could lead to a further reduction in competition by increasing the operating or entry costs of rival retail suppliers'.

[3] A factor in rising electricity prices in the privatised market is increased fuel costs. Private owners of fuel sources such as thermal coal or gas will seek to maximise returns by insisting on export parity pricing (equalising domestic and export prices) if the latter is above the former. Under full public ownership vertically integrated entities not only had security of supply, since they owned mines, but prices were set at cost of production.

4. Privatisation results in a major reduction in training of trades and gives rise to skill shortages. Privatisation adversely affects the level and type of R&D.

The evidence is that privatisation of electricity assets results in a reduction in investment in apprentice training. Table 1 indicates that publicly owned firms have a much higher level of annual apprentice intake compared to privately owned electricity distributors. Private firms seek to minimise expenses by reducing training and rely instead on sourcing skilled labour from the external labour market. Bonuses and other forms of remuneration of senior managers in privately owned entities are frequently tied to achieving reductions in the ratio of expenses to revenue. When this is linked to relatively short job tenure of senior managers this creates a powerful incentive for short term cost cutting that, from a medium term perspective, can prove to be quite damaging to performance.

Table 1: Apprentice Recruitment 2010-11. Public and Private Electricity Distributors. NSW and Qld.

Publicly Owned	Number Recruited 2010-11
Ausgrid	153
Endeavour	60
Energex	76
Ergon	61
Essential	102
Horizon	0
Western Power	0
Public Average	*65*
Privately Owned	
Actew/AGL	42
Alinta	0
Aurora	47
CitiPower	19
Power and Water	21
SP Ausnet	0
Private Average	*22*

Source: ASU 2011: 8. Based on Annual Reports.

The transfer of ownership of major electricity assets to the private sector and the consequent reduction in apprentice and other forms of training, such as cadetships for persons undertaking engineering degrees or other training positions for young newly qualified engineers, is a major cause of skill shortages in electrical trades and technicians and electrical engineers (Denniss and Toner 1999). Recently Fairbrother (2012) has documented the loss of permanent jobs in privatised electricity assets and the shift to complex chains of sub-contracting for maintenance and production, often involving very small firms on short term or casual contracts. These forms of employment are not conducive to either employers or individuals investing in skills.

Not only are government owned utilities, such as electricity entities, more likely to employ apprentices, and in relatively greater numbers, than privately owned electricity entities, they are also much more likely to have these apprentices complete their training. Recent research by the National Centre for Vocational Education and Training (Karmel and Roberts 2012: 13) into differences between government and private entities employing apprenticeships found

that ‘the effect of employer type is large. Government-employed apprentices have a completion rate 28.5 percentage points higher than privately employed apprentices.’ The average completion rate for apprentices employed in the private sector is just 49% compared to 78% in government entities.

These efficiency gains in training, arising from high completion rates in government entities, will be substantially lost as more government assets are transferred to the private sector.

One factor in the greater investment of publicly owned electricity entities in apprenticeship and other training is that these entities, even when corporatised, retain multiple objectives. Aside from the cost effective delivery of essential services; these entities are also required to consider the implications of their activities on regional development; development of strategic industries and workforce development. Of course, prior to corporatisation these public utilities were even more committed to achieving these diverse goals (Toner 1998).

