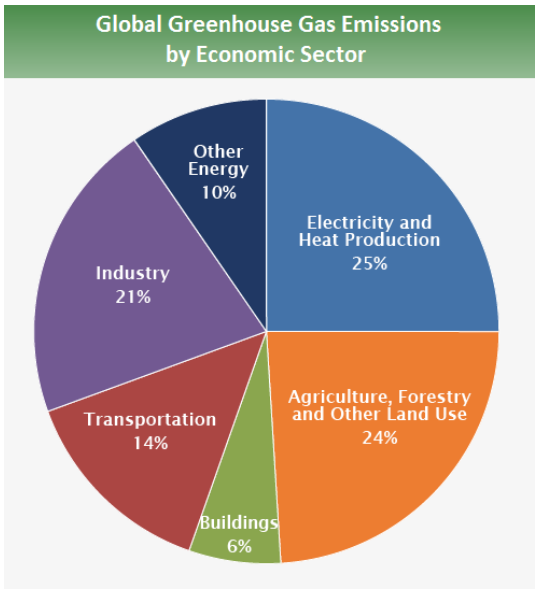
Renewable subsidies: destroyers of low cost electricity supplies

Renewable energy and its replacement of conventional electricity supplies

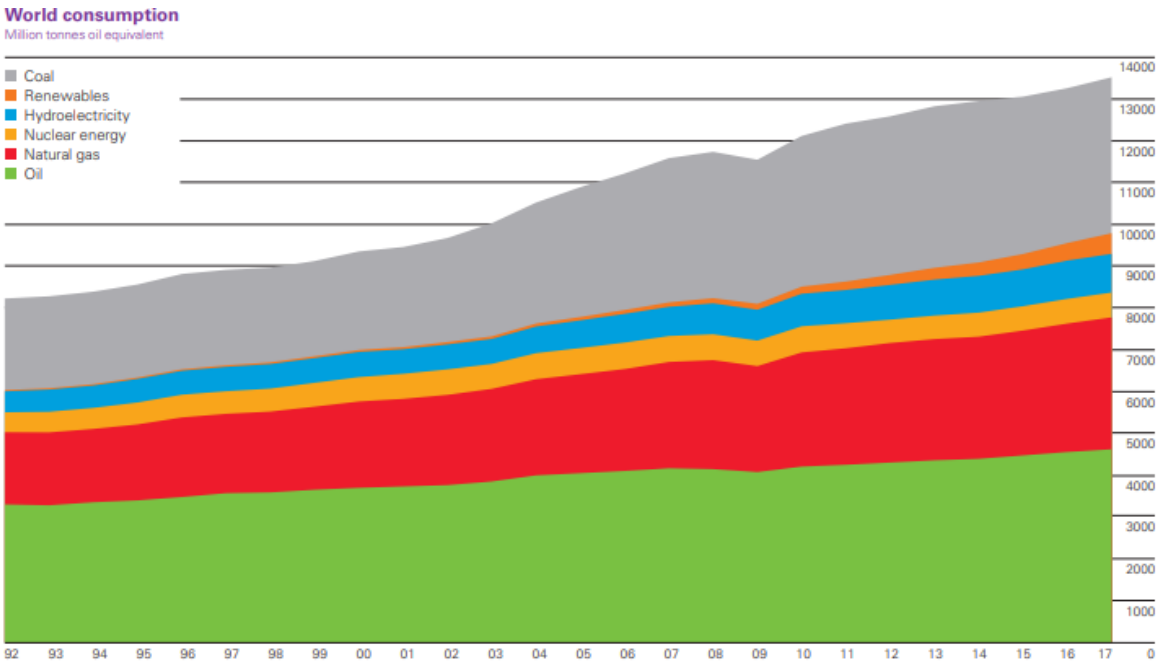
In meeting targets agreed at the 2002 Kyoto Convention, the precursor to the Paris Agreement, Australia, by preventing land clearance, reduced emissions by 100 million tonnes a year of CO2 equivalent. Comprising almost 20 per cent of total emissions, this reduction allowed Australia to claim that there had been a negligible increase over the period 1990-2012, and Australian politicians were able to bask in diplomatic plaudits at farmers' expense.

Australia also took measures to suppress greenhouse gas emissions from energy which, in its various forms, accounts for about 70 per cent of greenhouse gas emissions but as electricity brings only around 25 per cent.

Electricity however is the focus of attention on emission reductions.



