

The House of Representatives Standing Committee on the Environment and
Energy Inquiry into the Prerequisites for Nuclear Energy in Australia

(Thursday, August 29 2019, by teleconference)

Dr Ziggy Switkowski, Chair NBN Co, Chancellor of RMIT University

(and former board member and Chair ANSTO, 2006-2011)

Thank you for the invitation to participate in this Inquiry, and for your accommodating my schedule and the option to use a teleconference facility.

- The SA Nuclear Fuel Cycle Royal Commission (2016) updated the work of the Uranium, Mining, Processing and Nuclear Energy Review (2006) and is a very good source document for this Inquiry.
- To me the key questions are
 - Can you graft a long range commitment to nuclear energy onto a currently unconfirmed (unstable?) national energy policy?
 - Has the opportunity to deploy nuclear reactors in Australia passed because (i) of the Fukushima disaster in Mar 2011 which significantly reduced public support, and (ii) the competitive and rapid developments in wind and solar energy plus storage (such as pumped hydro and batteries)?

I expect that the Inquiry will hear quite polarized views concerning the deployment of nuclear reactors in Australia. It is that sort of topic.

I have prepared notes listing the pros and cons of nuclear power and provided them to the Secretariat but perhaps it is better, Chair, if I pause and await your guidance as I would be just as happy to address questions from panel members.

The attractions of nuclear power and its fit to Australia are believed to be:

- Very efficient and weather-independent generator of base load power with low variable costs per kwh. In theory, the phasing out of coal fired power and the phasing in of nuclear could make a lot of sense
- Low Greenhouse Gas emissions, comparable to renewables such as wind and solar and therefore helpful in reaching national emissions targets
- Australia has good energy and environmental standards and capable regulators including in radiation safety
- The size of the continent and location of population centres provides large areas where reactors could be safely located

- The Australian continent is geologically stable and many spaces can be found to house a storage facility for spent nuclear fuel which are away from population centres, and not near water, or in harm's way. A repository would be required after 2050, the engineering issues are well known, and several countries will have working facilities by then. As the RC suggested, stewardship of the world's nuclear waste may yet prove to be a significant commercial opportunity for Australia
- We have a technically capable workforce and a vocational and higher education sector that could quickly produce the trained people needed by a nuclear industry
- We have good experience with research reactors and radioisotopes for industry and medical applications
- We have about 1/3 of the world's economically recoverable uranium
- The arrival of Small Modular Reactors (SMRs: 60-200MW) might provide many opportunities, esp in regional Australia, for generation of clean safe base load power

The challenges to supporting a nuclear energy strategy appear to be:

- With the additional levels of safety and security demanded post-Fukushima (and post 9/11, 2001), conventional nuclear reactors are now very expensive (more than \$US1B per 100MW) with nearly half the costs associated with systems and technologies which one hopes are never activated in anger
- Given Australia begins from a standing start, the first reactor (of any commercial scale) would take about 15 years to reach normal operation (and generate revenues) through the stages of changes to legislation, skill building, design, community consultation, site selection, environmental approvals, vendor selection, construction, accreditation and operation. Given overseas experience, the risk is in the direction of longer times
- The commercial and political risks are substantial (over 5 or more political cycles) and forecasts of Australia's grid structure, energy mix and technology options for 2040 are very uncertain. Nuclear is the most capital-intensive technology with the most distant financial payback.
- Unlike with wind and solar, there appear to be no economies of scale associated with nuclear reactors ie costs/kwh grow with each new generation
- There is currently no bipartisan support for a nuclear energy strategy, community sentiment is mixed, and the topic of nuclear energy produces strong, often emotional opposition from some quarters and is readily undermined by scare campaigns. There is no social licence at this time.
- No coherent business case to finance an Australian nuclear industry has ever been presented, to my knowledge, and certainly none which does not anticipate heavy government support, particularly financial. This is typical in

every country where a civilian nuclear program has begun without the support of an earlier military one.

- Traditional reactor vendors such as Westinghouse and Hitachi have exited the industry and the leading manufacturing nations are now China, S Korea, Russia and France. Would Australia order a nuclear reactor from China?
- No country has yet commissioned and completed a spent fuel or high level waste facility. Australia has struggled even to get traction to build a small low level facility in Central Australia. The costs of spent fuel storage and reactor decommissioning are high and a potential burden on future generations over hundreds of years
- After the Three Mile Island (1979), Chernobyl (1986) and Fukushima (2011) events, the possibility of catastrophic failure within a nuclear system is non-negligible
- We have no existing nuclear industry beyond mining yellow cake

I do not intend to specifically address topics such as climate change, nuclear technology (eg fusion), economics, exotic fuel mixes (thorium), nuclear submarines, the fuel cycle (enrichment), weapons and non-proliferation, global geopolitics etc. My assumption is that the Inquiry will get as much input as it needs on these matters and the SA Royal Commission Report is a good reference source.

Finally, back to the questions:

- Can you graft a long term commitment to nuclear energy onto a currently unconfirmed (unstable?) national energy policy?
No.
- If the demand for 24/7 baseload power from centralised generators continues to fall, can any investment be justified for GW-scale nuclear generators in 2035 into an East Coast market where total demand is about 30GW today? Or might base load demand recover once electric cars become ubiquitous?
No.
- Will there be an opportunity for SMRs?
There should be esp in regional Australia to power small towns (100k), mining sites, desalination plants. But we won't know until SMRs are deployed in quantity during late 2020s.
- Should we change the Environmental Protection and Biodiversity Conservation Act?
Yes. All obstacles should be removed to the consideration of nuclear power as part of the national energy strategy debate.

(We should not make decisions in 2019 based upon legislation passed in 1999 reflecting the views of 1979).

In May 2016, the South Australia Nuclear Fuel Cycle Royal Commission recommended that prohibitions be removed.

If Bill Gates (TerraPower) want to partner with an Australian organization to introduce nuclear power into Australia, he could not lawfully do so.

- What is the role for government?

To produce a coherent national energy strategy which is (ideally) technology agnostic, balances costs with resilience and risk, delivers on national emissions targets, restores energy as a source of national competitive advantage, and has bipartisan support.

ZES Aug 29, 2019

Notes

- Chernobyl site planned in 1970 to support 12 reactors. Reactor #1 operational in 1977, Reactor 4 in 1983. Each generated 1000 MW. Remaining three shut down in 2000.