Submission No 38

INQUIRY INTO URANIUM MINING AND NUCLEAR FACILITIES (PROHIBITIONS) REPEAL BILL 2019

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Inquiry: 2019 Uranium Mining and Nuclear Facilities Repeal Bill

Dear Committee:

It is a pleasure to write to you regarding the 2019 Uranium Mining and Nuclear Facilities Repeal Bill. As a student of The University of Sydney, I would like to **voice my support for this repeal and my support for a future embrace of nuclear energy in New South Wales**. I believe that my voice can provide valuable insight into the views and wishes of young Australians in their fight for a sustainable energy future.

Need for Increased Investment in Low-Carbon Energy Sources

Lowering Australia's emissions of greenhouse gases is of paramount importance in its quest to combat climate change. **Fossil fuels, such as those burned in oil and gas-fired power plants, are in fact the primary source of increased atmospheric CO_2 concentrations.**[1] In order to meet the Intergovernmental Panel on Climate Change's goal of restricting global warming to 1.5 degrees celsius to avert the most serious consequences of climate change,[2] global efforts to decrease and stabilize atmospheric carbon are not simply needed but imperative. The IPCC has found that in the majority of calculated atmospheric carbon stabilization scenarios, **the share of global low-carbon energy must increase from 30% in 2014 to 80% in 2050**.[3] This has been affirmed in a second study from the Stanford University Energy forum, who concluded **carbon stabilization will require a large-scale deployment of nuclear power**.[4]

While NSW has made substantial investments in renewable energy via the 2013 Renewable Energy Action Plan,[5] **in 2017-18 renewables accounted for only 16% of NSW's total electricity generation**. **The vast majority of NSW's electricity during this period - 79% - was generated via coal-fired power plants**.[6] Needless to say, a much more ambitious push toward low-carbon energy is needed immediately to meet global goals and avert both regional and global climate change impacts.

*The potential impacts of climate change on NSW are not listed here for brevity. A good source for information on these potential impacts can be found at: https://climatechange.environment.nsw.gov.au/Impacts-of-climate-change

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[1] Alfarra, H., & Abu-Hijleh, B. (2012). The potential role of nuclear energy in mitigating CO2 emissions in the United Arab Emirates. *Energy Policy*, *42*, 272–285. https://doi.org/10.1016/j.enpol.2011.11.084

[2] McGrath, M. (2018, October 2). What does 1.5C mean in a warming world? Retrieved from https://www.bbc.com/news/science-environment-45678338.

[3] IPCC, 2014: *Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, 151 pp.

[4] Bauer, N., Brecha, R., & Luderer, G. (2012). Economics of nuclear power and climate change mitigation policies. *Proceedings of the National Academy of Sciences of the United States of America*, *109*(42), 16805–16810. https://doi.org/10.1073/pnas.1201264109

[5] NSW Energy. (2018). Renewable Energy Action Plan. Retrieved from https://energy.nsw.gov.au/renewables/renewable-energyoffers/renewable-energy-action-plan.

[6] Department of the Environment and Energy. (2019, September 10). Australian Energy Statistics by state and territory. Retrieved from https://www.energy.gov.au/publications/australian-energy-statistics-state-and-territory.

Nuclear Energy as a Feasible Bridge

In lieu of this situation — a situation in which immediate action is required — I urge the committee to consider lifting the ban on uranium extraction and nuclear facilities in NSW. Nuclear energy is a tested and proven solution that can drastically decrease NSW's reliance on fossil fuels for electricity generation. Nuclear energy is obviously not the ideal solution to this predicament — it poses a number of drawbacks and dangers — but it is in fact **NSW's best option to cheaply and cleanly produce enough energy to supply the state and push towards IPCC recommendations.** There are two key features of nuclear energy that I would like to emphasize: **(1) nuclear energy is an affordable energy alternative and (2) nuclear energy has a minimal environmental impact if managed properly.**

*Nuclear reactor safety is not discussed here for brevity. Modern nuclear technology is constantly evolving and is widely considered — along with proper management and planning — as safe. Resources regarding nuclear reactor safety topics from the International Atomic Energy Agency can be found at: https://www.iaea.org/topics/nuclear-safety-and-security

(1) Nuclear Energy as an Affordable Energy Alternative

While nuclear energy poses high initial investment costs, it is in fact quite affordable compared to other low-carbon energy alternatives. Table 1 illustrates the costs of electricity production via various production methods as stated in Kok (2017).