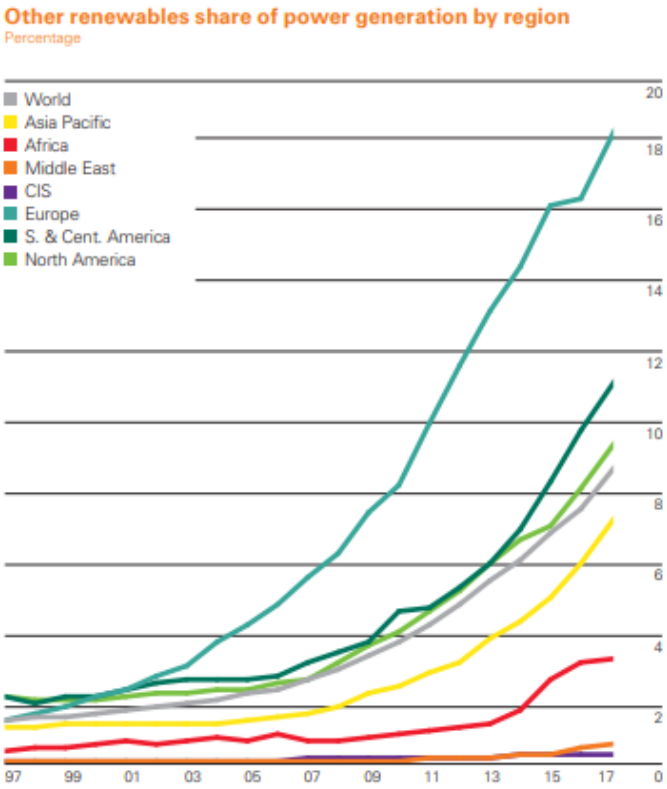
Although growing rapidly, non traditional renewables – primarily wind and solar - still compromise a tiny share of **total energy**, though they are getting close to the share of the energy source, nuclear, which four decades ago was forecast to replace much of the fossil supply.



World primary energy consumption grew by 2.2% in 2017, up from 1.2% in 2016 and the highest since 2013. Growth was below average in Asia Pacific, the Middle East and S. & Cent. America but above average in other regions. All fuels except coal and hydroelectricity grew at above-average rates. Natural gas provided the largest increment to energy consumption at 83 million tonnes of oil equivalent (mtoe), followed by renewable power (69 mtoe) and oil (65 mtoe).

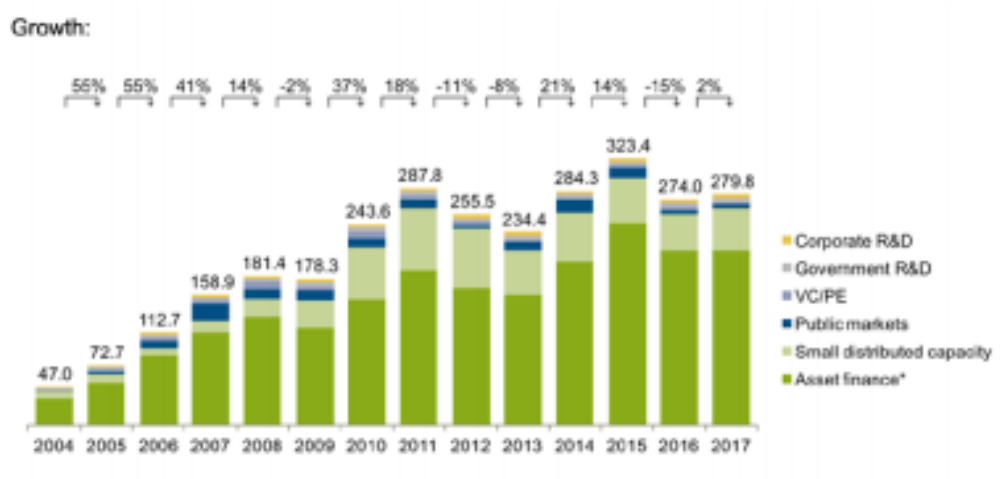
BP 2018

A different picture is evident in **electricity** generation, where In Europe non-hydro renewables now account for 17 per cent of supply, up from 2 per cent 20 years ago; in North America, from a similar base, renewables are now 9 per cent. Australia is approaching the European average.



In the seven years to 2010, we saw a remarkable growth in the funding of exotic renewables – wind and solar - to a level of some $280 billion a year, a level that has been maintained since then.

Global new investment in renewable energy 2004-2017



*Asset finance volume adjusts for re-invested equity. Total values include estimates for undisclosed deals

Source: UN Environment, Bloomberg New Energy Finance

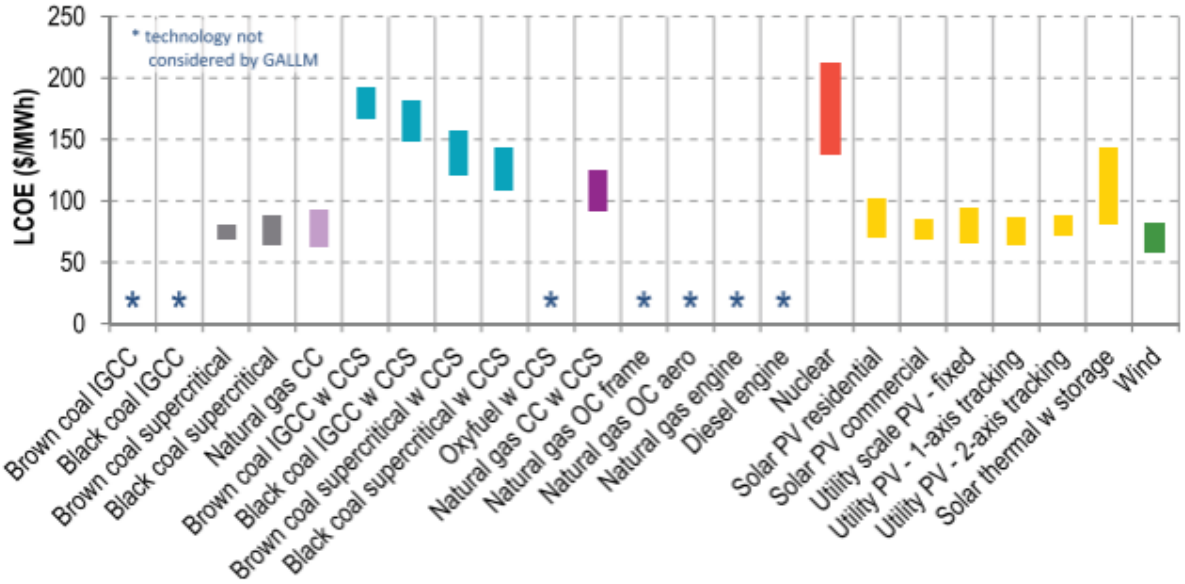
These renewables comprise some 60 per cent of the increase in electricity generating capacity, though due to their wind/sun reliance much less than this in actual output.