A similar argument applies to R&D expenditure. Investment in R&D is critical to ensure firms operate close to the technological frontier and to improve overall efficiency of the electrical supply system. The Institution of Engineers Australia (1999: 5) concluded of privatisation and corporatisation that ‘studies done by the Institution indicate that one of the major issues has been the loss of R&D within the utilities and large government instrumentalities’. Similarly, a House of Representatives inquiry into the effects of privatisation found that the changed ownership of the electricity industry reduced R&D spending significantly (Parliament of Australia 1999). Vertical disintegration reduced the ‘critical mass’ necessary for R&D. There is a strong positive relationship between increases in firm size and the probability of undertaking R&D and the intensity of R&D or R&D expenditure as a share of revenue. The smaller, disaggregated firms have less capacity to fund R&D relative to their larger, publicly owned predecessors. The substantial foreign ownership of privatised electricity assets is another factor reducing R&D spending as it is well established that most of the R&D undertaken by multinational corporations is in the global head quarters. Another factor identified in the Parliamentary inquiry is decreased willingness of the private firms to co-operate; either with each other or with external R&D agencies, for fear of sharing valuable information with competitors regarding technological advances or letting competitors knows the true state of their technological assets and productivity. Finally, privatisation also altered the objectives of R&D from public benefit to private profit as private firms are unwilling to undertake R&D that is of a ‘public good’ nature, that is, R&D directed at benefitting the electricity supply industry as a whole and/or electricity consumers generally. For example, less investment occurs in R&D designed to improve system wide efficiency and reliability or address system wide environmental problems, as opposed to R&D that achieves efficiency or other gains that can be retained for the benefit solely of the private firm that undertakes the R&D. The reluctance of privatised electricity sector to invest in R&D and demonstration plants for carbon capture and storage experiments is a clear example of this mechanism at work. The financial burden of undertaking this R&D been shifted to the taxpayer, who funds virtually all of this activity. As Ross Garnaut (2011: 2) notes in regard to investment in low emission technology in the Australian electricity industry ‘there is too little private investment in innovation generally in the absence of public fiscal support’.

5. The electricity regulatory system exposes abuse of market power but also creates perverse incentives for private investors that undermines efficiency, reliability and equity

The most recent report on the *State of the Energy Market 2011* by the Australian Energy Regulator (AER 2011) identifies significant abuse of market power in an infrastructure system comprised of private monopolies and oligopolies.[4] Second, it describes the significant constraints in the regulatory system in which the prime mechanism to get private investors not to abuse their market power and ensure efficient and reliable electricity supply is, in effect, to give them large financial incentives or pay them off. Finally, it exposes the perverse incentives in the regulatory system which undermines efficiency and reliability.

The actual abuse of market power inherent in a concentrated privatised electricity market has been extensively research and documented overseas. A study by the Australian Bureau of Agricultural and Resource Economics found that in the 'European Union, the United States and the countries in South America that began restructuring in the 1980s...evidence has been increasing that not only is there significant potential for firms to exercise market power, but that generators do exercise that market power through strategic bidding' (ABARE 2002: 11)..

More recently the AER (2011: 15) identified significant levels of price manipulation, or what it refers to quaintly as 'financial optimisation' in the Australian electricity market. It finds that 'short term fluctuations in spot prices do not always reflect the underlying cost of generation' rather they reflect 'strategic bidding' causing 'sometimes....very high or very negative prices' (AER 2011: 4). Wholesale electricity prices in Australia are regulated with a floor price of -$1000 and a ceiling of $12500 per Megawatt hour (AER 2001: 33). Strategic bidding of very low prices, close to or at the regulated floor price, is intended to 'discourage entry by competing independent generators and retailers' (AER 2011: 13). Conversely, the regulator documented cases of market manipulation such as 'very high average spot prices in South Australia, from 2007- 08 to 2009' achieved by the 'strategic withholding of generation capacity by AGL Energy..[during] periods of sustained high demand' over hot summer months (AER 2011: 13-14).

The source of market power and the cause of price manipulation is the inevitable concentration of ownership, especially in a relatively small electricity market such as Australia (ABARE 2002: 11). This concentration is an inherent outcome of an industry in which there are high barriers to entry created by high capital cost of infrastructure (limiting the number of firms that can raise large sums on capital markets); the infrastructure is subject to large economies of scale and output of the industry is subject to low price elasticity of demand. An example of this concentration is that 'in NSW Origin Energy, AGL Energy and TRUenergy now jointly supply over 80 per cent of small electricity retail customers, and they control almost 30 per cent of generation capacity in the mainland regions of the NEM [national electricity market] ...Around 58 per cent of new generation capacity commissioned or committed since 2007 is controlled by Origin Energy, AGL Energy and TRUenergy' (AER 2011: 4). The regulator is concerned that the private electricity market is becoming even more concentrated due to the vertical integration of retailers and generators and gas suppliers. As explained earlier vertical integration is an efficient means of controlling the risk faced by retailers of excessive volatility in wholesale spot markets that would otherwise have to be managed through hedging. 'While it makes commercial sense for the entities concerned,

[4] The Australian Energy Regulator sets the prices for transmission and distribution assets; monitors wholesale electricity prices and in some states regulates retail electricity prices (http://www.aer.gov.au/node/449).

vertical integration reduces liquidity and contracting options in futures markets. It thus drives up energy costs for independent retailers and may pose a barrier to entry and expansion for both independent generators and retailers' (AER 2011: 4).

