

Refuting Myths about Nuclear and Renewable Energy

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The AUKUS Agreement has given renewed stimulus to the nuclear energy lobby. With campaign support from the Murdoch press, they have increased their efforts to denigrate renewable energy and to promote nuclear energy and fossil gas in its place. Because of the sheer volume of their campaign and the difficulty of publishing fact checks and refutations in the mass media, public opinion polls indicate that some people seem to be taking the misleading claims of the nuclear lobby seriously. Therefore, this article refutes the principal myths the lobby is disseminating.

Myth: Renewables cannot supply 100% electricity

Denmark, South Australia and Scotland already obtain 88, 74 and 62 per cent of their respective annual electricity generations from renewables, mostly wind. Scotland actually supplies the equivalent of 113% of its electricity *consumption* from renewables; the difference between its generation and consumption is exported by transmission line.

All three jurisdictions have achieved this with relatively small amounts of hydroelectricity, zero in South Australia. Given the political will, South Australia and Denmark could reach 100% *net* renewables generation by 2030, as indeed two northern states of Germany have already done. The 'net' means they trade some electricity with neighbours but on average will be at 100% renewables.

Computer simulations by several research groups, including ours at UNSW, using real hourly wind, solar and demand data spanning several years, show that the Australian electricity system could be run entirely on renewable energy, with the main contributions coming from solar and wind. System reliability can be maintained by a combination of storage, building excess generating capacity for wind and solar (which is cheap), key transmission links, and demand management encouraged by transparent pricing.

Storage to fill infrequent troughs in generation from the variable renewable sources will comprise existing hydro, pumped hydro (mostly small-scale and off-river), and batteries. Geographic dispersion of renewables will also assist.

For the rare extended periods of *Dunkelflaute* (literally 'dark doldrums'), gas turbines with stores of biofuels or green hydrogen could be kept in reserve as insurance. Coal and nuclear power stations are too inflexible in operation to be useful as backup—they require a whole day to start up from cold and, when operating, have difficulty and increased costs in attempting to vary their output to follow the peaks and troughs in demand.

Myth: We need baseload power stations

This is an old, discredited claim that refers to the past when variable renewables (wind and solar) were absent and the fossil fuelled electricity supply system consisted mainly of two types of power station, baseload and peak load. Baseload power stations, such as coal and nuclear, operate 24/7 at maximum power output, except then they break down or undergo planned maintenance. Because of their inflexibility in operation, the former system also needed to supplement baseload with peak load power stations, hydro-electric and gas turbines. Peak load stations can vary their output rapidly in response to rapid changes in demand or breakdowns in baseload supply.

When a nuclear power reactor breaks down, it can be useless for weeks or months. For a conventional large reactor rated at 1000 to 1600 megawatts, the impact of breakdown on electricity supply can be disastrous. Big nuclear needs big back-up, which is expensive. Small modular reactors are not commercially available nor likely to be in the foreseeable future.

A renewable electricity system, including storage, delivers the same reliability, and hence the same economic value, as the traditional fossil fuelled system based on a mix of baseload and peak-load power stations.

Myth: Gas can fill the gap until nuclear is constructed

As a fuel for electricity generation, fossil gas in eastern Australia is many times more expensive per kilowatt-hour than coal. So it's not generally used for baseload power. Instead it's used for fuelling gas turbines for meeting the peaks in demand and helping to fill troughs in supply. For this purpose, it contributes about 5% of Australia's annual electricity generation. But, as storage expands, fossil gas will become redundant in the electricity system.

The fact that baseload gas-fired electricity generation continues temporarily in Western Australia results from a unique history. Unlike the eastern states, WA has a **Domestic Gas Reservation Policy** that insulates domestic customers from the high export prices of gas. However, most new gas supplies would have to come from high-cost unconventional sources.

South Australia has an ancient, struggling, gas-fired power station, Torrens Island, that was originally regarded as baseload, but can no longer perform as baseload. **It will be closed in 2026** and replaced with renewables and batteries. South Australia will soon have 100% renewable electricity without a single baseload power station.

Myth: Nuclear energy is cheaper than renewables

Assuming that Australia would not buy nuclear reactors from China or Russia, the only choices are the European Nuclear Reactor and the Westinghouse AP-1000 (or variants thereof). The former type is under construction in Finland, France and the UK. In each case, construction times have greatly increased and original cost estimates have tripled or more.

In South Carolina USA, two AP-1000 reactors were abandoned while under construction due to delays and cost escalation—under state law the electricity customers had to pay

for the failed project. In Georgia USA, two AP-1000 reactors have just been completed at double the original cost. They are the only new nuclear power reactors commenced in the USA since the 1970s and completed. Nuclear power projects bankrupted Westinghouse in 2017.

South Korea is exporting its modification of the Westinghouse reactor, the APR-1400, subsidised by an unknown amount by its government. Its only export project so far, the Barakah project in UAE, is three years behind schedule—the extent of its cost overrun is unknown. The state-owned Korean Electric Power Company (KEPCO) has a debt equivalent to US\$149 billion resulting mainly from its nuclear investments.

