Beyond Nuclear Initiative Submission to the Energy Futures Parliamentary Inquiry

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Beyond Nuclear Initiative (BNI) aims to highlight the adverse social and environmental impacts of the uranium and wider nuclear industry in Australia and to promote a nuclear free future.

The consensus among the world's leading climate scientists is that urgent steps are needed in the next 10 years to dramatically reduce our carbon emissions. Nuclear power has received significant promotion in Australia by industry advocates such as the Australian Uranium Association (now integrated with the Minerals Council Australia) with proponents attempting to exploit concern about climate change to reverse the industry's decline.

Nuclear power as an energy supply cannot be divorced from the chain of deleterious health, environmental, social and security issues posed by uranium mining, energy production, waste management and weapons proliferation. But there is also growing recognition that the urgency of the climate change crisis means there is simply no time to choose nuclear power.

The average construction time for a new nuclear power reactor is close to 10 years with construction costs for a new reactor estimated at approximately $15 billion. A 2003 Massachusetts Institute of Technology study concluded that more than two new reactors would have to start operating somewhere in the world every month over the next 50 years to displace a significant amount of carbon-emitting fossil-fuel generation (1).

Energy efficiency and renewable energy installations such as wind farms and solar arrays, which have been marginalized by decades of disproportionate federal subsidies to the fossil fuel industry, are still a faster and more affordable alternative that can be completed in timeframes of months to just a few years and have been demonstrated to be more effective in displacing carbon than nuclear power. In comparison to the rising costs of nuclear, since 2008 the world market cost of solar photovoltaic modules has fallen by 80% (2).

The huge up-front costs make nuclear power difficult or impossible for all but the wealthiest countries and the wealthiest corporations to pursue. Countries with annual GDP of less than US$50 billion, and electricity grid capacity of 5 GW or less, are poorly placed to be introducing nuclear power - and most countries which have expressed recent interest in introducing nuclear power do not meet both criteria.

In 2009, an updated version of the 2003 Massachusetts Institute of Technology study stated: "The estimated cost of constructing a nuclear power plant has increased at a rate of 15% per year heading into the current economic downturn. This is based both on the cost of actual builds in Japan and Korea and on the projected cost of new plants planned for in the United States. Capital costs for both coal and natural gas have increased as well, although not by as much."

Nuclear Risk vs Renewable Growth

Six decades of uranium mining in the Northern Territory has failed to grant the industry a secure social license to operate, and public mistrust of the industry coupled with a litany of environmental contamination incidents, failed rehabilitation efforts and health and security breaches mean any current and future projects will continue to be contested by the local community.

Nuclear power is currently unlawful under the 1998 Australian Radiation Protection and Nuclear Safety Act, while Victoria and New South Wales also have legislation banning nuclear power and nuclear waste storage and disposal. Three other states – South Australia, Western Australia and the Northern Territory – have legal prohibitions against various forms of radioactive waste transportation and dumping.

The acknowledgement that uranium from Australia is present in the crippled Fukushima reactors serves to highlight the unacceptably high risks of nuclear power and further entrench public mistrust in an industry that has never enjoyed public support for its introduction in Australia.

Aside from its lack of public acceptability as a method of reducing greenhouse gas emissions, nuclear power is further limited because it is used almost exclusively for electricity generation, which is responsible for less than one third of global greenhouse gas emissions. Because of these problems, the potential for nuclear power to help reduce greenhouse gas emissions by replacing fossil fuels is limited.

In the increasingly unlikely event that there was a doubling of nuclear power output by 2050, it would still only reduce greenhouse gas emissions by about 5% – less than one tenth of the reductions required to stabilise atmospheric concentrations of greenhouse gases.

The sector's contribution to employment compared to renewables is also negligible.

A 2012 report by the Australian Conservation Foundation shows uranium accounted for only 0.29 per cent of national export revenue and less than 0.015 per cent of Australian jobs in the decade to 2011 (3).

In the 2012 financial year, revenue from uranium was four times lower than Australia's 20th biggest export earner, eight times lower than Australia's 10th biggest export earner and 103 times lower than the biggest earner, iron ore.

The World Nuclear Association provides the highest estimate of employment in the Australian uranium sector at 1,760, representing just0.015% of all jobs in Australia. The the Australian Uranium Association claimed its members were "significant employers of First Australians" however the sector only provides around one job for every three thousand Indigenous Australians.

