Australian Academy of Science
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Mr Nathan Fewkes
Inquiry Secretary
Standing Committee on the Environment and Energy
Department of the House of Representatives
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By email: EnvironmentReps@aph.gov.au

Dear Mr Fewkes,

Australian Academy of Science Submission to the Inquiry into the Prerequisites for Nuclear Energy in Australia

1. Overview

The Australian Academy of Science welcomes the opportunity to address the terms of reference for the inquiry into the Prerequisites for Nuclear Energy in Australia. The Academy recognises the need for a reliable, affordable and low carbon energy system. The current energy mix is dominated by fossil fuels and emissions are rapidly increasing despite Australia's 2030 emissions reduction target. Given the overwhelming need to reduce carbon dioxide emissions from power generation, nuclear power plants offer an option within a range of potential energy sources for a low carbon future. The current prohibition unnecessarily restricts Australia's energy mix options.

Australia currently uses nuclear technology for medicines used in the diagnosis of heart disease and skeletal injuries as well as a range of cancers. Current Australian nuclear capability includes the ANSTO OPAL reactor and nuclear medicine manufacturing facilities in Sydney.

This submission is chiefly concerned with small modular reactors (SMRs) which potentially offer a safe, reliable and low emission option to conventional nuclear power plant. Several SMRs are currently under construction or licence in various parts of the world.

Small modular reactors (SMRs) are a smaller type of nuclear reactor than a conventional reactor. SMRs are designed to be manufactured at a plant and transported to the site to be assembled. This allows for reduced construction time, increased containment efficiency and increased security of nuclear materials, including waste. Some SMRs are fast reactors with higher fuel burn up rates, which reduces the amount of waste produced. Others are designed to run on an alternative fuel cycle using thorium, which offers significantly reduced long-term waste radiotoxicity compared to the uranium cycle. Because of these characteristics, SMRs require less land space compared to conventional nuclear power plants, fossil fuel and some renewable alternatives.

2. Addressing the terms of reference

a. Waste management, transport and storage

All power plants produce waste. Waste is generated at every step of the fuel cycle: mining, fuel production and preparation, power generation and decommissioning. The waste from a 1020 MW

SMR amounts to 25.5 tonnes of low-level waste in spent fuel.[1] It does not generate the gaseous waste of a comparably sized coal power plant (carbon dioxide emissions of 7 million tonnes per annum for a 1000 MW plant, sulfur dioxide of 200,000 tonnes, or coal ash of 400,000 tonnes)[2] or a natural gas power plant (nitrogen oxides emissions of 5.5 tonnes per annum for a 1000 MW plant, carbon monoxide of 1.6 tonnes, and particulates of 0.9 tonnes).[3] Unlike gaseous emissions, spent nuclear fuel is not released to the environment, but stored in radiation shielded containers according to standards set by the World Nuclear Association.

Biohazards and decommissioning of fossil fuel, renewable and nuclear power plants cannot be compared on a *like-for-like* basis due to the differences in their pattern of fuel extraction, power plant operation, waste containment or dispersal, and decommissioning. For example, coal contains trace elements which are naturally radioactive – uranium, thorium and radium. During coal combustion, these radioactive materials are concentrated in fly ash, bottom ash and boiler slag. Coal ash also contains other hazards such as cadmium, lead, mercury, selenium and thallium. Australian power stations release about 10-21 million tonnes of coal ash annually, and Australia currently has about 400 million tonnes of coal ash stored in dump sites that are unprotected from humans and the environment[4]. While coal ash regulation in Australia differs from state to state, a recent Environmental Justice report noted that the dump sites do not adhere to regulations and that management standards fall below global best practices[5]. Due to inefficient and ineffective containment, there have been a series of high-level environmental contaminations such as at Lake Macquarie in NSW[6], and groundwater contamination by the Yallourn power station in Victoria[7].

