

DEPARTMENT OF INDUSTRY, SCIENCE AND RESOURCES

MB22-001111

To: Minister for Resources (For Information)

PROSPECTS FOR NUCLEAR ENERGY IN AUSTRALIA

Recommendation:			
That you note the information on the prospects for nuclear energy in Australia.			
			Noted / Please Discuss
Minister:			Date:
Comments:			
Clearing Officer: Sent:.././..	Andrew Hutchinson	General Manager, Critical Minerals Office, Critical Minerals and Major Projects Division	s22
Contact Officer:	s22	A/g Manager, Major Commodities Section, Critical Minerals Office	s22
For Parliamentary Services' use only. Date Submitted to the Minister's office in PDMS:			16/09/2022

Key Points:

1. Your office requested information on the prospects for nuclear energy in Australia. Based on consultation with DCCEEW, we assess there is little prospect of nuclear power playing a role in Australia's energy grid.
2. This is in the context of high energy prices being experienced domestically and across the globe. Nuclear power currently provides about ten percent of the world's electricity according to the International Energy Agency (IEA).
3. Australia has a longstanding bipartisan moratorium on nuclear power. The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) prohibits the Minister for the Environment from approving the construction or operation of nuclear power plants.
 - a. New South Wales, Victoria and Queensland also have legislation prohibiting the construction and operation of nuclear reactors within their jurisdictions, with the exception of the Open Pool Australian Lightwater reactor at Lucas Heights NSW, operated by Australia's National Science and Technology Organisation (ANSTO).

4. Nuclear energy in Australia would be more expensive and slower to deploy than current clean energy technology alternatives, in particular wind and solar.
 - a. The 2022 Integrated System Plan, published by the Australian Energy Market Operator, sets out the most robust 'whole of system plan' available for supplying affordable and reliable electricity to the National Electricity Market, while supporting Australia's net zero ambitions. The Plan does not include nuclear power.
 - b. Analysis conducted by the CSIRO and AEMO in their 2021-22 GenCost Report found there was no prospect of Small Modular Reactors (SMRs – the potentially more socially acceptable power generation technology) deployment in Australia before 2030. Much of the decarbonisation of Australia's energy grid will have already happened by 2030, with lower cost renewables replacing coal fired generation, and batteries, gas and pumped hydro power stations providing firming capacity, frequency control and ancillary services.
 - c. The Government has a target of 82 per cent of electricity generation in the National Electricity Market to be sourced from renewable energy generation by 2030.
5. In addition to high capital and operational costs, there is no Australian facility to store or dispose of the high-level waste that would result from the nuclear fuel cycle. The National Radioactive Waste Management Facility has not been designed for the temporary storage or disposal of high-level waste.
6. Sectors of the society, including the Minerals Council of Australia, continue to call for consideration of next generation nuclear technologies to be included as part of the Australian energy mix.

Data referenced: IEA Nuclear, July 2022.

Consultation with the Office of Northern Australia: Nil.

Other Consultation: Department of Climate Change, Energy, the Environment and Water, and Radioactive Waste Policy, Major Projects Branch.

Attachments

- A:** If asked talking points
- B:** Background

If asked talking points

Will the Australian Government consider nuclear power for Australia?

- The Australian Government's Powering Australia plan has already stepped out the requirements to effectively manage Australia's energy transition using today's clean energy technology which is faster to build, and cheaper to operate, than nuclear energy facilities. The Government has no plans to lift the moratorium on nuclear energy in Australia.

Will the Government remove the moratorium on nuclear power?

- The Government will not be pushing up power prices by adopting nuclear power when Australia already has what it takes to meet its Net Zero commitments - abundant renewable energy resources and renewable technologies expertise.

Will the purchase of nuclear-powered submarines necessitate a nuclear power industry in Australia?

- The operation of the submarines does not require the development of a civilian nuclear power industry. The submarines do not need refuelling over their life.

How well placed is Australia to supply a future domestic nuclear industry?

- Australia has the world's largest uranium reserves and in 2021 our two operating uranium mines produced 4,441 tonnes of uranium, accounting for around 8.1% of global uranium production.
 - Our uranium is a key contributor to global energy security.
- Boss Energy's Honeymoon mine has been in care and maintenance since 2014, with a production restart planned for late 2023.
- Vimy Resources' Mulga Rock project has also been approved by the Western Australian Department of Mines, Industry Regulation and Safety, and may support future output, with the mine expected to start in 2025.

Background

Prohibition on Nuclear Power in Australia

- The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) prohibits the Minister for the Environment from approving the construction or operation of nuclear power plants.
- In addition, New South Wales, Victoria and Queensland have legislation prohibiting the construction and operation of nuclear reactors within their jurisdiction.
- The moratorium does not prevent nuclear research or nuclear technology for medicine, science, industry, commerce or agriculture, and Australia has one operating reactor – the Open Pool Australian Lightwater (OPAL) reactor, operated by Australia’s National Science and Technology Organisation (ANSTO).
- Uranium mining and milling is treated differently to other forms of mining under the EPBC Act. It is defined as a nuclear action, which is a Matter of National Environmental Significance (MNES), and requires approval from the Commonwealth Environment Minister if it is considered likely to have a significant environmental impact.

