Background paper on federal Inquiry into nuclear power in Australia November 2024

The federal Parliament is holding a new Inquiry (website) into potential nuclear power in Australia.

With the Coalition promoting nuclear power this is a critical time to send a clear message that domestic nuclear power is a distraction from effective climate action. The nuclear push seeks to delay and derail the renewable energy transition, extend the use of coal and greatly increase the role of gas. It is a high cost, high risk approach and a complete climate failure.

The Inquiry needs to hear that nuclear has no place in Australia's energy future and that we support an energy future that is renewable, not radioactive.

Please make a submission by the November 15, 2024 deadline (or request a extension if you can't make this date). You can email your submission to nuclear.reps@aph.gov.au or upload it to the inquiry website.

Here are some key points on the Inquiry's terms of reference (highlighted below). You are welcome to use any or all of this content, but please keep in mind that original submissions are more impactful so feel free to add your own thoughts to these comments or to write your own submission from scratch.

You don't need to respond to all of the terms of reference and even a short statement of concern or opposition sends a very important message.

A) DEPLOYMENT TIMEFRAMES

Claims that nuclear reactors could be generating electricity in Australia "by the mid-2030s" do not withstand scrutiny. Introducing nuclear power to Australia would necessitate at least 10 years for licensing approvals and project planning, and around 10 years for reactor construction. Any nuclear power reactor could only begin operating around the mid-2040s - at the earliest.

The former Australian Chief Scientist Alan Finkel states: "Any call to go directly from coal to nuclear is effectively a call to delay decarbonisation of our electricity system by 20 years." Likewise, a 2020 report prepared for the NSW Cabinet by NSW Chief Scientist Hugh Durrant-Whyte, a former Chief Scientific Adviser at the UK Ministry of Defence, notes that introducing nuclear power to Australia would be expensive and difficult and that it would be naive to think a nuclear plant could be built in less than two decades.

It is frequently claimed that the four-reactor project in the UAE was completed on time. In fact, the project was 3–4 years behind schedule. Moreover, Australia could not match the timeline achieved in the UAE for a myriad of reasons including the authoritarian nature of the UAE political system and the employment of a large, mostly-foreign workforce with few rights.

Small modular reactor (SMR) construction timelines have not been impressive. Promoters claim a 3–5 year construction timeline, however:
* For China's so-called SMR, planning to commercial operation spanned 22 years, and construction took nine years as opposed to the initial four-year construction schedule.
* For Russia's so-called SMR, a three-year construction project blew out to 12 years, and planning plus construction took around 20 years.
* Construction of Argentina's CAREM SMR began in 2014, at which time completion was expected in 2017. But the reactor remains incomplete and the expected completion date has been pushed back to 2028. A three-year construction project has become a 14-year project with further delays likely.
* Development of NuScale SMR technology in the US dates from 2003. In 2023, the company abandoned its flagship project in Idaho before construction began. NuScale is now celebrating its 21st birthday with no reactors in operation, none under construction and the threat of bankruptcy looming.
Australian economist Prof. John Quiggin notes that even if SMR proposals "work as planned (a big if), they will arrive too late to replace coal power in Australia".

B) FUEL SUPPLY, AND TRANSPORT OF FUEL

A 2020 report prepared for the NSW Cabinet by NSW Chief Scientist Hugh Durrant-Whyte, a former Chief Scientific Adviser at the UK Ministry of Defence, noted that it is "important to dispel a significant myth propagated through the [NSW nuclear power] inquiry that having large local uranium reserves is a driver for low-cost nuclear power. Most costs associated with the manufacture of fuel has little to do with the cost of uranium. It has much to do with enriching the fuel, manufacture of fuel rods ... reprocessing of the spent fuel and storage of waste."

Australia has significant uranium reserves and operating uranium mines, but no capacity for uranium conversion (or deconversion), no capacity for uranium enrichment, and no capacity for fuel fabrication. These are all costly and contaminating industrial processes.

