Powering the Boom: Australian Energy Use

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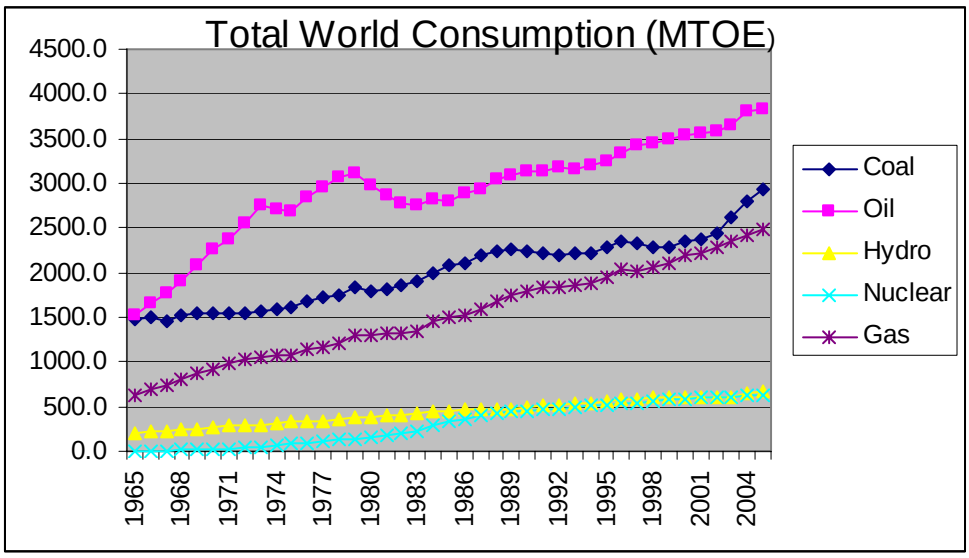
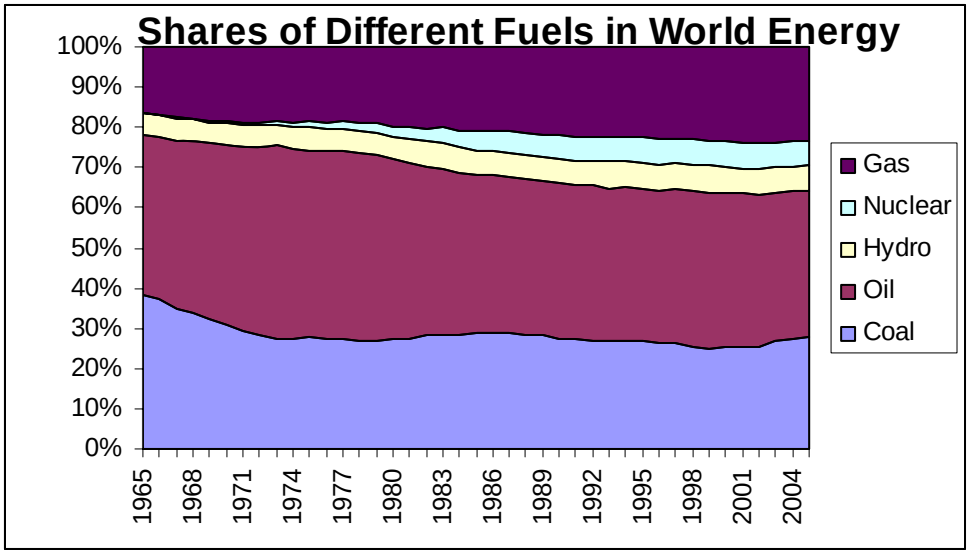
The Australian Boom and World Energy Usage

"Powering the boom" is a puzzling title to give to an address about an economy that is managing only about 4 per cent growth per annum. And this comes off the back of supplying the new Asian miracle economies. Even so, the lengthy period of this growth rate is stronger and more consistent Australia than has achieved for any period over the past century.

In looking ahead on how this might be sustained, it generally pays to look at the past. Energy is no exception.