Wastes generated from nuclear power plants are spent fuel which are mainly low-level radioactive waste. Also, a small amount of radioactive waste is produced during waste reprocessing at the reprocessing plants. These wastes are contained and not released to the environment. However, the coal examples above point to a need for vigilance and enforcement of waste storage practices.

Decommissioning of fossil fuel power plants occurs soon after the end of the plant's operating life and the wastes generated are associated with the demolition with no specific residual hazards. On the other hand, decommissioning of nuclear power plants requires significant financial cost and technical manpower to handle the radioactive components of a nuclear power plant. The cost and technical burden can be reduced by delaying the decommissioning process to allow shorter-lived radioactive materials to decay, which usually produces low-level waste. Reprocessing spent fuel and fabrication of mixed-oxide fuel releases small amounts of intermediate level and high-level waste.

Waste classifications differ internationally. In Australia[8], there are three levels of low-level waste: very short lived waste (very short lived radioactivity which can be safely stored in for short time periods, and then disposed of as non-radioactive waste), very low level waste (low levels of short lived radioactivity which can be disposed of in existing industrial or commercial landfill-type facilities

[1] https://www.nuclearaustralia.org.au/nuscale-smr-on-track-for-deployment/
[2] Ragaini, R. (2016). International Seminars on Nuclear War and Planetary Emergencies 48th Session: The Role of Science in the Third Millennium. World Scientific Publishing Company.
[3] Rhodes, R., & Beller, D. (2000). The need for nuclear power. Foreign Affairs, 30-44.
[4] http://www.adaa.asn.au/resource-utilisation/ccp-utilisation
[5] https://www.envirojustice.org.au/wp-content/uploads/2019/06/EJA_CoalAshReport.final_.pdf
[6] https://www.abc.net.au/news/2019-03-10/coal-ash-has-become-one-of-australias-biggest-waste-problems/10886866
[7] https://www.latrobevalleyexpress.com.au/story/6250065/report-reveals-coal-ash-pond-concerns/
[8] https://www.arpansa.gov.au/understanding-radiation/radiation-sources/more-radiation-sources/radioactive-waste-safety

with limited regulatory control) and low-level waste (higher levels of short lived radioactivity and low levels of long lived radioactivity which can be safely disposed of in an engineered near-surface (3-10 meters) facility. Intermediate-level waste contains higher levels of long-lived radioactivity which can be safely disposed of at greater depths (up to a few hundred meters). High-level waste contains levels of radioactivity high enough to generate significant amounts of heat during the radioactive decay process, and is disposed of in deep geological formations (over 700 meters below the surface).

Australia presently has some mechanisms for dealing with nuclear waste. Australia's only nuclear reactor, the Open-Pool Australian Lightwater (OPAL) operated by the Australian Nuclear Science and Technology Organisation (ANSTO), has for decades stored its spent fuel rods in a storage pond at ANSTO site[9]. Last year, the spent fuel was shipped to France's La Hauge plant for reprocessing and will be returned for further use in Australia. The transport routes and dates are kept confidential for security and safety reasons. While there has not been any record of accident associated with the transport of nuclear waste in Australia, the casks used to hold the spent fuel are specially designed to withstand serious accidents and external explosion[10]. The transport, storage and export of spent fuel are routine and in accordance with international requirements by the International Atomic Energy Agency (IAEA) that address the risks associated with the heat and radiation that the spent fuel produces. The IAEA new edition for its Transport Regulations in 2018 is called SSR-6[11].

Further mechanisms will be required. Transport of nuclear waste from future power plants in Australia would need to utilize existing transport infrastructure. Australian state and federal government will need to develop industry-specific policies and laws to ensure the safe handling and transport of nuclear waste from power plants, consistent with international requirements. This would include a regulatory framework that considers Australia's current and future infrastructure and technical capabilities.

