Nuclear power is not viable in the absence of a carbon price

Submission to Standing Committee on Environment and Energy of the Australian Parliament inquiry into the prerequisites for nuclear energy in Australia.

Submission from
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1

Terms of Reference

The Committee specifically inquire into and report on the circumstances and prerequisites necessary for any future government's consideration of nuclear energy generation including small modular reactor technologies in Australia, including

f: economic feasibility
i: national consensus

2

Summary

* The legislative prohibition of nuclear power was a purely symbolic measure when it was introduced in the late 1990s. Removing the prohibition would be similarly, symbolic and pointlessly divisive in the absence of a policy framework with the potential to make nuclear power an economically feasible option.

* Nuclear energy generation will be economically feasible in competition with existing coal and gas generation only in the presence of a carbon price of at least $50/tonne of CO2. Optimally, a lower price should be introduced immediately, rising in real terms over time as the date for deployment of nuclear approaches

* National consensus support for nuclear power is essential to any investment and will be difficult to attain. The only possible path to consensus is one based on
(a) unequivocal acceptance of mainstream climate science
(b) the adoption by the government of radically more ambitious goals for reductions in CO2 emissions

* The most important prerequisite for consideration of small modular reactors is the commercial available of reactors at costs that are at least competitive with existing Generation III/III+ reactors. This will not occur, if at all, before the late 2020s

Recommendations

Recommendation 1: A carbon price of $25/tonne should be introduced immediately, and increased at a real rate of 5 per cent a year, reaching $50/tonne by 2035

Recommendation 2: The government should immediately adopt the recommendations of the Climate Change authority for a 40 to 60 per cent reduction in emissions by 2030, relative to 2000 levels, and match other leading OECD countries in committing to complete decarbonization of the economy by 2050.

Recommendation 3: The Parliament should pass a motion

(i) affirming its confidence in mainstream climate science and its acceptance of the key conclusions of the Intergovernmental Panel on Climate Change.

(ii) Legislating a commitment to emissions reductions as in Recommendation 2

(iii) Removing the existing ban on nuclear power

Support for the motion should be binding on all members of the major parties.

Recommendation 4: The Energy Security Board should monitor the progress of the NuScale project.

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Background

Following a referral from the Minister for Energy and Emissions Reduction, the Hon Angus Taylor MP, the Standing Committee on Environment and Energy of the Australian Parliament resolved on 6 August 2019 to conduct an inquiry into the prerequisites for nuclear energy in Australia.

The central point of this submission, repeating the conclusion of previous inquiries is that the imposition of a carbon price, with bipartisan support is the critical necessary condition for the economic feasibility of nuclear power.

The submission is organised as follows. Section 1 deals with the legislative framework for nuclear power. Section 2 summarises the key findings of previous inquiries, namely the Switkowski inquiry and the SA Nuclear Fuel Cycle Royal Commission. Section 3 analyzes the need for a carbon price of at least $50/tonne. Section 4 argues that only a comprehensive commitment to decarbonization can provide a path to a national consensus allowing nuclear power. Section 5 deals with the future prospects for small modular reactors.

1. Legislative framework

The Australian Radiation and Nuclear Safety Act (1998) and the Environment Protection and Biodiversity Conservation Act of 1999 (the EPBC Act) included provisions prohibiting the development of nuclear power in Australia. These prohibitions were purely symbolic for two reasons

(i) there was no likelihood that nuclear power could be an economically feasible option in Australia

(ii) the development of nuclear power could not take place without the passage of legislation establishing the necessary regulatory authorities and the necessary public expenditure. Hence, a ban was superfluous.

These conditions have not changed, and will not change in the absence of a commitment to complete decarbonization of Australia's electricity supply. Hence, the removal of the current ban, in the absence of other changes, would be a pointlessly divisive piece of symbolism.

2. Previous inquiries

A nuclear power station was proposed for Jervis Bay, ACT, in the 1960s, but the project was abandoned as uneconomic by the McMahon government. https://www.abc.net.au/news/2019-08-12/jervis-bay-once-site-for-nuclear-proposal/11371296 The feasibility of nuclear power in Australia has been examined by two inquiries conducted in the 21st century.

Switkowski inquiry

The Switkowski inquiry conducted in 2006, nuclear power is a 'practical option' for Australia; that it could be delivered to the Australian grid within 10 years, although 15 is more likely; that nuclear power would be between 20 to 50 per cent more expensive than conventional power from coal and gas, and therefore, *would only be cost competitive if a tax were imposed on carbon* (emphasis added).

Technological development since 2006 have rendered much of the analysis undertaken by Switkowski irrelevant. The cost of renewable energy generation and storage have fallen dramatically, while nuclear projects considered promising at the time have experienced substantial overruns.

However, the crucial conclusion of the report remains valid. In the absence of a carbon price, nuclear power will never be viable in Australia.

SA Royal Commission

The South Australian Nuclear Fuel Cycle Royal Commission concluded that "it would not be commercially viable to generate electricity from a nuclear power plant in South Australia in the foreseeable future."

This conclusion was consistent with my submission, which is attached.

Events since then have reinforced that conclusion. A number of nuclear projects in the US and UK have been abandoned or deferred indefinitely, including VC Summer (US), Moorside

(UK), Wylfa (UK) and Kaminoseki (Japan), while cost estimates for projects under construction, including Vogtle (US), Flamanville (France) and Olkiluoto (Finland) have risen further.

