Richard Weatherley

4 November 2024

To the House Select Committee on Nuclear Energy:

Thank you for the opportunity to provide a brief submission to the ***Inquiry into nuclear power generation in Australia*****.**

My experience with nuclear power and the nuclear industry began in the period 1989-1995 when I worked with several organisations that succeeded in halting the expansion of nuclear power in the UK and Europe, largely on the grounds described below.

In that time, I saw radioactive discharges from nuclear reprocessing facilities that led to the Irish Sea being named the most contaminated water in the world. And I worked with a Geiger-Müller counter under my desk and an airborne radiation counter on the roof of my workplace – part of a Europe-wide network developed in response to the Chernobyl disaster. More recently, I have observed the global civil nuclear industry attempt to resurrect its fortunes via the climate crisis.

The following seven points summarise the issues I see with nuclear power in Australia and why it is doomed to failure:

1. **Nuclear power is incredibly expensive – and average Australians will pay**
2. **The nuclear industry lies (compulsively)**
3. **Reactor decommissioning durations and costs are vastly underestimated**
4. **Nuclear plants cannot be brought online fast enough to impact critical climate change targets**
5. **Nuclear plants are at serious risk from climate change**
6. **Nuclear plants are fallible and vulnerable**
7. **Radioactive waste persists for up to a million years**

These issues are described in more detail below.

Thank you for considering this submission.

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1. Nuclear power is incredibly expensive – and average Australians will pay

Costs and construction times for Western nuclear plants are routinely underestimated. The electricity that is produced cannot compete with renewables. In fact, nuclear power costs can become even less competitive as reactor operating and decommissioning costs and risks are better understood.

Example 1: Delivery of the French EPR reactor located in Flamanville is more than 10 years overdue and nearly four times over budget.

This so-called "next-generation nuclear reactor" model has also sustained multiple problems, delays and cost overruns in France, the United Kingdom, Finland and China as described below.

Example 2: In Finland, construction of the Olkiluoto unit 3 reactor commenced in 2005. Commercial operation was planned for 2010. This has been pushed back several times with the reactor only entering regular production in 2023, 18 years after the start of construction. The unit was estimated to cost €3 billion. By 2023 the total cost of the project is estimated to be €11 billion. The existing Olkiluoto units 1 and 2 have an electricity production cost of ~18 €/MWh. Olkiluoto unit 3 has an electricity production cost of ~49 €/MWh (over 2.5 times higher).

The same issues can be seen in the UK's Hinkley Point C, US Vogtle and many, many other reactor builds.

Example 3: The Hinkley C plant is located on the Somerset coast of the UK. In 2007, the then chief executive of French power provider EDF, which wanted to build the plant, boasted that by 2017 Britons would be able to cook their Christmas turkeys using electricity from Hinkley. When EDF finally committed to the 3.2 GW plant in 2015, the initial budget was £18 billion, with a scheduled completion date of 2025. Earlier this year, following a spate of cost and time blowouts, EDF said the estimated costs of building the plant would soar to as much as £46 billion. Completion of the first reactor was not expected until 2029 at the earliest. The French utility, meanwhile, did not even bother to give a timeframe for the second reactor.

What we do know is how much the British public will be paying for power from Hinkley. To build the plant, ***the UK government committed*** to paying A$171/MWh for the first 35 years, adjusted to inflation. This means the prices rise in line with inflation, by the end of 2023 it was A$245/MWh.

For context, Australia's wholesale energy cost in the last quarter of 2023 was A$48/MWh.

I also note that there has been no public discussion of the costs and logistics of spent fuel reprocessing.

2. The nuclear industry lies (compulsively)

A few quotes from the nuclear industry over the years:

- Nuclear power is “too cheap to meter” (1950s-1960s)
- Reactors are completely safe – they have backup systems
- Reactors are “failsafe”
- Reactors cannot melt down
- Western reactors cannot melt down
- Second-generation reactors are much safer than previous ones
- Third-generation reactors are much safer than previous ones
- Reactor accidents will occur at most once every 1,000,000 operating years
- The nuclear waste problem has been solved
- Nuclear fusion reactors will be powering our homes within the next 10 years
- Nuclear fusion power is clean, reliable, safe and cheap
- Nuclear reactors provide 100% stable, always-on power
- Nuclear power is zero-carbon
- Nuclear will solve the climate problem, just keep the coal plants running for a little while longer
- Nuclear power costs are well-known (construction time, electricity costs, waste disposal, decommissioning)
- Reactors can be built in 5-7 years
- Small Modular Reactors (SMRs) are clean, reliable, safe, cheap and can be built quickly

3. Reactor decommissioning durations and costs are vastly underestimated

Example: In the UK, the Nuclear Decommissioning Authority (NDA) has reassumed control of closed reactors after a failed attempt to privatise the decommissioning of nuclear reactors. The legacy fleet and Advanced Gas Reactors (AGRs) currently operated by EDF Energy will be decommissioned by the NDA and thus paid for in full by British taxpayers. The NDA plans to complete decommissioning for most of its fleet by 2125, except for the Scottish Dounreay site. This site will be remediated no sooner than 2333.