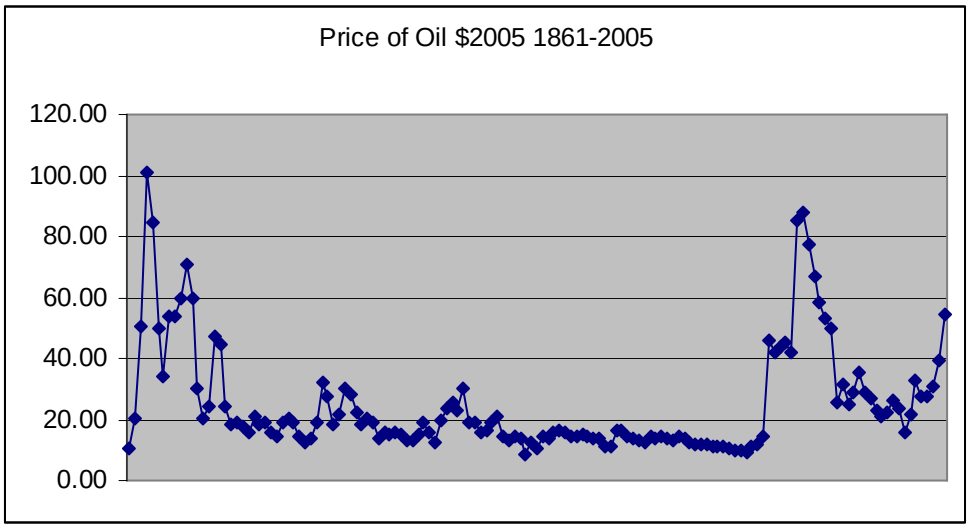


Essentially we can break down supply into three sources: fossil, nuclear and renewables. If we do so, the world picture is one of remarkable stability.



The share of fossil fuels in total consumption, including electricity is close to 90 per cent. Nuclear has been growing in spite of a standstill in most developed country markets. Hydro could not grow much even if the environmentalists were to allow it. The fossil fuel share has hardly moved over the past half century.

Much publicity is attached to "peak oil", the latest catch-cry of the resource pessimism that sweeps humanity from time to time – the previous occasion being the 1970's Club of Rome forebodings. But though oil production may peak, the consequent shortage will cause a gradual increase in the real price of petrol products and bring about economies and substitutes. In this respect, the price of oil is greatly exaggerated in most people's minds. It is actually quite a bit lower than it was after the second oil crisis of the late 1970s.



The Stern Report

The Stern Report and its associated intensified diplomatic push for carbon restraints is already having an effect on policy. In the UK the Leader of the Opposition has announced that if elected he will place a windmill on the roof of Number 10 Downing

Street. In anticipation of the report, more subsidies were announced in Australia for exotic and very expensive renewable energy. Australian total taxes, subsidies and other regulatory measures aimed at combating emissions of CO2 will approach one billion dollars per annum by 2010 even if there are no further measures introduced.

The Stern Report is posited on assumptions of a considerable acceleration of global warming, some dire projections of its effects and some bold conjectures about cost reductions from new technologies in mitigating those effects. The report addresses reductions in global emissions of carbon dioxide by 80 per cent of current levels.

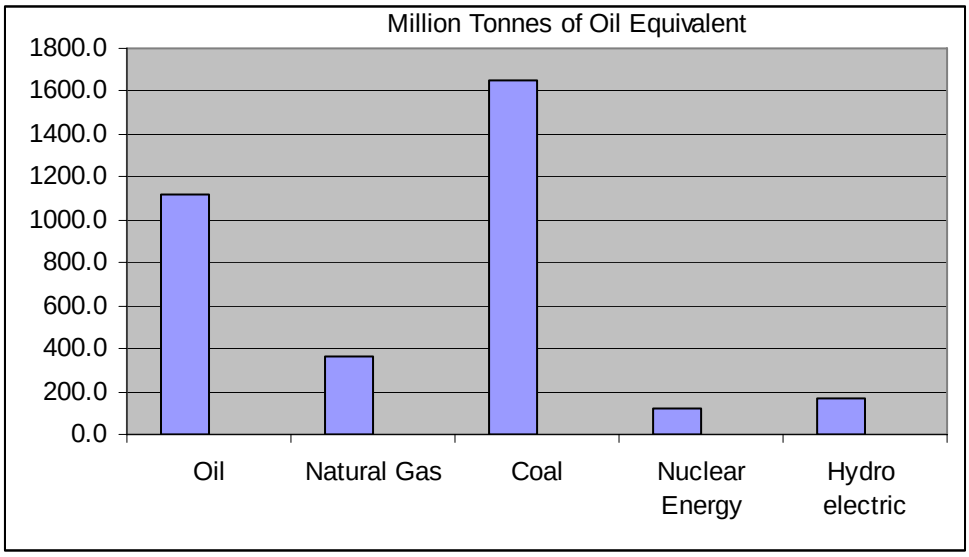
It argues that the economic cost will be a total of one per cent of world GDP, "which poses little threat to standards of living given that the economic output in the OECD countries is likely to rise by over 200 per cent and in developing countries by more than 400 per cent." (P.239)