The ongoing nuclear crisis in Japan in the aftermath of the triple reactor meltdowns at the Fukushima Daiichi nuclear complex has also hit the Australian sector and employment hard, with Honeymoon uranium mine in Australia announcing closure in November 2013 and Ranger uranium mine in the Northern Territory announcing significant layoffs and downsizing following three years of record company losses.

In contrast, in response to the Fukushima crisis Germany announced a ban on new nuclear power and a decision to phase out existing plants setting the country on track to achieve a 100% renewable energy economy by 2050, with a revitalized supply chain and 380,000 jobs in the renewable energy sector compared with just 30,000 in nuclear. France, with its fleet of ageing reactors is struggling to import electricity in winter and during summer droughts and heat waves where the impacts of water supplies necessary for the running of nuclear reactors are unavailable.

Prospects for Australian uranium exports also have a very poor global outlook and existing mines profitability has been in freefall in recent years.

The World Nuclear Industry Status Report confirms that plans to expand nuclear power (or to maintain current capacity with new build) are in doubt in the UK, the USA and Canada. Belgium joins Germany in plans to abandon nuclear power. The restart of reactors in Japan promises to be a protracted, contentious affair - and pre-Fukushima plans to expand nuclear to 50% of total electricity supply are now firmly in the past (4).

South Korea's nuclear industry has been hit by a series of scandals including bribery, corruption, and cover-ups, and the proportion of South Koreans who consider nuclear power safe fell from 71% in 2010 to 40% in 2011 and 35% in 2012.

France plans to reduce its reliance on nuclear power. Taiwan, Finland, and Spain have fewer than 10 reactors each and will remain, at most, small markets. Sweden has 10 reactors, with no scope for growth under existing government policy (new reactors are permitted only if replacing shut-down reactors).

As the International Atomic Energy Agency notes, the Fukushima disaster has "seriously undermined public confidence in the safety of nuclear power". To give one concrete example of the fallout from Fukushima, tests carried out at the European Union's 143 nuclear power reactors have exposed hundreds of problems requiring up to €25 billion (A$31 billion) to remedy.

Uranium Mining

Claims that nuclear power is 'greenhouse free' are incorrect as substantial greenhouse gas emissions are generated across the nuclear fuel cycle. Fossil-fuel generated electricity is more greenhouse intensive than nuclear power, but this comparative benefit will be eroded as higher-grade uranium ores are depleted.

Most of the earth's uranium is found in very poor grade ores, and recovery of uranium from these ores is likely to be considerably more greenhouse intensive (5). Nuclear power emits more greenhouse gases per unit energy than most renewable energy sources, and that comparative deficit will widen as uranium ore grades decline.

The Nuclear Energy Agency and International Atomic Energy Agency estimate that high-grade, low-cost uranium ores will be exhausted in about 50 years at the current rate of consumption and the estimated total of all conventional uranium reserves is would only be sufficient for about 200 years. But in a scenario of nuclear expansion, these reserves will be depleted more rapidly.

The most recent independent assessment of the Australian uranium industry, a Senate inquiry in October 2003 found the sector was 'characterised by underperformance and non-

compliance, an absence of reliable data to measure contamination or its impact on the environment and an operational culture focused on short term considerations.'

The World Nuclear Association (WNA), which consists of companies that make up 90% of the industry, admits that in "emerging uranium producing countries" there is frequently no adequate environmental health and safety legislation, let alone monitoring. It is considering proposing a Charter of Ethics containing principles of uranium stewardship for its members to follow. But this is a self-policing voluntary arrangement. Similarly, the International Atomic Energy Agency's safety guide to the Management of Radioactive Waste from the Mining and Milling of Ores are not legally binding on operators.

The Northern Territory's experiences of uranium mining has been plagued by environmental contamination incidents, ongoing failed rehabilitation of former mines, transport accidents and security and water management problems and the sector is long overdue for an independent assessment of its regulation and operations.

Ranger uranium mine as the longest running uranium mine in Australia has recorded over 200 spills, leaks, breaches and incidents in its operational lifetime. The most recent, a security breach in November 2013 in which a contaminated vehicle from the mine's controlled area was allowed to leave the site, was a repeat of a similar incident for which the company was breached in 2004 demonstrating that little has improved in over a decade of regulation and public scrutiny on the mine's operations.

Energy Resources of Australia are currently undergoing an approval process to expand the mine underground to extract uranium from a deposit called Ranger 3 Deeps holding an estimated 34,000 tonnes of uranium. If the project proceeds it would see the creation of 21,990 tonnes of depleted uranium waste, 3850 tonnes of high level nuclear waste and enough plutonium to build 3900 nuclear weapons.