Under a fully privatised electricity system the only mechanism open to regulators to ensure adequate investment and continuity of supply is to set a sufficiently high price. Given demonstrable and significant market power a recent worrying development was the 'threat by AGL to cease supplying electricity into NSW given suggestions by the NSW electricity pricing regulator emulate the pricing decisions of the Queensland pricing regulator (Sydney Morning Herald 'AGL will halt power sales if prices are set too low' Business section p.3 Thursday August 23, 2012).

Second, the AER indentifies a systemic problem in a privatised electricity market as the electricity system is an integrated network and its efficient operation requires the co-ordination of each element in the system. Once privatised however, the individual owners of these elements act only to maximise their own profits; this can significantly reduce the efficiency of the entire system and raise consumer costs. (Under full public ownership and provision co-ordination is inherent in the system as there is no financial incentive for one element of the system to gain at the expense of another, to cost shift or to be indifferent to the financial ramifications of its behaviour on another element). The AER gives an example of problems in the transmission network, which carries power from generators to distributors. An outage caused by a fault or by maintenance on the transmission network can result in 'network congestion', or limit the flow of power from particular generators to the network. In turn, congestion gives other generators temporary 'market power' and can increase consumer costs. Private owners of transmission networks that have no financial ties to generators or retailers are indifferent to the costs imposed by their network outages on generators and consumers. To address this problem in 2008 the AER had to create a large 'incentive mechanism' for transmission networks to improve the reliability of their networks and 'encourage network owners to account for the impact of their behaviour on the market...The mechanism permits a transmission business to earn an annual bonus of up to 2 per cent of its revenue if it can eliminate all outage events with a market impact of over $10 per megawatt hour' (AER 2001: 63).

The fundamental problem confronting regulators is that in an industry which inherently generates considerable market power and, where the wholesale electricity price is set on spot markets, it is in the financial interest of private electricity providers to limit supply and thereby raise prices. To induce private investors to meet the electricity power needs of the economy regulators must set a supply price for electricity that is equal to above the private 'hurdle' rate of return based on a comparison of returns achieved on all other asset classes adjusted for their relative risk. The private hurdle rate of return required to induce investment in electricity assets is high and much higher than that required by public sector for investment in electricity assets. There are two key factors driving the high private hurdle rate. The first was noted earlier and is that financial markets add a large risk premium to private debt compared to public debt. Quiggin (2002: 4-5) identifies 'a typical risk premium of four to six percentage points higher than the [government] bond rate...demanded by private equity investors in return for taking on risk'. Secondly, an additional premium is demanded by private investors in electricity assets as these have a number of features that make them more risky compared to alternative investments (ABARE 2000). Electricity assets have a very high capital cost; they are also long lived assets and this, in turn, requires borrowing over a long period of time, typically financed by 'rolling over' debt, or refunding over regular intervals,

say every 3-5 years. Because of uncertainty about future interest rates this raises the returns demanded by private investors. There is also regulatory risk from possible adverse changes to the 'rules of the game' after an investment has been made. For example, if the regulator sets electricity prices too high it will attract excessive investment which can lead to excess supply and make some plants uneconomic. Demand for electricity is also notoriously difficult to predict. Sustained periods of low economic growth can result low demand for electricity that can make newly installed electricity infrastructure unprofitable. Technological change can make particular plants redundant before they have reached the end of their economic life. Given these considerable uncertainties it has been estimated that for private investors in electricity assets in Australia the 'real cost of capital is likely to be in excess of 15 per cent per year' (PSIRU 4). The public sector can borrow on the private debt markets for 4-5 per cent. The Draft Energy White Paper states that '*the footloose and competitive nature of foreign capital emphasises the need for Australia to maintain attractive and stable investment and policy frameworks. This includes ensuring that energy markets provide the opportunity for commercial returns'.*