Waste disposal sites are necessary, and must be reliable in the very long term. Waste disposal sites vary from near-surface disposal in engineered vaults to disposal in engineered facilities located in stable underground geological formations at depths of hundreds of meters. Also, the type of nuclear waste also determines the depth of waste disposal site. While low-level waste can be stored in waste disposal site of a few metres, intermediate-level waste will require a greater depth of between a few tens to hundreds of metres. Another alternative option for the disposal of small amounts of nuclear waste is borehole disposal at depths from thirty to several hundred metres. The technologies and technical specifications are widely available in mining industries and assessments are provided by the IAEA.

In Australia, there are over 100 locations where radioactive waste is temporarily stored. Although there are currently no permanent disposal facilities for low-level waste and intermediate-level waste, the National Radioactive Waste Management Facility (NRWMF) Taskforce is considering three voluntarily nominated sites in South Australia: Wallerberdina, Lyndhurst and Napandee[12]. The NRWMF has considered some factors before selecting the sites and will require independent regulators to provide approvals across all the phases of the project[13]. The factors include safety and regulation; cultural heritage; environment; social and economic impact; facility land requirement;

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[9] https://www.ansto.gov.au/education/nuclear-facts/managing-waste
[10] https://www.abc.net.au/news/2018-04-12/nuclear-waste-from-australias-only-reactor-needs-to-be-removed/9643428
[11] https://www-pub.iaea.org/MTCD/Publications/PDF/PUB1798_web.pdf
[12] https://www.industry.gov.au/strategies-for-the-future/managing-radioactive-waste
[13] https://www.industry.gov.au/strategies-for-the-future/managing-radioactive-waste/selecting-a-radioactive-waste-site

community consultation; and is currently seeking public submissions. When these factors are fully considered, including the outcome of the community consultation and inputs from public submissions, the construction of the waste disposal site can commence. The NRWMF will be beneficial to the establishment of nuclear power plants in Australia as it will handle the permanent disposal of low-level wastes and temporary storage for intermediate-level wastes.

Overall, volumes of nuclear waste are small. There may be no need for capacity expansion as nuclear power plants produce relatively small volumes of nuclear waste. For example, the total amount of radioactive waste produced in the UK since the introduction of nuclear industry in 1956, and forecast to the year 2125, will be about 4.9 million tonnes. This can be packaged to fit in a final volume that will occupy a space similar to that of a standard sports stadium[14]. Therefore, waste disposal sites will not need to expand in the future after the facilities have been built.

Deep geological disposal has been studied for several decades. There has been construction and operation of underground research facilities where *in-situ* tests are conducted. Currently operational facilities are located in USA, Sweden and Finland. Facilities under construction can be found in Korea, Germany and Finland. Discussions are ongoing for sites in Argentina, Belgium, China, Japan, and the UK[15]. Licensing is in progress for additional facilities located in France, Finland and Sweden. The potential availability of these sites may provide multiple geological disposal options for spent fuel from nuclear power plants in Australia. Another alternative will be a fuel leasing service from other countries such as Russia via its state-owned Rosatom Overseas Inc[16]. Rosatom is the only company in the world that provides a verity of integrated services associated with the construction and operation of its nuclear power plants, including guaranteed fuel supply and take-back of spent fuel for storage and eventual reprocessing. Australian nuclear power plants could take advantage of these options to manage its high-level waste in the future.

b. Health and safety

The health and safety considerations in establishing and operating nuclear power plants in Australia, despite its lower incidence mortality and accident rate compared to other energy technologies and safety regulations.

Australia currently has a robust radiation protection framework. Australia's protection framework for public and environmental protection against radiological/nuclear emergencies is provided by Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) in its Guide for Radiation Protection in Emergency Exposure Situations (2019)[17]. The radiation emergency response aims to reduce the risk or mitigate the consequences of radiation through immediate actions such as evacuation, issuing iodine tablets and chelating agents, or sheltering. Over the long term, monitoring and control of food supply and relocation/resettlement of the affected population are undertaken. The areas covered by ARPANSA includes radiation emergency medical preparedness, health physics responses, environmental monitoring and nuclear safety and risk assessments.