Nuclear transport incidents and accidents are commonplace in countries with a significant nuclear industry. A British study identified 806 radioactive transport incidents in the UK from 1958−2004 including incidents involving medical and industrial isotopes (376), residues including discharged irradiated nuclear fuel flasks (111), irradiated fuel (101), radiography sources (78), radioactive wastes (63), uranium ore concentrate (33) and 'other' (44).

There are no comparable studies of transport accidents and incidents involving radioactive materials in Australia. However numerous accidents and incidents have been reported over the years. ANSTO has acknowledged that there are 1−2 accidents or incidents every year involving the transportation of radioactive materials to and from the Lucas Heights research reactor site.

C) URANIUM ENRICHMENT CAPABILITY

The World Nuclear Association notes that "in recent years there has been a significant surplus of world enrichment capacity". There is no reason to believe that companies

involved in uranium enrichment, such as Orano or Urenco, would see any value in establishing an enrichment plant in Australia.

A 2020 report prepared for the NSW Cabinet by NSW Chief Scientist Hugh Durrant-Whyte noted: "Enrichment is very unlikely to ever be undertaken in Australia due to cost, skills and non-proliferation agreements. Consequently, we will still need to send our mined uranium overseas to be enriched – and probably converted into fuel rods, which we will then need to import".
The World Nuclear Association notes that in response to Russia's 2022 invasion of Ukraine, and efforts to reduce reliance on Russia's uranium enrichment operations, Urenco is upgrading capacity at existing enrichment plants and Orano is studying possibilities to expand its enrichment capacity.

Australia has been involved in laser enrichment R&D. However it is doubtful whether laser enrichment processes will progress to commercial operations and still less likely that commercial operations would be based in Australia. In addition to the major commercial barriers, uranium enrichment is currently illegal in Australia (Australian Radiation Protection and Nuclear Safety Act 1998; Environment Protection and Biodiversity Conservation Act 1999).

D) WASTE MANAGEMENT, TRANSPORT AND STORAGE

There are currently no operating deep underground repositories for high-level nuclear waste anywhere in the world.

There is one operating deep underground repository for long-lived intermediate-level nuclear waste − the Waste Isolation Pilot Plant (WIPP) in the US state of New Mexico. However, the WIPP repository was shut for three years following a chemical explosion in an underground radioactive waste barrel in 2014, a result of inept management and inadequate regulation.

Efforts to establish national radioactive waste facilities (repositories and stores) in Australia for low- and intermediate-level waste have repeatedly failed since the 1990s. Decades of failure do not inspire confidence that far more complex high-level nuclear waste challenges from a nuclear power program (and/or a nuclear submarine program) would be responsibly managed in Australia.

Some nuclear power proponents argue that waste from a proposed nuclear power program in Australia is a non-issue since comparable facilities will be required for the AUKUS nuclear submarine program. That argument is circular and it ignores basic facts: Australia has no national facilities for nuclear waste disposal, and no country in the world has an operating repository for the disposal of high-level nuclear waste.

Opposition Leader Peter Dutton claims that: "If you look at a 450-megawatt reactor, it produces waste equivalent to the size of a can of Coke each year." In fact, over 450 million empty Coke cans per year would be required to accommodate waste generated across the nuclear fuel cycle for the operation of one 450-megawatt reactor; excluding front-end waste

(at uranium mines and enrichment plants), 367,000 empty Coke cans per year would be required; and just the spent nuclear fuel alone would require about 11,700 empty Coke cans per year.

Nuclear waste transport accidents and incidents are discussed in detail in a 2023 submission by environment groups to the Senate Environment and Communications Legislation Committee. In countries with a significant nuclear industry, nuclear waste transport accidents and incidents are commonplace. A UK government database – the Radioactive Material Transport Event Database − contains information on 1018 incidents from 1958 to 2011 (an average of 19 incidents each year) involving all forms of radioactive and nuclear materials. Of the 38 incidents in the UK in 2011 alone, 11 involved irradiated nuclear fuel flasks.

A report on 806 recorded radioactive transport incidents in the UK from 1958−2004 found that 111 involved residues including discharged irradiated nuclear fuel flasks, 101 involved irradiated fuel, and 63 involved (other) radioactive wastes.