Renewables figure excludes large hydro. Capacity and generation based on Bloomberg New Energy Finance totals.

Source: UN Environment, Bloomberg New Energy Finance

Renewables vs fossil fuel costs

For the past 30 years, proponents of wind and solar renewables have been claiming that they are or about to become competitive with fossil supplies for electricity generation. The usual approach to this is to assemble data on Levelised Costs of Electricity. The following was prepared for Australia by a government funded body (the CO2CRC).



Other reports have published similar relativities to those of the Australian CO2CRC.

Thus a UK report put the **2015, £/MWh** lowest cost for electricity as:

Wind	47
Solar	71
Nuclear	82
Gas	65
Coal	124

For new generation entering into service in 2022, the US EIA puts costs (in $2017) as with wind competitive to coal and gas even without tax credits and solar PV is said to be almost so.

These estimates suggest that subsidies to renewables are unnecessary – yet whenever such subsidies are reduced there is vigilant opposition from recipients and their supporters, who claim their withdrawal will throttle an infant industry.

New coal generators have been made politically infeasible in most westernised countries though crises have led to new plant being commissioned in Germany and Japan. And the continued competitiveness of coal is demonstrated by the fact that there are over 1000 new coal plants underway across the world, particularly in developing countries, where, as of the beginning of 2018, some 656 GW of new coal capacity was announced or under construction. This was in spite of an embargo on financing from the World Bank.

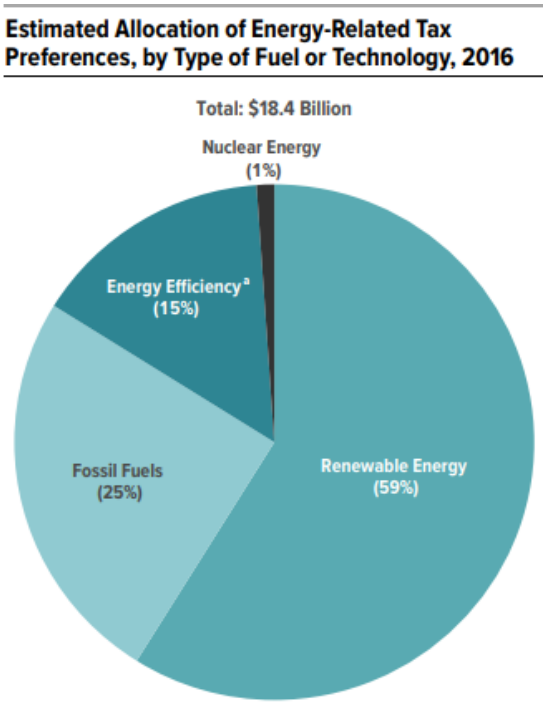
A major study commissioned by the Minerals Council of Australia estimated an Australian new black coal plant could be profitable at as little as $40 per MWh, much less than the estimates of semi-

official publications and less than half the estimated cost of UK wind, the cheapest new source cited by UK government sources.

Subsidy support for renewables

USA

US energy subsidies in 2016 were put at over $18 billion, with renewable subsidies accounting for 60 per cent of this.



Renewable subsidies are dominated by a 30 per cent investment credit. But, in addition, over 20 states have subsidies and renewable energy requirements which makes comprehensive estimates of the true subsidy difficult.

A review by the National Academy of Sciences (NAS) concluded that the tax credit for the generation of electricity from renewable sources reduced CO2 emissions at an average cost of $250 per ton. By comparison, federal agencies recently estimated that the value of the benefits of reducing CO2 emissions is between $40 and $65 per ton.