The real economic task involved is exemplified by the very minor reductions achieved in the EU under its Kyoto commitments, in spite of an existing carbon trading program which has a tax equivalent currently at around $25 per tonne of CO2 (enough to increase the Australian wholesale price of electricity by about two thirds). The report also points out that France, having moved to a position whereby 75 per cent of its electricity is nuclear, has seen overall emission levels fall only 15 per cent since the 1970s, with no reduction in the period from 1990.

It considers there is a fair amount of low hanging fruit around:

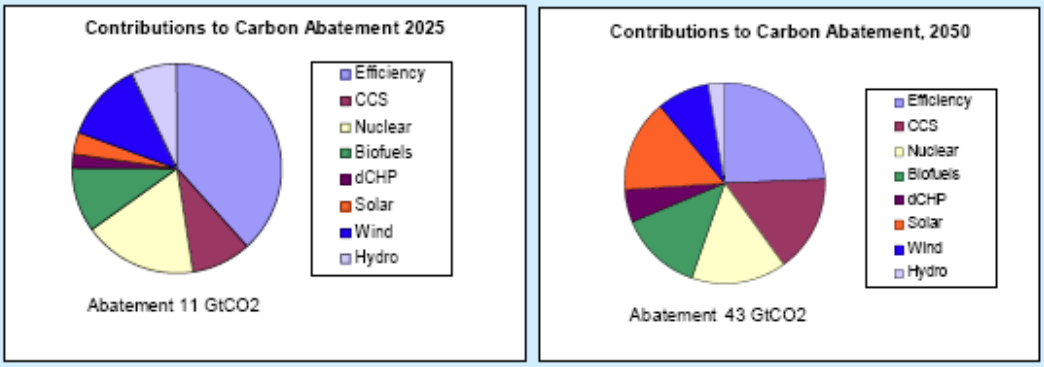
- $1-5 per tonne of CO2 for avoiding deforestation
- $5-15 per tonne for re-afforestation
- improvements in tilling methods (by 2020) at $27 per tonne of CO2

But, as land usage accounts for only 20 per cent of emissions, the report is realistic enough to realise that the heavy lifting would need to address fossil fuels. Oil and natural gas produce about one third less CO2 per unit of energy than coal. Some global estimates of CO2 per tonne of oil equivalent are as follows.



For what it is worth, the Stern Report still considers that by 2050 over 50 per cent of energy will be derived from fossil fuels, though accompanied by huge dollops of carbon sequestration. Here is how it pictures the distribution of emission savings.