In the case of an incident within a state or territory jurisdiction, the state emergency response agencies with radiation protection guidance from State Radiation Safety Officers are to respond.

[14] https://www.world-nuclear.org/information-library/nuclear-fuel-cycle/nuclear-wastes/radioactive-waste-management.aspx
[15] https://www.energy.gov/sites/prod/files/2017/11/f46/Peter%20Swift%20PRACoP%202017%20final.pdf
[16] https://www.rosatom.ru/en/global-presence/the-international-business-department/rusatom-overseas-inc-jsc-moscow/
[17] https://www.arpansa.gov.au/regulation-and-licensing/regulatory-publications/radiation-protection-series/guides-and-recommendations/rpsg-3

Commonwealth agencies such as ARPANSA may offer assistance through activation of the Commonwealth Disaster Plan (COMDISPLAN) and coordinated by Emergency Management Australia (EMA)[18].

That framework will need to be revised for commercial nuclear power plants. While Australia currently has a preparedness and action plan against nuclear disaster, adjustments to the guidelines will need to be made to cover the operations of commercial nuclear power plants, and actions to take in the case of a catastrophic event.

Australia has regulations in place to monitor the nuclear industry, but these must be improved. Australia's nuclear regulatory body, ARPANSA has a legislative framework backed by the Acts of Parliament (*Australian Radiation Protection and Nuclear Safety Act No. 133*[19], *134*[20] and *135*[21], in 1998), proclaimed on 5th February 1999 and currently in operation. There are also associated regulations, including the *Australian Radiation Protection and Nuclear Safety Regulation 2018*[22] and the *Australian Radiation Protection and Nuclear Safety (Licence Charges) Regulation 2018*[23]. These regulations would need to be improved to include nuclear power plant operations to ensure compliance with international safety rules and regulations. It is not uncommon for a country to adopt the regulatory approach of the nuclear power vendor country. However, in the case of Australia, such a framework would need to consider the existing legal, engineering, scientific, technical and legal resources. Finally, there will need to be separate regulations for different reactor types as a 'one-size-fits-all approach' may not be a safe and effective means to ensure compliance with nuclear power plant regulations.

International models for maintaining nuclear safety are available. The Australian Safeguards and Non-proliferation Office (ASNO) and the Australian Nuclear Science and Technology Organisation (ANSTO) have developed a security plan for the nuclear reactor at Lucas Heights, to address credible hostile scenarios formulated based on advice from national intelligence agencies.

c. Environmental impacts

Australian conditions argue against conventional nuclear reactors. The disaster at the Fukushima Daiichi power plant in Japan serves as a warning that while nuclear energy might be an option in solving the climate problem, nuclear power plants are also highly vulnerable to it. Conventional nuclear reactors need a large body of water to cool their reactors, and coastal areas are prone to highly dynamic, climate-driven changes: storms batter, sea levels rise and land shifts. Nuclear power can also be disrupted by water scarcity and rising water temperatures, resulting in safety issues including flooding, loss of power, loss of communication, blockage of evacuation routes, and equipment malfunction[24].

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[18] https://www.arpansa.gov.au/research/radiation-emergency-preparedness-and-response
[19] *Australian Radiation Protection and Nuclear Safety Act 1998* (https://www.legislation.gov.au/Series/C2004A00383)
[20] *Australian Radiation Protection and Nuclear Safety (Licence Charges) Act 1998* (https://www.legislation.gov.au/Series/C2004A00384)
[21] *Australian Radiation Protection and Nuclear Safety (Consequential Amendments) Act 1998* (https://www.legislation.gov.au/Series/C2004A00385)
[22] *Australian Radiation Protection and Nuclear Safety Regulations 2018* (https://www.legislation.gov.au/Series/F2018L01694)
[23] *Australian Radiation Protection and Nuclear Safety (Licence Charges) Regulations 2018* (https://www.legislation.gov.au/Series/F2018L01697)
[24] https://www.newscientist.com/article/mg21028138-200-the-climate-change-threat-to-nuclear-power/

Extreme weather events, which are already common in Australia, pose significant threats. This includes heatwaves (especially in South Australia, the jurisdiction currently being explored for potential sites), flood, water scarcity consistent with drought, coastal storms and erosion, and hurricanes. There are examples of extreme weather events in other parts of the world negatively affecting reactors.