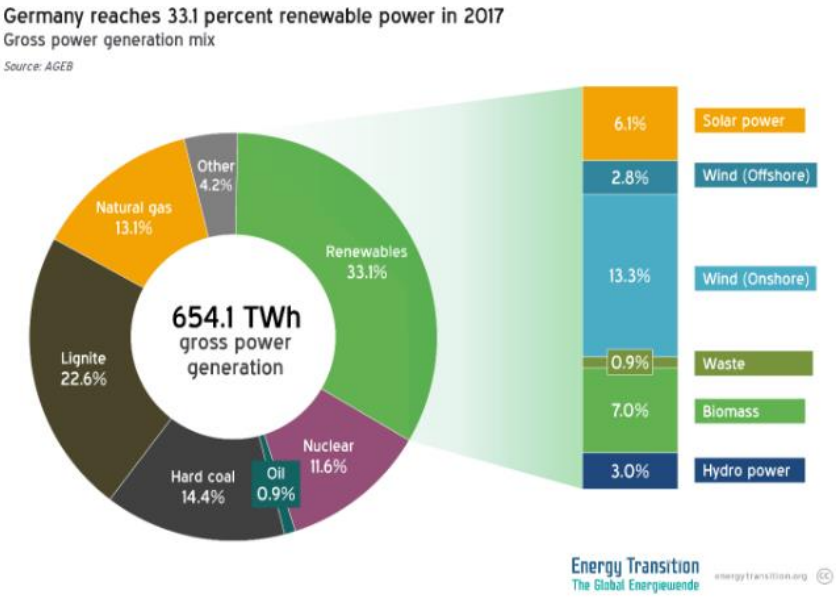
A study by the University of Texas projected that U.S. energy subsidies per megawatt hour in 2019 would be $0.5 for coal, $1- $2 for oil and natural gas, $15- $57 for wind and $43- $320 for solar. Wholesale prices for electricity in 2017 were between 2.9 cents to 5.6 cents per kilowatt hour. Therefore the wind production tax credit covers at least 30% to 60% of wholesale electricity prices.

Hydro provides around 6.5 per cent of US electricity with exotic renewable energy 7.5 per cent.

The Trump Administration will reduce federal subsidies and is canvassing ways to provide additional support for coal and nuclear in view of the reliability these sources offer.

Germany

Exotic renewables have risen from under 2 per cent of supplies at the turn of the century to over 30 per cent today.



Germany has spent an estimated 189 billion euros, or about $222 billion, since 2000 on renewable energy subsidies. That is over $15 billion a year. Germany spent 25 billion euros ($26 billion) on renewable energy in 2016, most of which—23 billion euros—consumers paid through a surcharge on their electricity bills. Citing these costs, in the June EU meeting, Germany's Energy Minister Peter Altmaier has poured cold water on EU's clean energy ambitions.

Spain

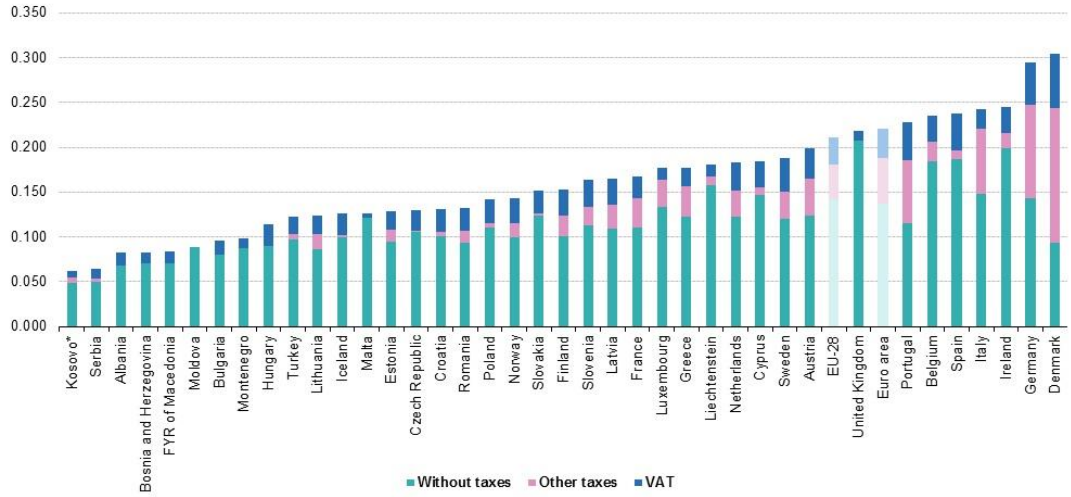
Spain embarked upon a vigorous subsidy program which was intensified following the election of the Zapatero Socialist Government in 2004. By 2009, wind had grown to 11 per cent of supply.

The pioneering work of Gabriel Calzada Alvarez demonstrated the costs of this intervention to the Spanish economy. Alvaraz modelled the cost intervention to show that the measures contributed to the very high level of unemployment in Spain. He concluded that though the stimulus to renewables resulted in increased jobs, especially in construction, the increased cost of electricity resulted in 2.2 jobs being lost for every job created. He also estimates the cost of each "green" job was €571,000 and the cost of each wind industry job €1 million.

Spanish wind development has continued to increase since 2009 albeit slowly as a result of a marked reduction in subsidies. New subsidies are now available but their level is difficult to determine, though the new wind is based on a price assured at €52 ($57)-per-megawatt-hour price used for the renewable industry and the roughly €42 ($46)-per-megawatt-hour level published by the government elsewhere. Wind and solar now accounts for about 24 per cent of electricity supply.