Also in the UK, the Sellafield nuclear fuel reprocessing site (including the old Windscale nuclear bomb plutonium facility) is due to be decommissioned by 2120 at a cost of £121 billion. These costs continue to be underestimated even as they are updated year on year.

These colossal decommissioning costs exist in all countries that operate civil and/or military nuclear reactor facilities. In most cases they were never factored into the total reactor lifecycle cost.

4. Nuclear plants cannot be brought online fast enough to impact critical climate change targets

Stabilising the climate is an emergency. Building out more nuclear power is slow. Building nuclear power in a greenfield country such as Australia is *very* slow.

The extra time that nuclear plants take to build has major implications for climate goals, as existing fossil-fuelled plants continue to emit CO2 while awaiting replacement. The construction of a nuclear plant is a long and complex process that releases CO2, as does the demolition of decommissioned nuclear sites, along with uranium extraction, transport and processing.

The 2021 World Nuclear Industry Status Report estimates that since 2009 the average construction time for reactors worldwide was just under 10 years, well above the estimate given by the World Nuclear Association (WNA) industry body of between 5 and 8.5 years.

According to scenarios from the World Nuclear Association and the OECD Nuclear Energy Agency (both nuclear industry lobby organisations), doubling the capacity of nuclear power worldwide in 2050 would only decrease greenhouse gas emissions by around 4%. But to do that, the world would need to bring 37 new large nuclear reactors to the grid every year from now, year on year, until 2050.

The last decade only showed a few to 10 new grid connections per year. Ramping that up to 37 is physically impossible – there is not sufficient capacity to make large forgings like reactor vessels. There are currently only 57 new reactors under construction or planned for the coming one-and-a-half decades. Doubling nuclear capacity – different from the explosive growth of clean renewable energy sources like solar and wind – is therefore unrealistic. And that for only a 4% greenhouse gas when we need to reduce by 100%.

5. Nuclear plants are at serious risk from climate change

Two in five nuclear plants operate on the coast and at least 100 have been built just a few metres above sea level.

Nuclear power plants must draw from large sources of water to cool their reactors; hence they are often built near the sea or waterways. But nuclear plants further inland will face similar problems with flooding in a warming world. Increasingly severe droughts and bushfires only ramp up the threat.

Recent scientific data indicates sea levels globally will rise further and faster than earlier predictions suggested. Even over the next couple of decades, as extreme weather events become more frequent and destructive, strong winds and low atmospheric pressure will drive bigger storm surges that could threaten coastal installations.

Around 516 million people worldwide live within an 80km radius of at least one operating nuclear power plant, and 20 million live within a 16km radius. These people bear the health and safety risks of any future nuclear accident. Efforts to build nuclear plants resistant to climate change will significantly increase the already considerable expense involved in building, operating and decommissioning nuclear plants, not to mention maintaining their stockpiles of nuclear waste.

The US Nuclear Regulatory Commission concludes most of its nuclear sites were never designed to withstand the future climate impacts they face, and many have already experienced some flooding. A recent US Army War College report also states that nuclear power facilities are at high risk of temporary or permanent closure due to climate threats – with 60% of US nuclear capacity at risk from future sea-level rise, severe storms, and cooling water shortages.

Nuclear reactors in the United States and France are often shut down during heatwaves, or have their output drastically reduced during these times.

6. Nuclear plants are fallible and vulnerable

Mines, factories and plants involved in the nuclear economy are easy targets for malevolent acts: terrorist threats, the risk of unintentional or deliberate serious incidents, cyberattacks or acts of war. The enclosures of some buildings containing radioactive materials are not designed to withstand this type of incident or attack.

Nuclear power plants present unique hazards in terms of the potential consequences resulting from a severe accident. Nuclear reactors and their associated highly radioactive spent fuel are vulnerable to natural disasters, as Fukushima Daiichi showed, but they are also vulnerable in times of military conflict.

Nuclear power plants are some of the most complex and sensitive industrial installations, which require a very complex set of resources in a constant ready state to keep them operational. This cannot be guaranteed in a hot war, cyber war or other conflict.

7. Radioactive waste persists for up to a million years

The multiple stages of the nuclear fuel cycle produce large volumes of radioactive waste. No government of significant size has yet resolved how to safely manage this waste.

Nuclear waste management is costing taxpayers absurd amounts of money, with costs for storage projects reaching into the billions. This is true both for Europe and North America. In 2019, a US Energy Department report showed the projected cost for long-term nuclear waste cleanup jumped more than $100 billion in just one year.

Nuclear waste is a disaster for our environment and for future generations, who will have the responsibility of managing it for millennia. This has never been done before. Humans have shown a remarkable inability to plan for – and manage – issues over long time scales. If we can’t manage climate change, how will we manage nuclear waste?