Indeed, Australian government electricity assets have proven quite attractive to both overseas governments and private investors. (Appendix 1 lists the ownership of Australian generation, transmission and distribution assets within the national electricity market). For example, offshore investors include the government of Singapore (through Temasek Holdings, the Singaporean sovereign wealth fund and Singapore Power, a publicly listed company but 100% owned by Temasek), China Light and Power, Spark Infrastructure (formerly known as Cheung Kong Infrastructure), French company GDF Suez, Tokyo Electric Power Company and China Huaneng Group. These foreign investors own a large number of assets across the Australian electricity supply chain. An important implication of foreign government ownership of these assets is that, in contrast to neoliberal advocates within the governments of Australia, overseas states obviously do not regard their ownership of Australian electricity assets as either excessively risky from a commercial point of view nor an impediment to competing against fully privately owned electricity entities.[5] There is also significant overseas private ownership of Australian electricity assets. Overseas ownership of these assets adds significantly to Australia's foreign debt, due to the repayment of interest and principal and the fact that the purchase of existing electricity assets is achieved primarily through debt rather than equity. The repatriation of interest, principal and profits also contributes to Australia's unsustainable current account deficit as there is no offsetting export income from electricity assets as both production and consumption of electricity occurs solely within Australia. Secondly, the economic benefit to Australia from the high level of foreign ownership of electricity assets is unclear. For example, the bulk of the investment would appear to be in existing assets and does not contribute to expanding new capacity. In addition, it is sometimes argued that overseas owners can transfer more efficient technologies and practices. This is an empirical question, though the evidence to date on productivity is unconvincing.

Finally, private firms operate under financial incentives that can result in capital investment decisions that, from the point of view of the final consumer, are neither efficient nor necessarily in the public interest. Particular focus has been on the growth of private investment in 'peak' generation capacity. Peak generation capacity is required to meet

[5] It is interesting to note that the Singaporean government, a major holder of Australian privatised electricity assets, retains a public vertically integrated monopoly for electricity supply in Singapore. Singapore Power was a government electricity monopoly, converted to a publicly listed company in 1995. The sole shareholder however, is Temasek Holdings the Singaporean government sovereign wealth fund.

occasional excess demand for electricity, typically on unseasonably hot or cold days. Peak power is supplied from gas fired turbine generators and while these have substantially lower capital cost than large coal fired base load generators they also have higher running costs per unit of energy produced. Peak generators are much more attractive to private investors than base load generators due to their lower risk as they have lower capital costs and shorter construction time (Beder 2011: 12). ABARE (2000: 10) explains that private investors, due to their 'higher required hurdle rates of return will tend to favour the less capital intense technologies such as CCGT [combined cycle gas turbine] rather than the more capital intensive coal fired stations favoured by the pre-existing structures and practices'. The second reason for private interest in peak generation is that whereas the normal wholesale price of base load power is in the range of $30-$40 per Megawatt hour the regulated ceiling price is $12,500 per Megawatt hour (AER 2011: 47). The regulator explains that this price 'is necessarily high to encourage investment in peaking plant' (AER 2011: 47). The profits from peak generation are much higher than from base load power. The private market has responded to these financial incentives- 'private sector investment to date has been made largely in peak and intermediate plant' (Morgan Stanley 2007: 48). This pattern of investment will raise consumer electricity prices as the ratio of peak to base load generation capacity increases over time a higher proportion of total electricity demand will be supplied from expensive peak sources.

References

Australian Bureau of Agricultural and Resource Economics (2000) Economic assessment of combined cycle gas turbines in Australia: some effects of micro-economic reform and technological change, *ABARE Conference Paper 2000*. Presented to 23rd Conference of the International Association of Energy Economics, Sydney, 7-10 June 2000.

Australian Bureau of Agricultural and Resource Economics (2002) Competition in the Australian national electricity market, *Current Issues*, January

Australian Energy Regulator (2011) *State of the Energy Market 2011,* Australian Competition and Consumer Commission 2011

ASU (2011) *Submission To Australian Government, Department of Resources Energy and Tourism (RET) Draft Energy White Paper 2011 Consultation* , Australian Municipal, Administrative, Clerical and Services Union

Beder, Sharon. (2011) *Submission Special Commission of Inquiry Electricity Transactions*, Unions NSW

Consumer Affairs Victoria (2012) http://www.consumer.vic.gov.au/shopping/energy-products-and-services/switching-and-price-comparison-services

Consumer Focus (2011) *Missing the mark Consumers, energy bills, annual statements and behaviour change*, http://www.consumerfocus.org.uk/files/2011/06/Missing-the-mark.pdf