Nuclear Power, Uranium Mining and Water Scarcity

The critical issue of water scarcity is already impacting on the power industry in Australia, largely due to the high water supply needs of coal-fired power plants. Introducing nuclear power, the most water-intensive of all electricity sources, would significantly exacerbate these problems.

A 2007 meeting of the Commonwealth-State Ministerial Council on Energy identified water scarcity in Australia's power sector a major driver for production change, highlighting the high-cost impacts of expensive long-distance water transportation to power plants due to dwindling local supplies, increased and more volatile electricity prices, blackouts and intensified competition for water resources between power generators, agriculture, residences, industries and environmental flows.

The nuclear power cycle uses water in three major ways: extracting and processing uranium fuel, producing electricity, and controlling wastes and risks. Compared to coal-fired plants nuclear power plants consume between 20-83% more water, with water consumption for nuclear reactors typically 13-24 billion litres per year, or 35-65 million litres per day. Conversely, the water consumption of renewable energy sources and energy efficiency/conservation measures is negligible or zero.

A 2013 report by the Union of Concerned Scientists noted that the non-renewable power sector is built for a water-rich world and that at every stage of the nuclear fuel cycle the industry contributes to unsustainable water consumption and pollution. Conventional fossil-fuel and nuclear power plants require water to cool the steam they generate to make electricity. At some power plants, a lot of the water they withdraw gets evaporated in the cooling process; at others, much of the water is discharged back to its source (albeit hotter). The majority of power plants need a vast, steady supply of water to operate, and in hot dry summers, that water can become hard to secure.

As climate change brings extreme heat and longer, more severe droughts that dry up − and heat up − freshwater supplies, a major challenge for electricity grid operators relying on the input of nuclear power will be securing adequate water supplies at a useable temperature. the US electricity system faces a real threat. The renewables sector produces far less water-intensive power and can reduce the risk of power failures and take pressure off our lakes, rivers, and aquifers (6).

An equally large risk to water systems and aquatic biodiversity is posed by the discharge of warm water from nuclear power plants. When power plants outgoing water is too warm to discharge operators can be forced to dial back power production or shut down completely. In the case of US power plants some operators have been granted permission for 'thermal variances' from local governments to allow them to discharge hotter water than their permits allow the state to let them discharge hotter water than their permits allow, resulting in extensive heat-related fish kills and tens of millions of dollars in losses to local fisheries.

WATER CONSUMPTION OF DIFFERENT ENERGY SOURCES:

(litres per kilowatt-hour of electrical output)

Nuclear	**2.3--2.8**
Coal	**1.9**
Oil	**1.6**
Combined Cycle Gas	**0.95**
Solar PV	**0.11**
Wind	**0.004**

Above table compiled from various sources:

- Paul Gipe, 1995, Wind Energy Comes Of Age, John Wiley & Sons.
- American Wind Energy Association.
- Meridian Corp., "Energy System Emissions and Materials Requirements", U.S. Department of Energy, Washington, DC. 1989, p. 23.
- Rose (2006)

Regulation of the uranium industry to prevent contamination is inadequate and in the case of existing Australian mines finite water supplies are used by companies free of charge despite proven adverse impacts on biodiversity and environmental flow rates.

Operator of the Beverley uranium mine in South Australia, Heathgate Resources, pollutes the underground aquifer with heavy metals, acid and radionuclides as a routine aspect of its operations, and is under no obligation to rehabilitate the aquifer.

BHP Billiton, operator of the Olympic Dam uranium, copper, gold and silver mine in South Australia is licensed to extract 42 million litres of Great Artesian Basin water daily for the mine and is the largest single-site industrial user of ground water in the Southern Hemisphere. Since GAB water extraction for the Roxby Downs mine began in the 1980s, many connected Mound Springs have experienced reduced flows and some have ceased flowing altogether.

Despite announcing an $8 billion half-yearly profit from the mine in 2007 BHP Billiton is not required to pay one cent for the water it extracts from the GAB.

In 1994, former Olympic Dam operation WMC admitted that some 5-6 billion litres of waste had leaked from the tailings dams at Roxby Downs and into the groundwater and soil below. The leak had occurred unchecked for at least two years.