Transport incidents are also commonplace in France. In 2008, the French nuclear safety agency IRSN produced a report summarising radioactive transport accidents and incidents from 1999−2007. The IRSN database lists 901 transport incidents and accidents from 1999−2007 − on average 100 annually or about two each week.

There is no comparable database of radioactive transport accidents in Australia. One example of problems with the movement of radioactive waste was revealed in 1998. It was revealed that "airtight" spent fuel storage canisters at ANSTO's Lucas Heights site had been infiltrated by water − 90 litres in one case − and corrosion had resulted. When canisters were retrieved for closer inspection, three accidents took place (2/3/98, 13/8/98, 1/2/99), all of them involving the dropping of canisters containing spent fuel while trying to transport them from the 'dry storage' site to another part of the Lucas Heights site. The public may never have learnt about those accidents if not for the fact that an ANSTO whistleblower told the local press. One of those accidents (1/2/99) subjected four ANSTO staff members to small radiation doses (up to 0.5 mSv).

Transportation of radioactive materials (including nuclear waste) also poses security risks.

E) WATER USE AND IMPACTS ON OTHER WATER USES

A standard 1,000-megawatt reactor consumes 36.3 to 65.4 million litres per day (13.2 to 23.9 billion litres per year).
A World Economic Forum paper states that water consumption for nuclear power is 2,870 to 3,270 litres per megawatt-hour (l/MWh), far thirstier than coal (1,220 to 2,270 l/MWh) and gas (700 to 1,200 l/MWh).
According to a report prepared by Dr Ian Rose for the former Queensland Labor government, evaporatively-cooled large coal-fired power plants use around 1,850 to 2,000 l/MWh whereas evaporatively-cooled nuclear power plants use around 25% more water, or around 2,300 l/MWh.

Water consumption per megawatt-hour for solar PV and wind power is near-zero.

Dry (gas) cooling is used in only a handful of operating power reactors worldwide. Four of these – the last remaining gas-cooled reactors in the UK – are due to be shut down by the end of the decade. The UK has closed all 28 of its Magnox gas-cooled reactors and France has closed all of its 10 UNGG gas-cooled reactors. The reason that dry cooling is rarely used is that it decreases operating efficiency and increases costs.

On the basis of worldwide experience, lessons for Australia include:
* The enormous water requirements for nuclear reactors severely limits non-coastal siting options.
* For coastal sites, the impact on marine life can be severe even during routine operations, and nuclear accidents can have devastating impacts (e.g. the devastation of the fishing industry in the Fukushima region of Japan following the 2011 nuclear disaster).
* It is highly unlikely that dry cooling would be an option for nuclear reactors.
* The growth of renewable energy in Australia has been, and will continue to be, dominated by two energy sources with negligible water requirements: solar PV and wind power.

F) RELEVANT ENERGY INFRASTRUCTURE CAPABILITY, INCLUDING BROWNFIELD SITES AND TRANSMISSION LINES

Australia has no capacity for uranium conversion (or deconversion), no capacity for uranium enrichment, and no capacity for fuel fabrication.

The introduction of nuclear power to Australia would require the education and training of thousands of nuclear scientists, engineers etc., presumably at taxpayers' expense.

Claims that converting coal power plants to nuclear plants will be straightforward and advantageous rest on shaky foundations. Coal-to-nuclear transitions could potentially reduce nuclear costs by using some existing infrastructure at coal plants, but nuclear power would still be far more expensive than firmed renewables (renewable systems with storage capacity).

No coal power plants have been repurposed as nuclear plants in the US or the UK, so purported synergies and cost savings are speculative.

The claim that the renewable energy transition would require 28,000 kms of new transmission lines by 2030 is not true. The Australian Energy Market Operator's Integrated System Plan foresees around 5,000 kms by 2030, a third of which has already been built.

Most or all of the owners of the sites targeted by the federal Coalition for nuclear reactors have no interest in supporting the development of nuclear power or in selling their sites. On the contrary, they are actively pursuing renewable energy and energy storage projects.