Denniss, Richard and Toner, Phillip (1999) On the Wrong Track? An Analysis of the Suitability of Contracting-out for Rail Track Maintenance, *Economic Analysis and Policy*, 29, (2): 117-131

Department of Resources, Energy and Tourism (2011) *Draft Energy White Paper. Strengthening the Foundations for Australia's Energy Future*

Ernst & Young (2012) http://www.ey.com/AU/en/Newsroom/News-releases/Feeling-powerless---Time-and-effort-stops-consumers-switching-for-a-better-electricity-deal

Eslake, Saul and Walsh, Marcus (2011) *Australia's* Productivity Challenge, Grattan Institute, Melbourne.

Fairbrother, Peter et al (2012) *Jobs and Skills Transition for the Latrobe Valley Phase 1: Benchmark occupations and skill sets*, National Centre for Sustainability at Swinburne University

Garnaut, Ross (2011) *Garnaut Climate Change Review. Update Paper 7: Low emissions technology and the innovation challenge*, http://www.garnautreview.org.au/update-2011/update-papers/up7-low-emissions-technology-innovation-challenge.html

Institution of Engineers, Australia (1999) "*New Knowledge and New Opportunities" A Discussion Paper on Higher Education Research and Research Training Comments by the Institution of Engineers, Australia* , Canberra

Report by the Independent Committee of Inquiry Into National Competition Policy (Hilmer Report) (1993), Canberra

Karmel, Tom and Roberts, David (2012) *The role of 'culture' in apprenticeship completions*, National Centre for Vocational Education Research

Moran, Alan (2002) *The Financial Costs and Benefits of Privatisation*, Energy Issues Paper No. 25, Institute of Public Affairs Ltd

Morgan Stanley (2007) *Report to the Owen Inquiry: Securing Private Investment in New Generation in New South Wales*

NSW Government (2012) NSW *2012-13 Budget Papers. Budget Paper 2 - Budget Statement*

OECD (2012) *OECD Stats Extract. Central Government Debt as a % of GDP* http://stats.oecd.org/index.aspx?queryid=8089

Parliament of Australia (1999) *The effect of certain public policy changes on Australia's R&D*, The House of Representatives Standing Committee on Industry, Science and Resources, Canberra

Quiggin, J. (2002), 'The fiscal impact of the privatisation of the Victorian electricity industry', *Economic and Labour Relations Review* 13(2), 326–339.

Smith, Stewart (1997) *Elect city and Privatisation*, Parliamentary Library Research Service
Toner, Phillip (1998) Trends in NSW Government apprentice intake: Causes and implications, *Australian Bulletin of Labour* 24(2): 141-157

Topp, V. and Kulys, T. 2012, *Productivity in Electricity, Gas and Water: Measurement and Interpretation*, Productivity Commission Staff Working Paper, Canberra

2009 Victorian Bushfires Royal Commission (2009) *Final Report*, Parliament of Victoria

Walker Bob and Betty Conn Walker (2011a) *Briefing Note. 2010-11 NSW Budget performance and outlook confirm Electricity Privatisation should be stopped*

Walker, Bob and Conn Walker, Betty (2011b) *Special Commission of Inquiry Into Electricity Transactions Submission by Prof Bob Walker, University of Sydney and Dr Betty Con Walker, Centennial Consultancy*

Appendix 1 Ownership of Generation, Transmission and Distribution Assets within the NEM (Source: Australian Energy Regulator 2011)