Figure 9.4 The distribution of emission savings by technology



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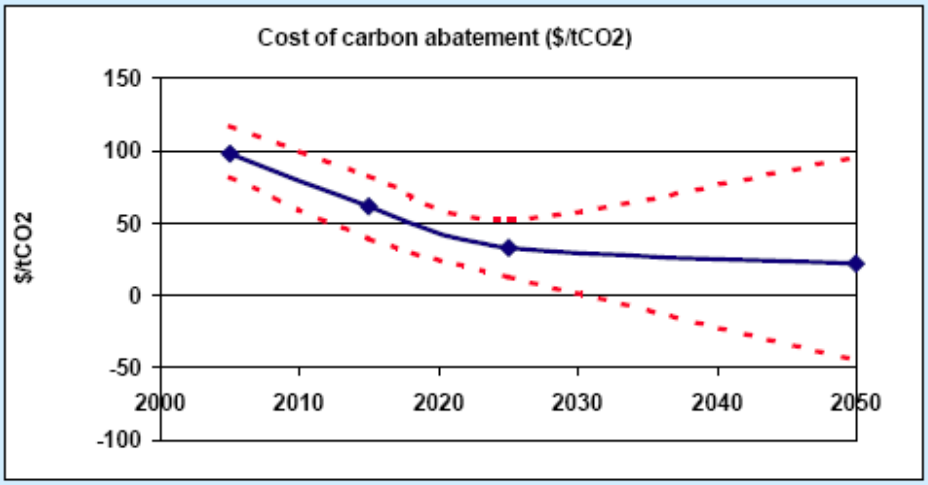
It puts the tax effect of reducing carbon usage at about $100 per tonne of CO2 today. It sees the cavalry arriving as time goes on until costs on the median estimate are around $35 per tonne and continuing to gradually fall after 2030.

Figure 9.5 Average cost of reducing fossil fuel emissions to 18 $GtCO_2$ in 2050*



*The red lines give uncertainty bounds around the central estimate. These have been calculated using Monte Carlo analysis. For each technology, the full range of possible costs (typically ± 30% for new technologies, ±20% for established ones) is specified. Similarly, future oil prices are specified as probability distributions ranging from $20 to over $80 per barrel, as are gas prices (£2-6/GJ), coal prices and future energy demands (to allow for the uncertain rate of uptake of energy efficiency). This produces a probability distribution that is the basis for the ranges given.

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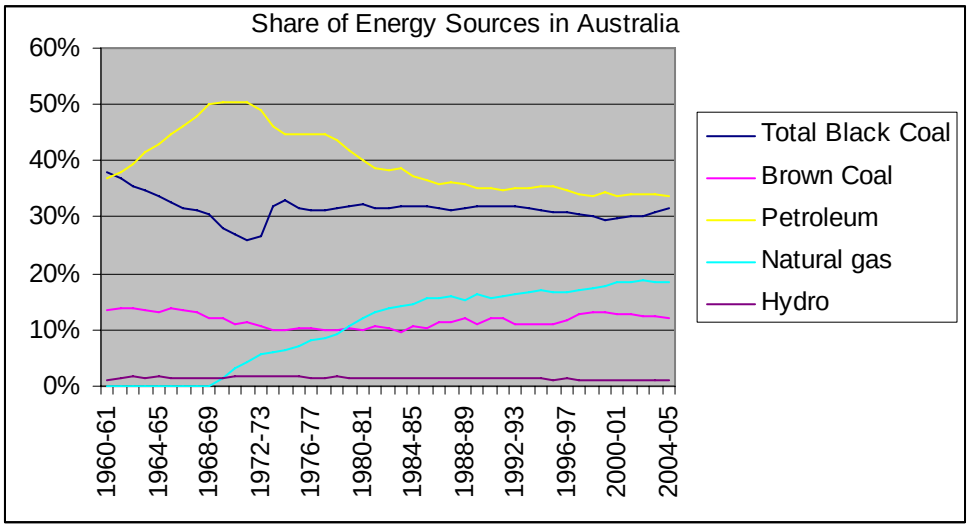
Technology improvements aside, there is also a great deal of small print which is necessary to allow these estimates to remain on the cusp of credibility. They already incorporate existing energy efficiency taxes and they also assume a considerable emphasis on energy saving at the production end (forecast to cost $5 per tonne by 2020) and voluntary energy saving (partly stimulated by education programs).

Against these costs, Stern says, "the social cost of carbon today, if we remain on a BAU trajectory, is of the order of $85 per tonne of CO_2 - higher than typical numbers in the literature, largely because we treat risk explicitly and incorporate recent evidence on the risks." (p.XVI)

Specific Australian Developments

For Australia, the energy share usage pattern has been some growth of renewables with hydro but overall fossil fuels are 95 per cent of consumption and rather more than that of electricity consumption. Coal dominates fossil fuels even though gas has increased rapidly, both for final consumption and as an input for electricity generation.