The only new[1] project to begin construction in the OECD[2] has been the Hinkley C project. As discussed below, the viability of this project depended critically on the adoption of ambitious goals for emissions reductions and a high price for carbon.

3. The need for a carbon price

Under current market conditions, and in the absence of new government subsidies, it is highly unlikely that any coal-fired generating capacity will be constructed in Australia, or that gas-fired capacity will expand substantially. The crucial requirement for the economic viability of new nuclear power is that it should be able to compete with existing fossil fuel generators and hasten the process of decarbonization.

In the absence of other recent projects in comparable jurisdictions, the Hinkley Point C reactor provides the only available comparator to estimate the likely costs. The agreement to construct Hinkley was based on a guaranteed 'strike price' of £92.50/MWh (in 2012 prices), to be adjusted by the CPI during the construction period and over the subsequent 35 years tariff period. At current exchange rates, this price corresponds to approximately $A165.

Prices in the NEM have generally averaged around $A90/MWh. This implies that, if new nuclear power is to compete with existing fossil fuel generators, a carbon price must impose a cost of $75/MWh on fossil fuel generation. Assuming emission rates of 1.3 tonnes/MWh for brown coal, 1 tonne/MWh for black and).5 tonnes for gas, the implied carbon price ranges from $50/tonne (to displace brown coal) to $150/tonne (to displace gas).

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[1] Two plants commenced construction in South Korea after long delays, but cost information is not readily available. The South Korean government has decided to cease investment in new nuclear power plants and to replace coal-fired power with renewables.

[2] Attention in this submission is confined to developments in OECD countries. In particular, it is observed that experience in Russia and China is of little relevance, given the absence of reliable information on operating costs and safety standards, radically different costs of labour and capital and the assumption that reliance on Russian or Chinese firms for crucial national energy needs will not be acceptable.

It should be noted that Hinkley C has a number of advantages over a possible Australian plant. The most important of these are the availability of a 'brownfield' site, next to existing nuclear power plants, (avoiding the costs and delays involved with a new site) and the fact of an existing industry with necessary skills and expertise. Against this, it is possible that interest rates will be lower in the future than at the time the Hinkley agreement was negotiated.

The introduction of a carbon price of $50/tonne would raise concerns about the economic disruption. Moreover, the price need not be attained until construction of nuclear power plants was about to commence, which is unlikely before 2025. Further, in view of past policy reversals, a sustained commitment to carbon pricing would be required before investors would be willing to risk their capital. This leads to

Recommendation 1: A carbon price of $25/tonne should be introduced immediately, and increased at a real rate of 5 per cent a year, reaching $50/tonne by 2035.

4. National consensus

To the extent that a national consensus on nuclear power exists in Australia, it is negative. All major parties currently support the maintenance of the existing ban on nuclear power. A reversal of this position is a necessary precondition of the expansion of nuclear power. In the absence of a positive consensus, no construction firm, finance institution or generation enterprise would be willing to take the risk of investing in nuclear power.

The only basis on which a positive consensus could emerge is that of an radically expanded commitment to decarbonize the Australian economy, using a combination of:

* nuclear power;

* renewables;

* replacement of internal combustion engines with electric vehicles;

* changes in industrial processes; and

* limits of land clearing, combined with reforestation.

An immediate test of the feasibility of such a consensus will be provided by the deliberations of the Committee on this matter.

Recommendation 2: The government should immediately adopt the recommendations of the Climate Change authority for a 40 to 60 reduction in emissions by 2030 and match other leading OECD countries in committing to complete decarbonization of the economy by 2050.

http://www.climatechangeauthority.gov.au/special-review/final-report-australias-future-emissions-reduction-targets

Recommendation 3: The Parliament should pass a motion

(i) affirming its confidence in mainstream climate science and its acceptance of the key conclusions of the Intergovernmental Panel on Climate Change.

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Support for the motion should be binding on all members of the major parties.

5. Small modular reactors

Small nuclear reactors have been in use for many decades, notably in nuclear powered submarines. These reactors are substantially more costly (per MW of capacity) to construct and operate than larger reactors which benefit from economies of scale. The promise of small *modular* reactors is that these higher costs may be more than offset by the construction of large numbers of small reactors under factory conditions, with the parts being transported to the construction site for assembly.

Although a variety of small modular reactor designs have been proposed, the only one with serious prospects of being commercially available in a relevant scale, is the NuScale project being undertaken in the US with support from the Department of Energy. This proposal was initially funded in 2013 with a target date of 2021. It is currently estimated that the first module of a pilot plants will be installed in 2026, with a 12-module plant being operational by 2027.

There is considerable room for doubt over whether this goal can be achieved. Assuming that it is achieved, and that large scale production begins shortly thereafter, it is possible that commercial availability might be realised by 2030. Availability for export markets such as Australia would be subject to further delays.

Recommendation 4: The Energy Security Board should monitor the progress of the NuScale project.

Concluding comments

It appears highly unlikely that the recommendations set out in this submission will prove politically acceptable, or that nuclear power will in fact be deployed in Australia. However, I believe the conditions set out in this submission are the only ones under which there is even a possibility of successfully introducing nuclear power.