Nuclear is a low emission technology, both in general operation and for lifetime. Electricity generation from nuclear fuel is classified as a low carbon technology. A 1000 MW nuclear power plant offsets about 7-8 million tonnes of carbon dioxide per year if it displaces coal. A nuclear power plant also reduces sulfur dioxide, nitrous oxide and particulate emissions, thereby contributing significantly to improved air quality. Globally, nuclear power avoids about 600 million tonnes of carbon emissions per year. If nuclear power was removed from the global electricity generation mix, carbon dioxide emissions from electricity generation would be at least 17 percent higher and 8 percent higher for the overall energy sector. Projections show that by 2030, cumulative carbon savings from nuclear power plant by 2030 will exceed 25 billion tonnes. In 2016, nuclear power contributed about 11% (2417 TWh) to the global electricity generation mix, followed by gas (4,933 TWh), and oil (1,068 TWh). If the 11% of electricity supplied by nuclear power had been replaced by gas – by far the cleanest burning fossil fuel – an additional 2,388 million tonnes of CO2 would have been released into the atmosphere; the equivalent of putting an additional 250 million cars on the road (see Table 1).

Table 1. Comparison of avoided carbon emissions in 2016

Power plants	Lifecycle emissions (gCO_2eq/kWh)	Estimated emissions to produce 2417 TWh electricity (million tonnes CO_2)	Potential emissions avoided through use of nuclear power (million tonnes CO_2)	Potential emissions avoided through use of nuclear (million cars equivalent)
Nuclear power	12	29	NA	NA
Gas (CCS)	490	1184	1155	c. 250
Coal	820	1981	1952	c. 400

Source: World Nuclear Association (https://www.world-nuclear.org/information-library/nuclear-fuel-cycle/nuclear-wastes/radioactive-waste-management.aspx)

SMRs use significantly less water than conventional nuclear reactors. Given that water shortages or drought conditions as experienced in Australia in recent times are projected to increase in the future, SMR power plants present a viable nuclear option. This is because SMRs consume much less water (around 0.002 l/s) and could be considered for inland and coastal locations.

Environmental risks can be managed through regulation and engineering design. Coolant water leaving the power plant while still too hot can affect aquatic life. Designs of water-discharge systems have been modified to help cool the water before it is returned to the water body, and the systems are located to reduce effects on aquatic life[25]. With modern design of water intake systems and an effective regulatory body, nuclear power plant can be engineered to pose a minimal threat to aquatic ecosystems.

[25] https://cna.ca/issues-policy/environment/aquatic-life-land-use/

d. Energy Affordability and Reliability

SMRs are more reliable, more flexible and cheaper than conventional nuclear power plants and fossil fuel plants. Modern SMRs are low cost power generation options and are more reliable and flexible than conventional nuclear plants and fossil fuel alternatives. Although the capital cost of SMRs will vary depending on the site location, their cost will decline along with other low carbon technologies such as wind and solar as they become more widely adopted. A 2015 Australian Power Generation Technology report evaluated Australia's electricity future and found that the levelized cost of energy (LCOE) from nuclear was almost comparable to residential solar PV systems in 2015 but all renewables are projected to become cheaper than nuclear and fossil fuel by 2030[26]. However, this depends on capital costs, fuel costs, fixed and variable operations and maintenance (O&M) costs, financing costs, and an assumed utilization rate consideration and overall country situation.