Spain, along with Germany is among the highest cost electricity prices in the EU.

EU electricity costs



* Kosovo under UNSCR 1244/99

Australia

Australia has probably the lowest cost, cleanest (in that it is low sulphur) coal in the world but has very generous subsidy programs for renewables. The main ones are a requirement to have a growing level of renewable energy included within retail supplies until a share of 23 per cent is reached by 2020 (this includes a share of about 8 per cent which is commercial, mainly hydro). The resulting subsidy from this regulatory requirement is some $A85 per MWh. In addition, small scale rooftop solar has a subsidy (paid up front to defray costs of installation) at $A40 per MWh.

Placed into perspective, the average price of electricity in Australia up until 2015 was about $40 per MWh.

Overall levels of subsidy to renewables are as follows

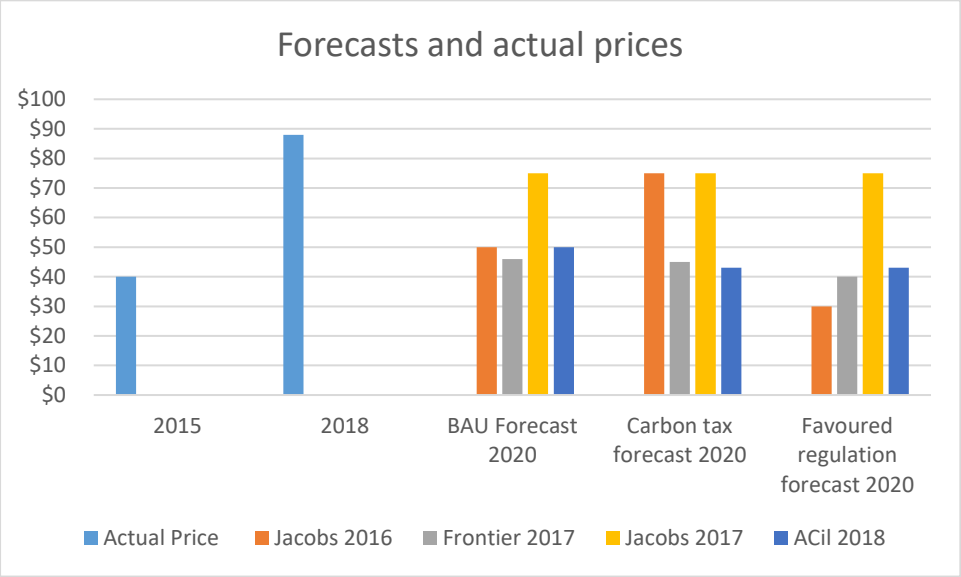
Commonwealth Costs 2016 ($M)	
LRET (wind and large solar subsidies) costs 21,431,000 MWh at $85 per MWh	1822
SRES (roof top solar subsidies) costs 6,000,000 MWh at $40 per MWh	240
Environment Departmental budget costs	
ARENA	154
CEFC	239
Clean Energy regulator	674
Other	69
Other Agencies (CSIRO, BoM, other depts.)	~500
Total Commonwealth	***3698***
State Costs	
Queensland Solar Bonus ($276 per customer in 2015/6)	350
NSW Climate Change Fund/Energy Savings	317
ACT	6
Victoria (schemes twice cost per customer of NSW)	439
SA (schemes three times cost per customer of NSW)	62
State Schemes Total	***1172***
NATIONAL TOTAL	**4870**

This level of subsidy is high in the context of the value of the wholesale electricity market (about $9 billion a year prior to 2015 and now, following price increases caused by subsidised electricity forcing the closure of major generators, around $18 billion).

Australia also had a carbon tax at $24 per MWh for a couple of years.

In the period beyond 2020, the present Australian plan is to introduce a National Energy Guarantee (NEG). This is to replace the main renewable support program with an emission abatement form of carbon tax set at a level to allow emissions in the sector to fall by 26 per cent in line with the Paris Agreement. The NEG also includes a provision under which renewable energy contracts must also contain a "firm capacity" element to compensate for their intrinsic unreliability.

As with previous policy interventions and proposals, the NEG is promoted as a path to lower prices and is backed up by economic modelling which is supposed to prove this. The track record of such modelling is poor and is biased towards the client's preference. .