In the absence of draconian regulatory measures, this pattern is also likely to persist.

One facet of demand, that for transport, features a steady decline in the share of public transport in a market for trips that is expanding quite rapidly. At present public transport accounts for about seven per cent of trips down from over 50 per cent forty years ago and is likely to continue falling. Transit accounts for only about 2% of trips in the US.

The reason is neatly encapsulated in this diagram showing the percentage of jobs within Melbourne accessible by car and transit respectively within 40 minutes.

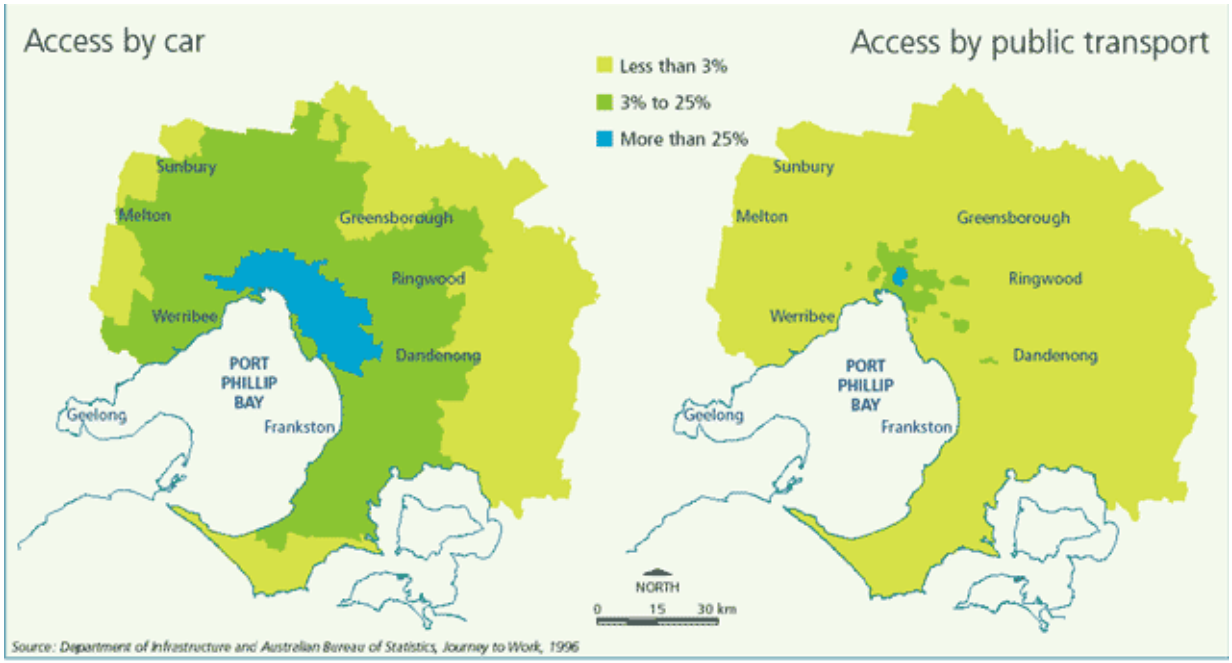


Figure 4. Percentage of jobs accessible within 40 minutes travel (by car and by public transport)

This can only get less favourable for transit since the pattern is responding to a change in the nature of journeys. Transit's disadvantages are compounded by the changing nature of cities' themselves. Less than 50 years ago 55 per cent of Melbourne's jobs were in the central area. Today it is 28 per cent and only 10 per cent work in the area we call the Central Business District. Work locations which were once dictated by the availability of mass transit and tended to be located in the central areas of the city, are now becoming far more dispersed. Today, notwithstanding subsidies of 80 per cent of the cost, transit carries 8 per cent of vehicular passengers, with cars accounting for 92 per cent.

Australian Power Usage

The major increase in energy use aside from petrol will be electricity.