Jillian Marsh, Adnyamathanha Traditional Owner, noted in her submission to 2002-03 Senate References and Legislation Committee that: "The government chose not to demand that the groundwater be rehabilitated, an unacceptable situation for the Australian public at large given our increasing reliance on groundwater and the increasing salinity of land surfaces and water systems."

Nuclear Weapons Proliferation and Global Insecurity

It remains the case that uranium mining and the nuclear fuel cycle is inextricably linked to the proliferation and use of nuclear weapons

The hazards associated with nuclear power include the risk of potentially catastrophic accidents, routine releases of radioactive gases and liquids from nuclear plants, the intractable problem of nuclear waste, and the risks of terrorism and sabotage. But there is another hazard which is unique to nuclear power and which is of such concern that alone it must lead to a clear rejection of a nuclear ‘solution’ to climate change ... even if such a solution were possible. This is the repeated pattern of ‘peaceful’ nuclear facilities being used for nuclear weapons research and production.

Global expansion of nuclear power could contribute to an increase in the number of nuclear weapons states – as it has in the past. It would probably lead to an increase in the number of ‘threshold’ or ‘breakout’ nuclear states which could quickly produce weapons drawing on expertise, facilities and materials from their ‘civil’ nuclear program. Nuclear expansion would also increase the availability of nuclear materials for use in nuclear weapons or radioactive ‘dirty bombs’ by terrorist groups.

A nuclear weapon powerful enough to destroy a city requires a mere 10 kg of plutonium. The ‘peaceful’ nuclear power industry has produced 1,600 tonnes of plutonium (Institute for Science and International Security, 2004) – enough to build about 160,000 nuclear weapons. If 99% of this plutonium is indefinitely protected from military use, the remaining 1% would suffice for 1,600 nuclear weapons. Australia’s uranium exports, once irradiated in

nuclear power reactors, have produced about 80 tonnes of plutonium (ASNO, 2003-04) – enough for about 8,000 nuclear weapons.

No Solution to Nuclear Waste

As the proposed host of Australia's first national radioactive waste dump, the Northern Territory government is well placed to consider the social, environmental and political costs of the eight year community and legal campaign to resist the imposition of the waste facility on the NT community.

Over its operational lifetime every nuclear reactor produces hundreds of tonnes of highly dangerous and long-lived radioactive waste. There is currently estimated to be over 300,000 tonnes of high-level nuclear waste around the world today in addition to over one billion tonnes of low-level radioactive waste. This waste includes some of the most toxic materials known to humankind, such as plutonium, which pose a threat of cancers and genetic disorders to future generations for hundreds of thousands of years.

After nearly 50 years of the nuclear power experiment, to date, internationally no government has been able to solve the intractable problem of storing radioactive waste for the length of time it needs to be isolated from humans and the environment. In the absence of a viable solution, expanding the rate of waste production is just irresponsible.

Summary

On a national scale the introduction of nuclear power in Australia would exacerbate water problems caused by fossil-fuel intensive energy production, increase electricity prices and blackouts and increase competition for access to scarce water resources. Coastal nuclear plants face the added impediment of rising sea levels and predicted increases in extreme weather events such as tornados, cyclones and tsunamis.

At a time when the uranium commodity price is at historic lows reflecting a lack of confidence from governments and investors worldwide, it makes little sense for the Northern Territory government to consider subsidies to prop up existing failed ventures or assist in establishing additional mines.

Beyond Nuclear Initiative recommends the Energy Futures committee;

1. **Undertake a cost/benefit analysis of the nuclear industry in the Northern Territory considering the environmental, health, security and social risks posed by uranium mining and the nuclear fuel cycle**
2. **Remove all public subsidies for uranium mining or nuclear projects in the Northern Territory**
3. **Oppose the construction or expansion of any existing or proposed nuclear projects in the Northern Territory**

References

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2. L. Pentz Gunter and K Kamps, Nov 7 2013, Don't trade global warming for nuclear meltdowns, CNN accessed at http://edition.cnn.com/2013/11/07/opinion/pandora-nuclear-gunter-kamps/index.html

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4. World Nuclear Status Report, 2013, published online at http://www.worldnuclearreport.org/

5. 'Water-Smart Power: strengthening the U.S. electricity system in a warming world', accessed at www.ucsusa.org

6. Guy Woods (Department of Parliamentary Services), December 4, 2006, "Water requirements of nuclear power stations", Research Note no. 12, 2006–07, ISSN 1449-8456, accessed at www.aph.gov.au/library/pubs/rn/2006-07/07rn12.pdf

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