Table 1.3 Generation ownership in the National Electricity Market, July 2011

GENERATING BUSINESS	POWER STATIONS	CAPACITY (MW)	OWNER
QUEENSLAND	TOTAL CAPACITY	12 692	
Stanwell Corporation	Stanwell; Tarong; Tarong North; Swanbank; Barron Gorge; Kareeya; Mackay Gas Turbine; others	4 015	Stanwell Corporation (Qld Government)
CS Energy	Callide; Kogan Creek; Wivenhoe	1 969	CS Energy (Qld Government)
CS Energy	Gladstone	1 680	Rio Tinto 42.1%; NRG Energy 37.5%; others 20.4% Contracted to CS Energy
Origin Energy	Darling Downs; Mount Stuart; Roma	1 046	Origin Energy
Callide Power Trading	Callide C	900	CS Energy (Qld Government) 50%; InterGen 50%
Millmerran Energy Trader	Millmerran	760	InterGen (China Huaneng Group 50%; others 50%) 50%; China Huaneng Group 50%
Arrow Energy	Braemar 2	495	Arrow Energy (Shell 50%; PetroChina 50%)
Braemar Power Projects	Braemar 1	435	Alinta Energy
AGL Hydro	Oakey	275	ERM Group 62.5%; others 37.5% Contracted to AGL Energy
AGL Hydro	Yabulu	235	RATCH Australia Contracted to AGL Energy / Arrow Energy
Stanwell Corporation	Collinsville	187	RATCH Australia Contracted to Stanwell Corporation
RTA Yarwun	Yarwun	146	Rio Tinto Alcan
QGC Sales Qld	Condamine	135	BG Group
AGL Energy	German Creek; KRC Cogeneration; others	78	AGL Energy
Pioneer Sugar Mills	Pioneer Sugar Mill	68	CSR
Ergon Energy	Barcaldine	49	Ergon Energy (Qld Government)
EDL Projects Australia	Moranbah North	46	EDL Projects Australia
CSR	Invicta Sugar Mill	39	CSR
NEW SOUTH WALES	TOTAL CAPACITY	16 742	
Macquarie Generation	Bayswater; Liddell; Hunter Valley	4 839	Macquarie Generation (NSW Government)
Delta Electricity	Vales Point B; Munmorah; Colongra; others	2 648	Delta Electricity (NSW Government)
Snowy Hydro	Blowering; Upper Tumut; Tumut; Guthega	2 466	Snowy Hydro (NSW Government 58%; Vic Government 29%; Australian Government 13%)
TRUenergy	Mount Piper; Wallerawang	2 400	Delta Electricity (NSW Government) Contracted to TRUenergy
Origin Energy	Eraring; Shoalhaven	2 322	Eraring Energy (NSW Government) Contracted to Origin Energy
Origin Energy	Uranquinty; Cullerin Range	670	Origin Energy
TRUenergy	Tallawarra	422	TRUenergy (CLP Group)
Aurora Energy Tamar Valley	Tamar Valley; Bell Bay	386	AETV (Tas Government)
Infigen Energy	Capital; Woodlawn	182	Infigen Energy
Marubeni Australia Power Services	Smithfield Energy Facility	160	Marubeni Corporation
Redbank Energy	Redbank	145	Redbank Energy
EDL Group	Appin; Tower; Lucas Heights	108	EDL Group
Eraring Energy	Brown Mountain; Burrinjuck; others	98	Eraring Energy (NSW Government)
AGL Hydro	Copeton; Burrendong; Wyangala; others	74	AGL Energy
Essential Energy	Broken Hill Gas Turbine	50	Essential Energy (NSW Government)
Acciona Energy	Gunning	47	Acciona Energy
Infratil Energy Australia	Hunter; Awaba	30	Infratil