We have a national market that has its fragilities due to regulation and government ownership. But it has delivered the steady increments of supply that have been warranted by demand increases. Supply has increased by about 22% since 2000 and kept up with demand. (In addition there has been new wind power – a further 2% brought in on the back of subsidies). In terms of the new capacity we have seen brought into the market, over half is private. New peak and baseload capacity has more or less corresponded to expectations.

NEM new conventional generation post 2000

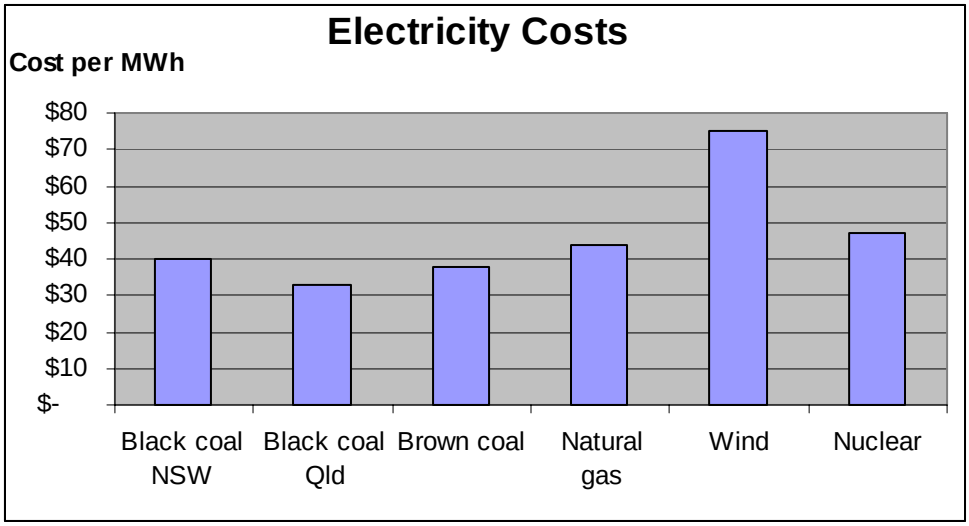
	DATE	CAPACITY	OWNER			
nsw	2001	150	National Power (B&B)	private	coal	Redbank
	2008	400	Tru	private	gas	Tallawarra
	2007	100	Macquarie	public	gas	Tomago
	2007	450	WAMBO	private	gas	Wagga
vic	2002	300	Snowy	public	gas	Valley
	2002	150	agl	private	gas	Somerton
	2001	92	alinta	private	gas	Bairnsdale
	2007	90	Hazelwood	private	coal	Valley
	2006	320	Snowy	public	gas	Laverton
	2008	236	Loy Yang	private	coal	Valley
queensland	2001	900	CS	public	coal	Callide
	2002	852	Intergen	private	coal	Surat
	2002	443	Tarong	public/private	coal	Nanango
	2000	288	Enertrade	public	gas	Oakey
	2005	240	Transfield	private	gas	Townsville
	2006	450	Newgen (B&B)	private	gas	Braemar
	2008	57	Q. Gas	private	gas	Chinchilla
	2007	750	CS	Public	coal	Kogan
sa	2000	478	IP	private	gas	Pelican
	2000	84	Origin	private	gas	Ladbroke
	2002	183	agl	private	gas	Adelaide
	2002	92	Origin	private	gas	Torrens