All expert studies – e.g. by CSIRO, AEMO, and the multinational investment advisor Lazard – find that nuclear is the most expensive electricity generating technology, while solar PV and wind are the cheapest. This is true after including the cost of ‘firming’ renewables with storage. Contrary to the claims of some nuclear proponents, the levelized cost method used in these studies takes account of the different lifetimes of the technologies. It also includes the cost of connecting the power stations to the main grid. While renewables will need a few additional major high-voltage transmission links, so would nuclear.

Myth: Nuclear energy can co-exist with large contributions from renewables

This myth has two refutations:

1. Nuclear is too inflexible in operation to be a good partner for variable wind and solar. Its very high capital cost necessitates running it constantly at full power, not just during periods of low sun or wind. This would mean offloading renewables, although they are much cheaper to operate.
2. On current growth trends of renewables, there will be no room for nuclear energy in South Australia, Victoria or NSW. The 2022 shares of renewables in total electricity generation in each of these states were 74%, 37% and 33% respectively. Rapid growth from these levels is likely. It's already too late for nuclear in SA. Provided the growth of renewables is not deliberately suppressed in NSW and Victoria, these states too will reach 100% renewables long before the first nuclear power station could go online.

Myth: There is insufficient land for wind and solar

Although a wind farm may span a large area, its turbines, access road and substation together occupy a tiny fraction of that area, typically about 2%. Most wind farms are built on land that was previously cleared for agriculture and are compatible with all forms of agriculture. Off-shore wind occupies no land.

Solar farms are increasingly being built sufficiently high off the ground to allow sheep to graze beneath them, providing welcome shade. This practice, known as agrivoltaics, provides additional farm revenue that's especially valuable during droughts. Rooftop solar occupies no land.

Myth: Nuclear energy is safe

Nuclear energy is dangerous for three reasons: its contribution to the proliferation of nuclear weapons, the impacts of nuclear accidents and the task of managing high-level nuclear wastes for 100,000 years or more.

The two principal nuclear explosives are Uranium-235 and Plutonium-239. Both can be obtained from the nuclear energy supply chain. Under the cloak of nuclear energy, several countries – the UK, France, India, Pakistan, North Korea and South Africa – have produced nuclear weapons either by further enrichment of uranium to increase the concentration of Uranium-235 beyond the level (3–4%) required for nuclear energy or by extracting Plutonium-239 from the spent fuel of their nuclear power reactors.

In addition, the following countries have attempted to use nuclear power to produce nuclear explosives while cloaking their development of nuclear weapons: Algeria, Argentina, Australia, Brazil, Libya, South Korea and Taiwan. Fortunately, they did not complete their programs for various reasons. Nuclear power and nuclear weapons are intimately linked.

The most serious nuclear accidents were the Kyshtym disaster in former USSR in 1957, the partial meltdown at Three Mile Island in the USA in 1979, Chernobyl in Ukraine in 1986, and Fukushima in Japan in 2011. Except for Three Mile Island, which took the US to the brink of a major disaster, each of these accidents have likely caused many thousands of cancer deaths from exposure to ionising radiation.

There are no operating permanent repositories for high-level nuclear wastes. Finland is the only country that's close to completing a deep underground repository. The USA spent billions developing one at an unsuitable site in Nevada and then had to abandon it. At present, high-level wastes are in temporary storage above ground at nuclear reactor sites, either in steel and concrete casks or in pools of water.

The contrast between nuclear and renewable energy technologies is demonstrated by their respective responses to the earthquake and tsunami that struck the Pacific coast of Japan in 2011. At the Fukushima Daichi nuclear power station, three of the six nuclear reactors melted down accompanied by hydrogen explosions that expelled vast amounts of radioactive materials into the environment. Further down the coast at Kamisu, the tsunami passed through a near-shore wind farm located in the surf (see picture) without stopping it. It was only shut down when the grid went down and recommenced operating when the grid was restored three days later.

Summary

Renewables – solar, wind and existing hydro – together with storage and energy efficiency, can supply all Australia's electricity and ultimately all energy, including transportation and heating. Nuclear energy is too dangerous, too expensive, too slow to build, and too inflexible in operation to be a good partner for wind and solar. A nuclear scenario would inevitably involve the suppression of clean, inexpensive, safe renewables.

Further reading

Mycale Schneider & Antony Froggatt (2023). *The World Nuclear Industry Status Report 2023*. <https://www.worldnuclearreport.org/-World-Nuclear-Industry-Status-Report-2023-.html>

Mark Diesendorf (2024). The intimate relationship between nuclear weapons and nuclear power. *Pearls & Irritations*, <https://johnmenadue.com/the-intimate-relationship-between-nuclear-weapons-and-nuclear-power/>

Richard Broinowski (2022). *Fact or Fission: The truth about Australia's nuclear ambitions*. 2nd edition, Scribe Publications.

Picture caption: The near-shore Kamisu wind farm which survived the 2011 tsunami

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