GENERATING BUSINESS	POWER STATIONS	CAPACITY (MW)	OWNER
VICTORIA	**TOTAL CAPACITY**	**10 791**	
LYMMCo	Loy Yang A	2 170	GEAC (AGL Energy 32.5%; TEPCO 32.5%; RATCH Australia 14%; others 21%)
Snowy Hydro	Murray; Laverton North; Valley Power	2 098	Snowy Hydro (NSW Government 58%; Vic Government 29%; Australian Government 13%)
International Power	Hazelwood	1 600	International Power / GDF Suez 91.8%; Commonwealth Bank 8.2%
TRUenergy Yallourn	Yallourn; Longford Plant	1 451	TRUenergy (CLP Group)
International Power	Loy Yang B	965	International Power / GDF Suez 70%; Mitsui 30%
Ecogen Energy	Jeeralang A and B; Newport	891	Industry Funds Management (Nominees) Contracted to TRUenergy (CLP Group)
AGL Hydro	Kiewa; Somerton; Eildon; Clover; Dartmouth; McKay; others	596	AGL Energy
Pacific Hydro	Yambuk; Challicum Hills; Portland; Codrington	265	Pacific Hydro
Acciona Energy	Waubra	192	Acciona Energy
Energy Brix Australia	Energy Brix Complex; others	160	HRL Group / Energy Brix Australia
Alcoa	Angelsea	156	Alcoa
Aurora Energy Tamar Valley	Bairnsdale	68	AETV (Tas Government)
SOUTH AUSTRALIA	**TOTAL CAPACITY**	**4 430**	
AGL Energy	Torrens Island	1 280	AGL Energy
Alinta Energy	Northern; Playford	742	Alinta Energy
International Power	Pelican Point; Canunda	494	International Power / GDF Suez
Synergen Power	Dry Creek; Mintaro; Port Lincoln; Snuggery	315	International Power / GDF Suez
TRUenergy	Hallet; Waterloo	287	TRUenergy (CLP Group)
Origin Energy	Quarantine; Ladbroke Grove	261	Origin Energy
Infigen Energy	Lake Bonney 2 and 3	198	Infigen Energy
AGL Hydro	Hallett 1 and 2; Wattle Point; North Brown Hill	194	AGL Energy
Origin Energy	Osborne	175	ATCO 50%; Origin Energy 50%
Infratil Energy Australia	Snowtown	99	Infratil
Infigen Energy	Lake Bonney 1	81	Infigen Energy Contracted to Essential Energy (NSW Government)
Meridian Energy	Mount Millar	70	Meridian Energy
TRUenergy	Cathedral Rocks	66	TRUenergy (CLP Group) 50%; Acciona Energy 50%
Pacific Hydro	Clements Gap	57	Pacific Hydro
Infratil Energy Australia	Angaston	49	Infratil Contracted to AGL Energy
RATCH Australia	Starfish Hill	35	RATCH Australia Contracted to Hydro Tasmania (Tas Government)
TASMANIA	**TOTAL CAPACITY**	**2 693**	
Hydro Tasmania	Gordon; Poatina; Reece; John Butters; Tungatinah; Woolnorth; others	2 305	Hydro Tasmania (Tas Government)
Aurora Energy Tamar Valley	Tamar Valley; Bell Bay	386	AETV (Tas Government)

Fuel types: coal; gas; hydro; wind; diesel/fuel oil/multi-fuel; biomass/bagasse; unspecified.

Note: Capacity is as published by AEMO for summer 2011–12.

Source: AEMO.

Table 2.1 Electricity transmission networks

NETWORK	LOCATION	LINE LENGTH (KM)	ELECTRICITY TRANSMITTED (GWH), 2009–10	MAXIMUM DEMAND (MW), 2009–10	ASSET BASE ($2010 $ MILLION)[1]	INVESTMENT—CURRENT PERIOD ($2010 $ MILLION)[2]	CURRENT REGULATORY PERIOD	OWNER
NEM REGION NETWORKS								
Powerlink	Qld	13 569	49 593	8 891	4 100	2 642	1 July 2007 – 30 June 2012	Queensland Government
TransGrid	NSW	12 656	72 814	14 051	4 346	2 541	1 July 2009 – 30 June 2014	New South Wales Government
SP AusNet	Vic	6 553	50 925	9 858	2 291	806	1 Apr 2008 – 30 Mar 2014	Publicly listed company (Singapore Power International 51%)
ElectraNet	SA	5 591	13 266	3 408	1 372	816	1 July 2008 – 30 June 2013	Powerlink (Queensland Government), YTL Power Investment, Hastings Utilities Trust
Transend	Tas	3 469	11 658	2 366	981	625	1 July 2009 – 30 June 2014	Tasmanian Government
NEM TOTALS		41 838	198 256		13 090	7 430		
INTERCONNECTORS[3]								
Directlink (Terranora)	Qld–NSW	63		180	136		1 July 2005 – 30 June 2015	Energy Infrastructure Investments (Marubeni 50%, Osaka Gas 30%, APA Group 20%)
Murraylink	Vic–SA	180		220	124		1 Oct 2003 – 30 June 2013	Energy Infrastructure Investments (Marubeni 50%, Osaka Gas 30%, APA Group 20%)
Basslink	Vic–Tas	375			884[4]		Unregulated	Publicly listed CitySpring Infrastructure Trust (Temesek Holdings (Singapore) 28%)

GWh, gigawatt hours; MW, megawatts.