Table 1[7] *w/o subsidies

Energy Source	Cost per kWh (Inc. initial invest., in USD)
Nuclear	$0.062
Coal-fired	$0.053
Geothermal	$0.057
Solar*	$0.091
Wind*	$0.078

The table illustrates the current high costs of producing solar and wind power: these forms of power currently require large government subsidies to remain competitive in the energy market. **Solar and wind power, thus, still need substantial technological developments to be affordably implemented large-scale**. **While this technology continues to develop, nuclear power can serve as a stepping stone to meet the pressing need for immediate and drastic reductions in carbon emissions but still affordably produce enough energy to meet the needs of the NSW population.**

[7] Kok, K. (2017). *Nuclear engineering handbook* (Second edition.). https://doi.org/10.1201/9781315373829

(2) Nuclear Energy as an Environmentally-Friendly Energy Source

Nuclear energy, as compared to conventional fossil fuel based energy sources, has a comparatively low environmental impact. This is due to **(a) nuclear energy's lack of operational carbon emissions and (b) waste from nuclear energy has a minimal impact if properly managed**.

(a) Emissions from Nuclear Energy v. Other Fuels

Nuclear power generation does not emit carbon during operation: the only carbon emissions from nuclear energy arise from support functions.[8] **While natural gas has been presented and widely implemented as an alternative to coal-burning plants to reduce carbon emissions, it still emits large quantities of atmospheric CO_2**, as noted in Table 2.

Table 2[9]

Fuel	Lbs. CO_2 Per Million Btu Energy Produced
Anthracite Coal	228.6
Bituminous Coal	205.7
Lignite Coal	215.4
Subbituminous Coal	214.3
Diesel Fuel	161.3
Gasoline (w/o ethanol)	157.2
Propane	139.0
Natural Gas	117.0

Natural gas, while only emitting approximately half of the atmospheric carbon as coal, is in no way a low or zero-carbon energy source. While it is in fact a much cleaner source than NSW's predominantly coal-powered energy network, **simply replacing coal-fired power facilities with natural gas facilities will not be a measure drastic enough to effectively combat the looming climate crisis**. With solar and wind technologies, the ideal and fully sustainable energy sources, still under development to become fully efficient, economical and widely implementable, nuclear energy is in fact the only option that can drastically cut emissions whilst still remaining affordable and implementable. In short, nuclear energy is currently our only reasonable energy option to meet climate goals.

[8] Alfarra, H., & Abu-Hijleh, B. (2012). The potential role of nuclear energy in mitigating CO2 emissions in the United Arab Emirates. *Energy Policy*, *42*, 272–285. https://doi.org/10.1016/j.enpol.2011.11.084

[9] US Energy Information Administration. (2019). U.S. Energy Information Administration - EIA - Independent Statistics and Analysis. Retrieved from https://www.eia.gov/tools/faqs/faq.php?id=73&t=11.

(b) *Nuclear Waste: Minimal Impact if Managed Properly*

Nuclear waste has and will be a controversial and daunting topic for the near future: it is by far — along with overall safety — the primary drawback in harnessing nuclear energy. When considering nuclear waste, however, there are two key points to keep in mind: **(1) the volume of waste generated from nuclear power is miniscule compared to conventional power, and (2) nuclear waste's responsible and safe disposal involves placing the waste in geographically isolated ceramic containers,[10] which would be more than feasible considering Australia's vast landscape.** In fact, it could be argued that the primary obstacle in properly managing nuclear waste is managing public perception. This could be mitigated by providing proper information and disclosures regarding the safety of nuclear waste sites and by openly and honestly framing the formation of nuclear waste repositories as a compromise necessary in the quest for a clean energy future.

Conclusions and Key Takeaways

Nuclear energy is in no way an ideal or permanent solution for NSW's energy market. Solar, wind and hydro-powered plants are in fact the future of power generation: but the future is not today. In considering this bill, **I urge the committee to consider the enormity of the looming climate crisis and that the ideal technologies to combat this crisis in the realm of power generation are not yet capable of producing the necessary results. We must immediately deploy those technologies which we know can immediately bring about drastic results, even if they are not ideal.**

I ask the committee to:

1. **Repeal this Chernobyl-era and fear-driven rather than science-driven bill,**
2. **Push to replace the 2013 Renewable Energy Action Plan with more ambitious zero-carbon energy share targets, and**
3. **Thoughtfully consider the involvement of nuclear energy in this plan as a method to more quickly attain higher levels of decarbonization as dictated by the speed of climate change.**

I thank the committee for their time and consideration. I am happy to answer any questions regarding my submission.

Grant Barnes

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[10] Adamantiades, A., & Kessides, I. (2009). Nuclear power for sustainable development: Current status and future prospects. *Energy Policy*, *37*(12), 5149–5166. https://doi.org/10.1016/j.enpol.2009.07.052