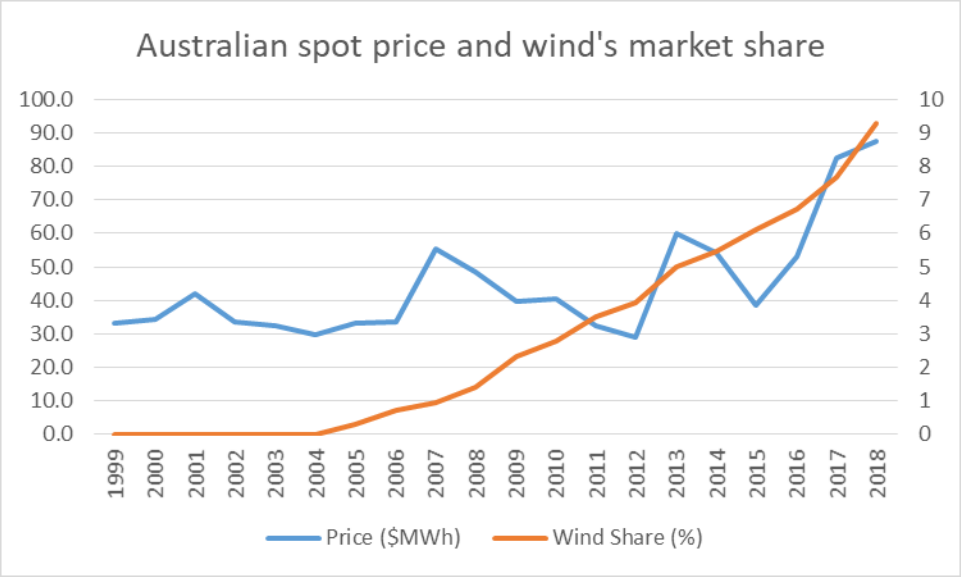
The latest modelling for the NEG is not even internally consistent as almost all the new generation is estimated to come from rooftops even though the whole basis for the NEG is to create a climate of confidence so that wind will be encouraged.

Although many reports have been commissioned which projected renewable subsidies would lower overall prices by forcing incumbent generators with high fixed costs to bid at their marginal cost, this has not been the overall pattern. Instead, a dramatic lift in prices has been brought about by the steady expansion of renewable energy forcing the closure of existing coal fired generation, which has brought a dramatic upward shift in prices.

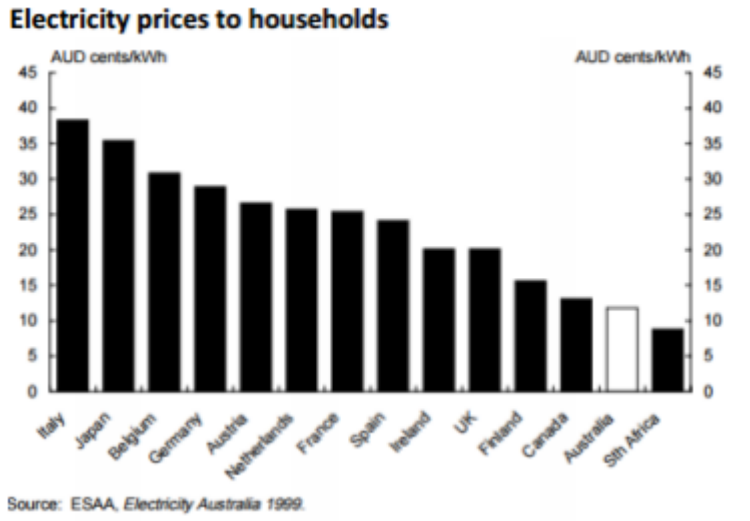
The fall from grace of the Australian electricity industry has been breathtaking. At the turn of the century, Australia had perhaps the world's lowest-cost, most competitive electricity industry. This rested on cheap, low-sulphur coal, which was responsible for 85% of generation, ample supplies of gas, and modest but useful hydro-electricity generation capacity.

That low-cost market-based system had collapsed.

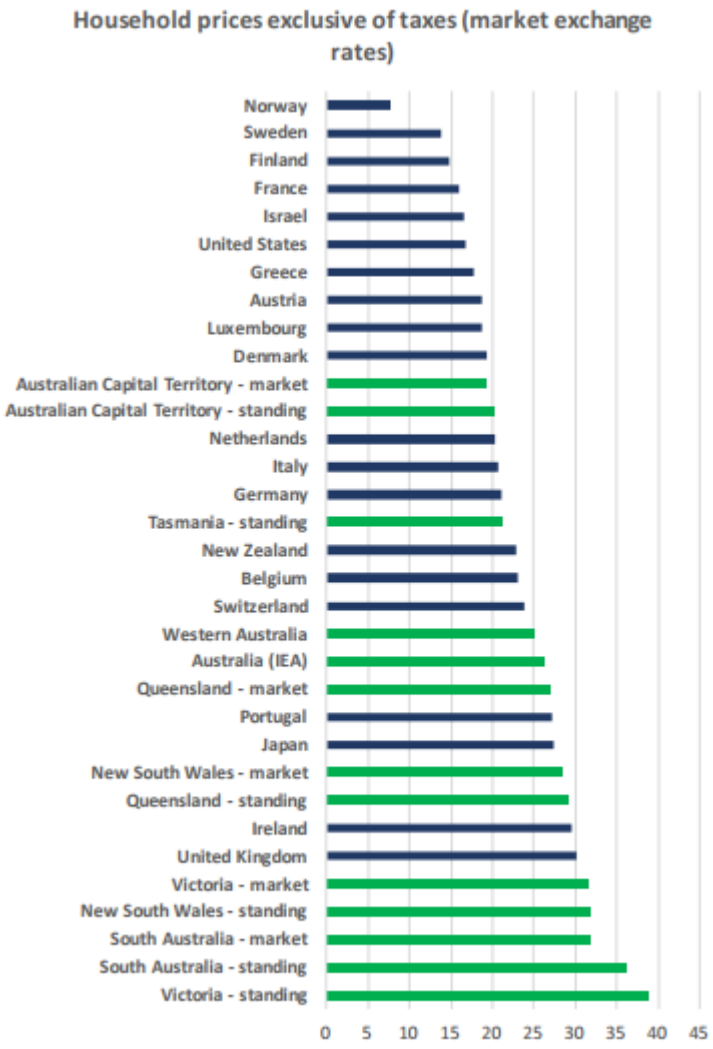
The chart below shows the relationship of wind's market penetration and the spot price.