Inquiry into Nuclear Power

- In 2019, the Australian Parliament Standing Committee on Environment and Energy conducted an inquiry into the pre-requisites for nuclear power in Australia, following a referral from the former Minister for Energy and Emissions Reduction, the Hon Angus Taylor MP.
- The Committee’s report was delivered on 13 December 2019. Coalition members made a number of recommendations, including conditionally lifting the moratorium.
 - The former Government did not respond to the Committee’s report.
- Labor members of the Committee submitted a dissenting report which labelled the inquiry a “dangerous distraction” and recommended that “the government focus on delivering a settled national energy policy as its highest priority.”
 - The Albanese Government has delivered on this recommendation with its *Powering Australia Plan* which will create jobs, cut power bills and reduce emissions by boosting renewable energy.

Nuclear energy technology – Small Modular Reactors

- The potential deployment of Small Modular Reactor (SMR) technology is currently the subject of the nuclear power debate in Australia. SMR technology is a newer Generation III and IV technology using nuclear power reactors with an electrical power output of up to 300 megawatts (MW).
- If successfully deployed at scale, SMRs have the potential to be constructed at lower cost than traditional nuclear reactors due to mass-production in factories; replace fossil fuel plants with low carbon baseload generation; and provide reliable power to remote communities and off-grid mining sites.
- SMRs are only expected to be financially viable in Australia if there is sufficient global deployment to significantly drive down production costs, and if market or regulatory drivers discourage the use of alternative technologies.
- CSIRO and AEMO's GenCost 2021-22 report finds no prospect of domestic SMR projects this decade, given the technology's commercial immaturity and high costs.
- The first SMR in the West is expected to be the NuScale Power Module in the US. It is estimated to begin generating power in 2029, with full plant operation by 2030.
- While Australia does not generate nuclear energy, Australia participates in nuclear energy research through the Australian Nuclear Science Technology Organisation (ANSTO). In particular:
 - In 2021, Australia joined a research partnership with the United Kingdom for research and development across priority and emerging technologies, including small modular reactors (SMRs).
 - ANSTO is an active member of the International Atomic Energy Agency (IAEA), and is part of a Coordinated Research Project exploring prerequisites for the consideration of SMRs.

Analysis of nuclear power in Australia

- AEMO's 2022 Integrated System Plan forecasts the renewable share of total annual generation to rise to 83 per cent in 2030.
- The GenCost 2021-22 report forecasts SMRs to have a levelised cost of energy (LCOE) between \$136-\$326/Megawatt hour (MWh) in 2030.
 - LCOE is a measure of the average net present cost of generation in dollars per megawatt hour for a plant over its lifetime.
 - Costs will trend to the lower range in the event of significant global investment and deployment of SMR technology.

- The projected LCOE in 2030 for integrated wind and solar PV, which includes the cost of storage and transmission, range from \$53-\$82/MWh, depending on the share of Variable Renewable Energy (VRE).

Nuclear waste treatment

- The Australian Radioactive Waste Agency (ARWA) is a national agency, advising government and working with the community to safely and efficiently manage Australia's radioactive waste.
- A National Radioactive Waste Management Facility (NRMWF) will be built to provide permanent disposal of Low Level Waste and interim storage for Intermediate Level Waste until a disposal facility for Intermediate Level Waste is built in a different location.
- Under the National Radioactive Waste Management Act 2012 the NRWMF is prohibited from managing high level waste (HLW) and spent nuclear fuel.
- If a nuclear power industry was to be considered in the national interest then suitable legislation could be enacted and policy amendments made to facilitate the development of HLW and spent fuel management facilities. Any such change would require the development and funding of additional facilities and capacity required to manage the resulting radioactive wastes (all types including HLW and SNF) so that Australia can continue to fulfil its international obligations for responsible radioactive waste management.

Australia's uranium mining and export industry

- Australia's uranium industry is an important contributor to global energy security. Australia has the world's largest proven uranium reserves and was the third largest exporter of uranium globally in 2021.
 - In the 2020-21 financial year, Australia exported approximately 6.16 million kg of uranium valued at A\$606 million. Of this total, around 40% was exported to the United States, 30% to France and 8% to Canada, with the remainder exported to other countries in Europe and Asia.
 - All Australian uranium is exported and can only be used for peaceful, civilian purposes such as power generation and nuclear medicine.
- Since the closure of the Energy Resources of Australia's Northern Territory Ranger mine in 2021, there are now two active producers and exporters of uranium in Australia. Heathgate Resources from its Four Mile Mine and BHP Olympic Dam Corporation from its Olympic Dam mine – both of these mines are located in South Australia.

- The combined total of uranium produced at Four Mile and Olympic Dam comprised approximately 8.1 percent of total global production in 2021.
- Boss Energy, which owns the Honeymoon deposit in South Australia and has been in care and maintenance since 2014, has recommenced operations in recent months with the intention of restarting production in late 2023.
- Australia also holds a range of uranium deposits under development in Queensland and Western Australia but no operating mine in either state.