Source: ESAA

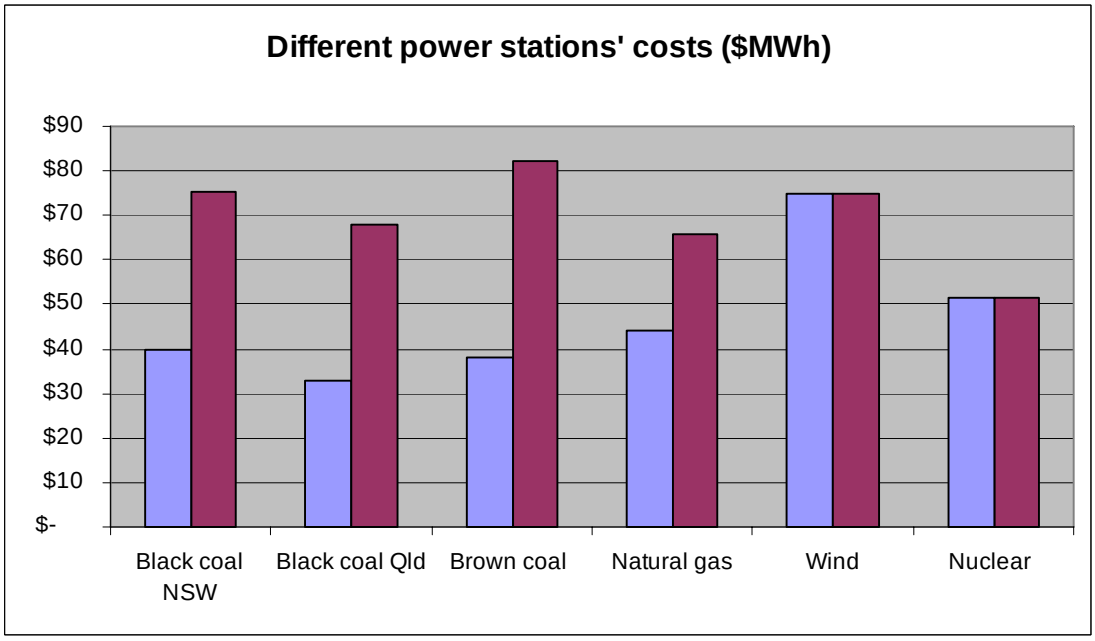
In addition, the competitive market that has been created is itself responsible for a vast lift in de facto capacity resulting from the better utilisation of existing supplies.

Some argue, and they may be right, that there will be some acceleration of this build required in the future as we have eaten into the fat that was the legacy of government ownership. Even so, there should be no problems in meeting increased demand as long as regulations do not intensify.

Australia has perhaps the cheapest primary energy in the world available in major quantities. Coal from Queensland and parts of NSW, as well as powering the China boom is abundantly available for conversion into electricity at $40 per MWh virtually forever. Brown coal in Victoria is available at a similar price. These prices are less than a half of those in Japan and considerably below those of the EU and most of the US. $40 is half the price of wind energy (the costs of which are flattered by its inherent unreliability) and the cheapest nuclear option is about 30 per cent dearer including the (relatively low) disposal costs.



Now a greenhouse tax would be a great equaliser. Here are the costs with a carbon tax or tradeable right set at $41 per tonne of CO2.



With such an imposition natural gas becomes a bit cheaper than coal, though this might be offset by a rise in its price, which in Australia is very low – less than half that of the US.

The big movers (or stayers) are nuclear and wind. Wind on the assumptions given becomes cheaper than coal in Victoria and NSW, though its role can never be to supply more than about 10 per cent of the load at almost any conceivable price and with the most heroic assumptions on future improvements.

Nuclear though assumes the pole position. Uranium is relatively abundant and comprises only as small share of costs, and the bulk of costs are for plant. Doubtless these costs are also inflated by over-engineering to cater for hysteria over safety matters. This and the fact that relatively few new plants have been built in recent

years means that the price might even be reduced below the levels indicated by current studies.

So in a non carbon constrained world there is a means of abundant and reliable energy supply that will allow existing consumption at only a modest increase in costs – remember that the prices indicated here are wholesale energy prices and there are fixed costs of transmission and distribution accounting for half the total costs. In other words, a 30 per cent price premium translates into a 15 per cent premium at the user point.

However, Australia has no advantage, indeed considerable disadvantages, in nuclear even aside from the rather uniquely strong anti nuclear pressure groups. Our advantage is in cheap fossil fuel based energy. And politicians of all parties are gradually introducing greenhouse inspired measures to hobble this resource. In abandoning our advantage, even progressively, not only will this mean far higher capital costs but it will eliminate our comparative advantage in energy intensive industries. It will therefore, at a minimum entail a considerable industrial restructuring.