One international measure for 1998 estimated prices as follows



As at 2016, Australia had become among the highest cost providers and there were further substantial price increases in 2017.

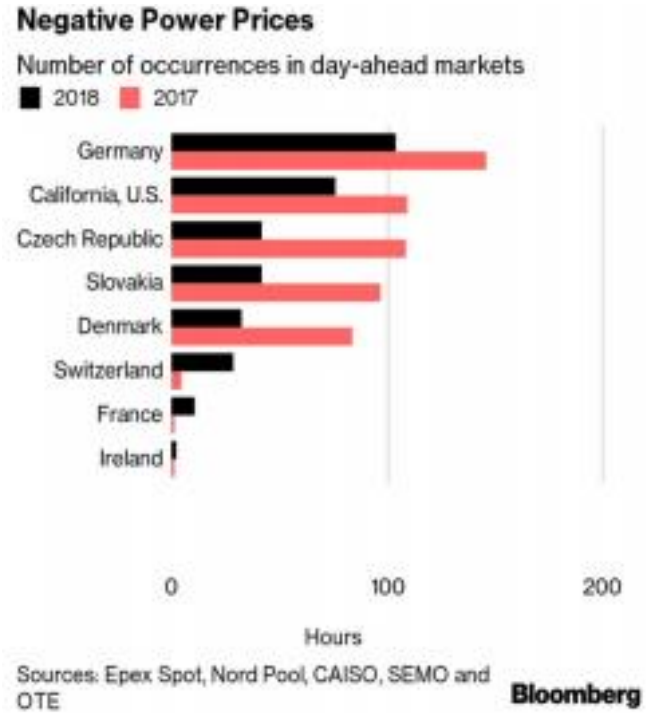


In addition, the reliability of the system is impaired. Australia's relatively thin transmission system means it does not have the same interlinkages seen in other western nations, hence the system itself is more precarious.

As a result of storms in the state of South Australia during September 2016, the lack of resiliency brought about by the high proportion of wind resulted in the whole state going black. The asynchronous nature of wind generators meant that with the settings then in place, what would have been a localised problem as a result of storms resulted in a system black. Unlike synchronous generators, asynchronous generators cannot easily accommodate load power factor variations.

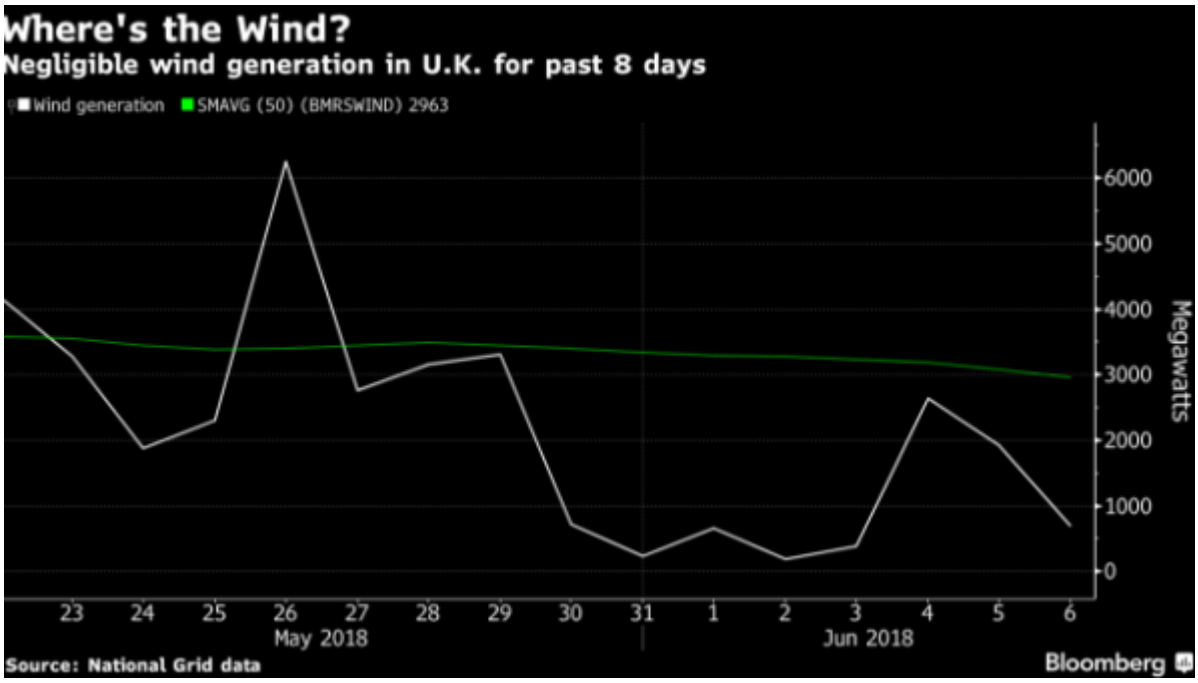
Reduced system reliability of a wind/solar dominated supply is inevitable once dependence on weather vagaries and sunshine availability takes control. Compared to despatchable power from fossil sources, nuclear and hydro, all of which are commonly available 90 per cent of the time, wind and solar is only available 15-35 per cent of the time and can be at very low availability for days on end.

