Nuclear power: a real option

People think of Chernobyl and react in horror. But nuclear power is safe - and needed

John Harries
Columnist

Contrary to public opinion, nuclear power is a real option in the push to lower carbon emissions.

Nuclear power is a major generator of electricity in most advanced and many developing countries where it is considered an essential part of their electricity supply. The very low carbon emissions of nuclear power greatly assist these countries in meeting their international carbon emission commitments.

Although nuclear power has a very good record in supplying reliable, affordable and low carbon electricity in many countries, Australia has prohibitions in both Commonwealth and State legislation against using it, which prevents nuclear even being considered.

It's time these legislative prohibitions were removed. It is difficult to have a rational discussion about the nuclear power option for Australia when, whatever the outcome, the technology itself is prohibited by legislation. Removal of these prohibitions would allow nuclear to be considered on its merits.

Nuclear power is a very well-established technology with over 17,000 power reactor-years of operation since the first commercial power reactors started in the 1950s.

Currently, 444 nuclear power plants are connected to the grid in 30 countries, with an additional 54 nuclear power reactors under construction and 111 nuclear power reactors on order or planned with approvals, funding or major commitment in place.

Nuclear provided 10 per cent of the global electricity in 2018 and 18 per cent of the electricity of advanced economies. Nuclear plays a key role in lowering carbon emissions from the power sector in many countries. The carbon emissions for the whole nuclear fuel cycle are very low; similar to emissions from hydro and wind per unit of electricity produced.

In 2018, nuclear power plants around the world produced 50 per cent more clean electricity than wind and solar combined. In the European Union and USA, nuclear produces more low carbon electricity than hydro. The use of nuclear enables countries to achieve low carbon emissions from electricity generation.

For example, nuclear supplied 72 per cent of electricity in 2016 in France which had an electrical generation carbon emission intensity of 58 g CO2/kWh compared to 440 gCO2/kWh for its neighbour Germany which has a similar sized electricity grid and is closing nuclear plants.

The International Energy Agency analysed different electricity technologies and found that nuclear power is competitive in terms of the levelised cost of electricity (LCOE) with fossil fuels and firmed renewables. The long operating life and low operating costs of nuclear power plants offset higher construction costs.

However, LCOE analyses do not include system costs in a grid with significant variable renewable energy (VRE). A recent OECD report on the costs of decarbonisation (2019) highlighted how the variability of wind and solar increase electricity system costs because of the cost of the extra backup generators, additional transmission lines and excess capacity required.

Even including the major accidents in Chernobyl in 1986 and Fukushima in 2011, nuclear power remains among the safest of all generation technologies based on lives lost per unit of electricity produced in over the 60 years of commercial operation.

The Chernobyl accident is the only accident in the history of nuclear power generation in which members of the public are known to have been killed by radiation; and the Chernobyl reactor type could not have been licenced outside the former Soviet Union.

Reactor designs are continually being improved based on the operating experience of current reactors. These designs must be assessed, approved and licensed by a nuclear regulator before construction.

Options for nuclear in Australia include large one-gigawatt plants similar to those recently constructed in South Korea and the United Arab Emirates and smaller reactors like the Small Modular Reactors (SMRs) now undergoing regulatory assessment overseas. SMRs have advanced safety features, are designed to load-follow [*which means it adjusts its power output as demand for electricity fluctuates throughout the day - Ed.*] and their smaller size reduces the upfront capital cost which makes them easier to finance and quicker to operate.

Australia can benefit from current and emerging reactor designs as well as from the considerable international experience accumulated in regulating nuclear power reactors, taking into account safety, environmental, technical, economic and social factors.

Nuclear power can make a significant contribution to the reliability of Australia's electricity grid and reduce carbon emissions.

John Harries works with the Australian Nuclear Association