1. The regulated asset bases are as set at the beginning of the current regulatory period for each network, converted to June 2010 dollars.
2. Investment data are forecast capital expenditure over the current regulatory period, converted to June 2010 dollars.
3. Not all interconnectors are listed. The unlisted interconnectors, which form part of the state based networks, are Heywood (Victoria–South Australia), QNI (Queensland–New South Wales) and Snowy–Victoria.
4. Basslink is not regulated, so has no regulated asset base. The listed asset value is the estimated construction cost.

Sources: AER, *Transmission network service providers: electricity performance report for 2009–10*, regulatory determinations by the AER.

Table 2.2 Electricity distribution networks

NETWORK	CUSTOMER NUMBERS	LINE LENGTH (KM)	MAXIMUM DEMAND (MW), (2009–10)	ASSET BASE (2010 $ MILLION)[1]	INVESTMENT—CURRENT PERIOD (2010 $ MILLION)[2]	CURRENT REGULATORY PERIOD	OWNER
QUEENSLAND							
Energex	1 298 790	53 256	4 817	7 867	5 783	1 Jul 2010 – 30 Jun 2015	Qld Government
Ergon Energy	680 095	146 000	2 608	7 149	5 113	1 Jul 2010 – 30 Jun 2015	Qld Government
NEW SOUTH WALES AND ACT							
AusGrid[3,4]	1 605 635	49 442	5 609	8 688	8 579	1 Jul 2009 – 30 Jun 2014	NSW Government
Endeavour Energy[3]	866 724	33 817	3 697	3 803	3 052	1 Jul 2009 – 30 Jun 2014	NSW Government
Essential Energy[3]	801 913	190 844	2 239	4 451	4 277	1 Jul 2009 – 30 Jun 2014	NSW Government
ActewAGL	157 635	4 858	604	617	314	1 Jul 2009 – 30 Jun 2014	ACTEW Corporation (ACT Government) 50%; Jemena (Singapore Power International) 50%
VICTORIA							
Powercor	706 577	84 027	2 362	2 189	1 550	1 Jan 2011 – 31 Dec 2015	Cheung Kong Infrastructure/ Power Assets Holdings 51%; Spark Infrastructure 49%
SP AusNet	623 307	48 259	1 774	2 052	1 465	1 Jan 2011 – 31 Dec 2015	SP AusNet (listed company; Singapore Power International 51%)
United Energy	634 508	12 628	2 016	1 365	877	1 Jan 2011 – 31 Dec 2015	Jemena (Singapore Power International) 34%; DUET Group 66%
CitiPower	308 203	6 506	1 354	1 273	821	1 Jan 2011 – 31 Dec 2015	Cheung Kong Infrastructure/ Power Assets Holdings 51%; Spark Infrastructure 49
Jemena	309 505	5 971	958	748	468	1 Jan 2011 – 31 Dec 2015	Jemena (Singapore Power International)
SOUTH AUSTRALIA							
ETSA Utilities	817 300	87 220	2 981	2 772	2 154	1 Jan 2011 – 31 Dec 2015	Cheung Kong Infrastructure/ Power Assets Holdings 51%; Spark Infrastructure 49%
TASMANIA							
Aurora Energy	271 750	24 385	1 042	1 105	650	1 Jan 2008 – 30 Jun 2012	Tas Government
NEM TOTALS	9 081 942	747 213		44 079	35 103		

MW, megawatts.

1. Asset valuation is the opening regulated asset base for the current regulatory period, converted to June 2010 dollars.
2. Investment data are forecast capital expenditure over the current regulatory period, converted to June 2010 dollars. The data include capital contributions, which can be significant—for example, 10–20 per cent of investment in Victoria and over 20 per cent in South Australia—but do not form part of the regulated asset base for the network.
3. Following the privatisation of energy retail assets in New South Wales, the network divisions of EnergyAustralia, Integral Energy and Country Energy were rebranded as AusGrid, Endeavour Energy and Essential Energy respectively.
4. AusGrid's distribution network includes 962 kilometres of transmission assets that are treated as distribution assets for the purpose of economic regulation and performance assessment.

Sources: Regulatory determinations by the AER and OTTER (Tasmania); performance reports by the AER (Victoria), the QCA (Queensland), ESCOSA (South Australia), OTTER (Tasmania), the ICRC (ACT), AusGrid, Essential Energy and Endeavour Energy.