The unpredictability and non-depatchability of wind means considerable price volatility. The growth in the wind share means a considerable increase in negative prices as can be seen below.



Negative prices are great for consumers except when they bring about cost impositions on plant that needs to back-off, and the costs imposed on that plant bring about a net increase in overall costs.

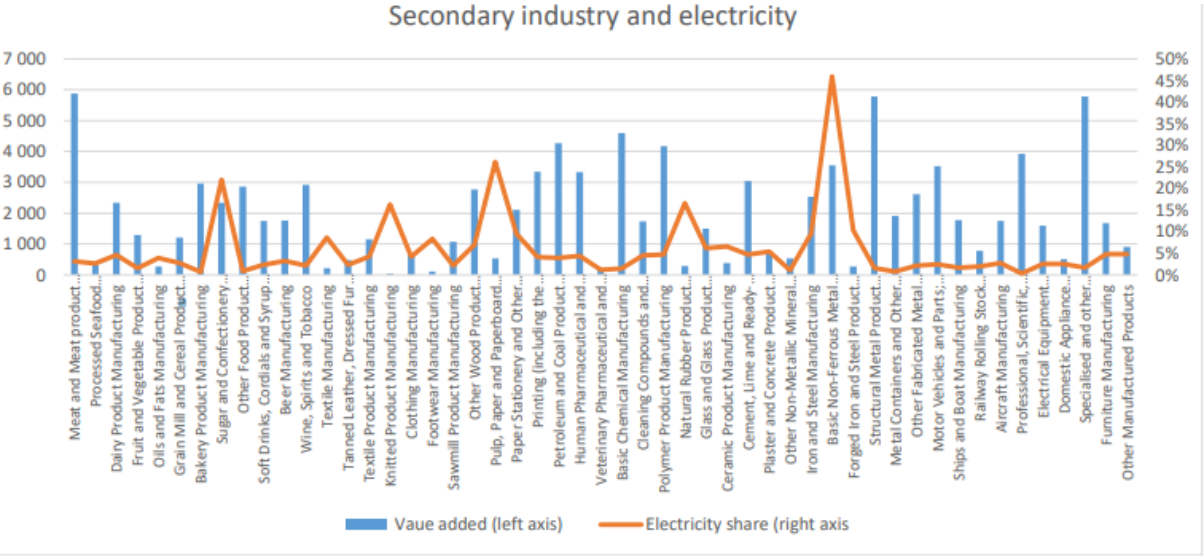
Further illustrating the perils of relying on wind, the UK saw a [prolonged wind drought] in June 2018 with wind's contribution oscillating between 5000 Mw and a few hundred.



The unplanned nature of marked reductions in electricity availability

But it is the effect of cost increases on industry that is the most serious facet, especially for a country like Australia where the industry competitiveness has been built on low cost power. Industries especially threatened can be seen in the chart below, as including basic metals, pulp and paper, sugar and confectionery.

Australian industry: value added and electricity share of costs



Renewables and Energy Policy

The process by which “exotic” renewables, wind, solar, and in Europe wood burning, have become so prominent in energy policy has its impetus from two sources.

Originally promotion of renewables formed a component of the immensely influential Club of Rome notions of a world steadily running short of resources. Oil and gas were said to become depleted in under 30 years time (that is by 2002) and coal would be all gone in 100 years. But the greenhouse scare from the late 1980s massively expanded the impetus for political interventions with the Paris Agreement being the present standard. The perceived need to reduce CO2 emissions was reinforced by an extraordinary technological optimism that the renewable technologies would soon become cheaper than fossil sources.

This stimulated the requirements to save energy, the subsidies to renewables, massive increases in R&D for these technologies and coal and gas joining uranium as a target to be demonised.

The world is replete with politico-economic disasters caused by governments seeking to accelerate what they consider the inevitable march of history. The reversal of the 1000 year long steady increase in productivity of energy supply by the substitution of wind and solar for coal, gas and nuclear has markedly increased the cost of electricity and of all the goods and services that make use of it to varying degrees.

The effect on national productivity is significant and, because nations penalise commercial energy by different amounts, it is leading to shifts in relative competitiveness between developed countries, and between developed countries and the developing countries, China, India and the former Soviet Union, which have far fewer imposts on traditional electricity supplies. The fact that these countries are now joined by the US means the push for interventions from renewables will collapse but extrication from the regulatory messes created by penalising fossil and nuclear supplies will prove costly and painful.