A study by Ram et al. (2018) compared the LCOE among G20 countries and found that nuclear is comparable to most renewables in South Korea and Japan, and cheaper than most fossil fuel technologies and utility batteries utility in the UK, USA and EU[27]. A Canadian SMR roadmap study[28] found that the LCOE of SMRs are cost competitive to on-grid benchmark technologies (e.g. wind, hydro, fossil fuel) and that lowering the cost of-capital from 9 percent to 6 percent discount rates significantly improves the economics of SMRs[29]. While SMRs are also affected by LCOE factors that affect conventional nuclear power plants, the SMR LCOE for off-grid are sensitive to development cost and scale-independent O&M factors (staffing, insurance premiums, licencing renewal costs). The Canadian SMR roadmap study conclude that SMRs could cogenerate heat and power for communities to improve their economics.

SMRs can run at baseload, but can also be configured to have some load-following capacity. Both conventional and SMR nuclear power plants are typically operated as baseload plants and run continuously at full power. Modern nuclear power plants such as light water reactors, NuScale's mini pressurized water reactor (PWR), or SMRs can be configured to have some load-following capacity through manoeuvring capabilities, although its more economical to run at full capacity. Load-following is an operational mode where the power plant is adjusted as demand and price for electricity fluctuates throughout the day. These capabilities can be a low carbon approach to address the intermittent nature of renewables such as wind and solar energy, and to restore power during extreme weather conditions when renewable energy power supply is affected. To offset the economic cost of load-following to balance renewables, the power plants can run at combine heat and power (CHP) to supply district heating and power supply[30].

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[26] http://earthsci.org/mineral/energy/coal/LCOE_Report_final_web.pdf

[27] Ram, M., Child, M., Aghahosseini, A., Bogdanov, D., Lohrmann, A., & Breyer, C. (2018). A comparative analysis of electricity generation costs from renewable, fossil fuel and nuclear sources in G20 countries for the period 2015-2030. Journal of cleaner production, 199, 687-704.

[28] https://smrroadmap.ca/wp-content/uploads/2018/12/Economics-Finance-WG.pdf

[29] When building a project such as power plant, a power plant company (or company) may source capital from investors or government to finance the project. Depending on the arrangement, an investor agrees to lend the required capital to the company to build the nuclear power plant at a certain interest rate. The company pays the agreed interest rate the investor on an annual basis until the capital is paid back to the investor at the end of the agreed term. In other words, this is the minimum return an investor expects for providing capital to the power plant company. In this case, the discount rate is the interest rate used to determine the present value of future cash flows back to the investor. The Canadian report found that reducing this cost-of-capital when financing SMRs will improve the economies of SMRs. This will allow SMR operators (or company) have lower repayment, thus not placing higher financial burden on the company and not charging higher electricity bills to the wholesale market.

[30] https://physicsworld.com/a/can-nuclear-be-used-to-balance-renewables/

f. Community engagement

Indigenous communities must be engaged respectfully. For more than 20 years, Indigenous communities in Australia have strongly opposed the construction of nuclear waste facilities in their land both NT and SA[31]. This has resulted in tensions between Indigenous Australians, industry groups and the government. Marsh and Green (2019) study highlighted these tensions and noted that the current consultation approach by the Australian government has been ineffective in engaging First Nations peoples of Australia in a respectful and meaningful manner[32]. While the current tensions pertain to the construction of nuclear waste dump site, the construction of nuclear power plants in the future will need to overcome the tensions between traditional landowners and the government. This includes ensuring Indigenous communities are involved in the decision-making process, avoiding tactics that result in divisions within the indigenous communities, and avoiding exerting pressures on traditional owners including legal threats[33]. SMRs require small amount of land and spent fuel could be stored temporarily at the site facility before being shipped overseas for reprocessing. According to a 2007 report by the Australian Institute, nuclear power plants could be sited near current coal power plants to use exiting transmission networks[34]. The Australian Nuclear Association[35] identified more than 20 potential locations around Queensland (Starwell, Gladstone, Caillde, Woolaga, Tarong, Kogan Creek Braener, Wivenaoe, Millimeman, Toowoomba, Swanbank), New South Wales (North Coast and Grafton, Gienbawn dam, Upper Hunter, Mid Coast, Central tablelands, Marulan, Shoalhaven and Jervis Bay, South Coast, Snowy, Burrihjack), Victoria (South Gippsland, Portland, Cape Liptrap, La Trobe, Murry Region, Dartmouth, Eldon Reservoir, West Gippsland) and South Australia (Kadina, Fleurieu Peninsular, Crag Point and Port Augusta). Addressing the tensions, deploying SMRs and considering the suggested locations for future nuclear power plants may prevent further encroachment on traditional lands and encourage community engagement.