G) FEDERAL, STATE, TERRITORY AND LOCAL GOVERNMENT LEGAL AND POLICY FRAMEWORKS

Nuclear power was made illegal in Australia under two pieces of legislation introduced under the Howard Coalition government: the Australian Radiation Protection and Nuclear Safety Act 1998 and the Environment Protection and Biodiversity Conservation Act 1999. Any government seeking to pursue nuclear power would need Senate support not only to repeal existing bans but also to pass other legislation to facilitate the development of nuclear power.

Queensland, NSW and Victoria have legislation banning nuclear power. The federal government might have legal powers to override state/territory laws banning nuclear power, but costly and protracted legal challenges could be anticipated.

A federal government attempting to introduce nuclear power would also require the political cooperation of relevant state/territory governments because of the primary role of state/territory governments in managing energy systems, yet nuclear power is opposed by state governments in all five states targeted for nuclear reactors by the Coalition (including the by the new Queensland LNP government). With the possible exception of SA, where the Liberal opposition supports consideration of nuclear power, there is bipartisan opposition to nuclear power in the five states.

The Dutton Coalition has made it clear that a Coalition government does not value social license would be prepared to override and ignore local and regional community opposition.

H) RISK MANAGEMENT FOR NATURAL DISASTERS OR ANY OTHER SAFETY CONCERNS

Dr. Ziggy Switkowski notes that the introduction of nuclear power to Australia would involve a "non-negligible" risk of a "catastrophic failing within a nuclear system"

Japan is still in the early stages of recovering from the 2011 Fukushima nuclear catastrophe. The human impacts have been profound, particularly for the more than 190,000 evacuees displaced by the nuclear disaster. Direct economics costs amount to many hundreds of billion dollars; if indirect economic impacts are included, this figure rises to over one trillion dollars. Likewise, Chernobyl was a trillion-dollar accident.

It is noteworthy that insurance policies from some of Australia's major insurers, including AAMI, CGU, Allianz, QBE and NRMA contain specific text excluding coverage for nuclear disasters. None of these will insure homes, cars or possessions against a nuclear accident or release.

The conflict in Ukraine highlights the security issues that Australians would need to consider if nuclear power were to be introduced here. The Russian military's seizure of the operating Zaporizhzhia nuclear power plant — at a time when some of the plant's six reactors were operating — was the most dangerous incident so far. Off-site power to the Zaporizhzhia plant has been cut eight times since Russia seized control of the plant in 2022, increasing the risk of a major accident.

International Atomic Energy Agency Director-General Rafael Mariano Grossi warned in April 2024 that attacks on the Zaporizhzhia nuclear plant raise "the very real threat of a serious nuclear accident, which could have significant health and environmental consequences".

No other energy system is as easily weaponised as nuclear power and reactors have been described as pre-deployed terrorist targets.

I) POTENTIAL SHARE OF TOTAL ENERGY SYSTEM MIX

The Australian Energy Market Operator's integrated system plan, a roadmap for the optimal future grid, envisages 83% renewable generation by 2030, 96% by 2040 and 98% by 2050.

Nuclear power reactors could not begin operating until the mid-2040s. Nuclear power as an option to meet the tiny fraction of electricity demand not met by renewables would be an extraordinarily expensive and unnecessarily risky option.

J) NECESSARY LAND ACQUISITION

The Coalition states that it has legal advice that it can use compulsory acquisition powers to seize land for its proposed nuclear reactors.

The Howard Coalition government illegally seized control of farming land in South Australia for a planned national nuclear waste dump in 2003. This was later annulled following a Federal Court challenge.

The fact that the Opposition is explicitly referencing compulsory acquisition powers is a clear indication that nuclear lacks social license in Australia.