h. Security implications

Australia's current risk of nuclear security incident is currently low. In safeguarding the unauthorised removal of nuclear materials from a nuclear facility, the main consideration is the amount necessary to build a nuclear explosive device. This determines how attractive the nuclear materials will be for someone to intending to build such a device. There is also a requirement for fuels to be enriched to make them suitable for use in nuclear device. Australia has a minimal amount of attractive materials such as plutonium, and a small number of nuclear sites, which lowers the security risks. However, depending on the number of nuclear power plants built and operating in the future, the level of nuclear security risk may become a subject of concern. Regarding sabotage, the main consideration is the radiological consequences of a malicious act directed at the nuclear power plant. For technology theft, the issue to consider is the prevention of the dissemination of enrichment and reprocessing technologies.

Australian nuclear security would need to be improved as a prerequisite to nuclear power. Security plans employ multiple layers of security in nuclear facilities which incorporate physical barriers to restrict access, technological measures including area surveillance, and measures to prevent cyberattack. In 2017, the International Physical Protection Advisory Service (IPPAS)

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[31] Diesendorf, M. (2016). Shunning nuclear power but not its waste: Assessing the risks of Australia becoming the world's nuclear wasteland. Energy Research & Social Science, 19, 142-147.
[32] Marsh, J. K., & Green, J. (2019). First nations rights and colonising practices by the nuclear industry: An Australian battleground for environmental justice. The Extractive Industries and Society.
[33] https://intercontinentalcry.org/nuclear-war-australias-aboriginal-people-25148/
[34] https://www.tai.org.au/sites/default/files/Nuclear%20siting%2040_8.pdf
[35] https://reneweconomy.com.au/nuclear-lobby-identifies-preferred-sites-for-20-nukes-in-australia-19298/

concluded its follow-up mission to Australia and their report provided four recommendations and fifteen suggestions which could enhance nuclear security.

3. Concluding Remarks

Nuclear energy offers a low carbon option that can potentially enable Australia to meet its emission reduction obligations while providing affordable and safer electricity. Australia has a general framework that can support nuclear power, but its introduction must be weighed against the risks, economic considerations and community concern.

Small modular reactors (SMRs) potentially address many of the issues with respect to safety and reliability of nuclear reactors when compared to conventional reactors. However, SMRs are currently in the early stages of development and construction.

The Australian climate is increasingly characterised by variability, extreme events and droughts, which can adversely impact nuclear power generation. Nuclear power installations would need to be adapted to Australian conditions, which may not mirror those of overseas facilities.

Communities impacted by nuclear power plants or by storage of nuclear wastes, especially Australia's Indigenous communities, need to be meaningfully included in decision-making.

Developing nuclear power in Australia would require significant legislative reform at the federal and state level. In particular, the prohibition on nuclear power plants in the EPBC Act represents a substantial barrier.

To discuss or clarify any aspect of this submission, please contact Dr Stuart Barrow at stuart.barrow@science.org.au or 02 6201 9464.

Yours sincerely,

Professor John Shine AC PresAA
President
The Australian Academy of Science