K) COSTS OF DEPLOYING, OPERATING AND MAINTAINING NUCLEAR POWER STATIONS
L) THE IMPACT OF THE DEPLOYMENT, OPERATION AND MAINTENANCE OF NUCLEAR POWER STATIONS ON ELECTRICITY AFFORDABILITY

Nuclear power would be uneconomic in Australia and far more expensive than continuing to build an energy system based on renewables. Nuclear power would result in increased taxes and increased power bills. Taxpayer subsidies worth tens, perhaps hundreds of billions of dollars, would be required.

CSIRO's May 2024 GenCost report clearly demonstrates the cost advantage of firmed renewables:
* Large-scale nuclear: $155-252 / MWh
* Small modular reactors: $387-641 / MWh
* 90% wind and solar PV supply to the National Electricity Market including storage and transmission costs: $100-143 / MWh

A recent report by the Institute for Energy Economics and Financial Analysis found that nuclear power would increase power bills for a four-person household by $972 per year, and that the cost of electricity generated from nuclear reactors would be 1.5 to 3.8 times higher than the current cost of electricity generation in eastern Australia.

M) ANY OTHER RELEVANT MATTER

CLIMATE POLLUTION IMPACTS: There would be at least a 2.3 billion tonne increase in carbon emissions in Australia's National Electricity Market from an attempted transition to nuclear reactors.

An analysis by Solutions for Climate Australia found this level of carbon dioxide emissions produced from continuing to burn coal and, in particular, gas, for Australia's electricity supply until 2052, assuming some nuclear reactors coming online by 2040-41. This analysis was used for the purpose of estimating emissions and assumed an ambitious and optimistic timeline for delivery of nuclear reactors.

The suppression of renewable energy, through both investment uncertainty and the federal Coalition's commitments to stop large scale renewable projects, would leave Australia reliant on ageing, expensive and increasingly unreliable coal and gas power stations, with ongoing high levels of climate pollution.

This estimation is conservative. The heavy reliance on gas in this estimation likely downplays future emissions from the Coalition's nuclear plan. If closures of current ageing coal fired power stations are delayed than anticipated by AEMO, as regularly suggested by the federal Coalition, total emissions would be even higher than the additional 2.3 billion tonnes of carbon emissions that is conservatively estimated.

Any suggestion that nuclear reactors are a solution for climate change is totally misguided as the transition would see Australia blow out our emissions, leading to more lives and livelihoods being lost in Australia and globally from increasing climate disasters.

First Nations communities: Over the past 25 years successive governments have unsuccessfully tried to establish a national radioactive waste repository and store against the wishes of Traditional Owners at multiple sites, particularly in South Australia and the Northern Territory.

In 2023, Dr. Marcos Orellana, the UN Special Rapporteur on Toxics and Human Rights, visited Australia. His end of mission report noted that these struggles over proposed radioactive waste facilities have left "a legacy of division and acrimony in the communities" and that "alignment of regulations with the UN Declaration on the Rights of Indigenous Peoples is a critical step in the path towards healing open wounds of past environmental injustices".

The UN Declaration states that "*no storage or disposal of hazardous materials shall take place in the lands or territories of indigenous peoples without their free, prior and informed consent".*

Weapons proliferation: The contribution of civil nuclear power programs to nuclear weapons proliferation used to be denied by the industry. However these dual-use connections are now openly acknowledged and have become a selling point to lobby for

increased taxpayer subsidies for struggling nuclear power industries in the US, the UK, France and elsewhere.

Our energy future is renewable not radioactive: While nuclear power has been stagnant for more than 20 years, renewable energy is growing strongly around the world. In 2023, nuclear power suffered a net loss of 1.7 gigawatts (GW) capacity, while renewable additions amounted to a record 507 GW — record growth for the 22nd consecutive year.

Nuclear power accounts for a declining share of global electricity generation (currently 9.2%) whereas the renewables share has grown to 30.2%. The International Energy Agency expects stunning growth in the coming years with renewables reaching 46% by 2030.

Renewable energy sources currently generate over three times more electricity than nuclear reactors and will generate five times more by the end of the decade. In multiple ways, including speed of deployment, safety, cost, waste, security, flexibility and environmental, employment and wider economic benefits renewable energy is a far superior energy option.