

Submission to the Parliamentary Inquiry on the prerequisites for nuclear energy in Australia

Dear Inquiry Members,

I am a penultimate year chemical engineering student, and even though I may not have any formal qualifications to my name, I will soon be progressing into the workforce and be directly impacted by this future decision. For over 30 years Australia has had its ban on nuclear power development, while simultaneously being an active participant in the nuclear industry worldwide, with mining uranium for export, through to researching and developing new technologies with the ITER prototype. There is zero possibility for making any energy system 100% risk-free. Nuclear has the lowest mortality rate vs energy production amongst all other energy sources, resulting in 442 times fewer deaths relative to brown coal per unit of energy (Our World In Data). Burning coal also releases more radioactive waste than a nuclear power plant does, through the release of radioactive particles in the fuel (EPA). This heavily polluting energy source has caused such a staggering negative environmental impact over the last 200 years that the adverse risks of a nuclear disaster are extremely minute in comparison.

Many arguments can be settled by looking at energy emissions, environmental impact and electricity cost between France and Germany. France has the largest number of nuclear reactors in the world, which accounts for 72% of its electricity production, as well as its air quality being among the best in the world. This has been well documented as attributable to its introduction of the nuclear electricity program in 1980 (European Environmental Agency). Germany pays almost more than double that of price in France for electricity (Stasita), while also producing more carbon emissions from what energy they do generate, through their renewable portfolio consisting predominately of wind and solar. When comparing the energy market, costs and environmental impact that France has compared Germany, it is obvious that incorporating nuclear power into the energy mix is beneficial in every aspect. With such a larger number of reactors, and with zero fatalities, it is entirely possible to run a nuclear power plant in a safe manner.

Unfortunately, humans will never be perfect, and will always make mistakes. This is entirely why multi-level safety features are built and integrated into reactors. Active, redundant, primary, secondary and tertiary safety instruments ensure that the highest safeguards are implemented to control and prevent all outcomes possible. With technological advancements in the last decade, safety instruments and standards have increased significantly. This would preclude the possibility of human error when plants are designed. When comparing this to all other forms of energy generation, nuclear has the highest safety standards worldwide. If Australia was willing to have a serious discussion about the benefits of nuclear technology and be open to building their own plants, we could be a world leader in safety, given the advancements in technology and in the types of reactors possible. When discussing the issue of recyclability, renewable technologies are currently facing a sizeable dilemma. Solar panels, being comprised of multiple materials, have no way of being recycled economically. Wind turbine blades are made from carbon or glass fibre reinforced composites, which at this current stage, have zero ability to be recycled at the end of their life cycle. Nuclear power plants in the US have a license to operate for up to 40 years, while also allowing licenses to be renewed for an extra 20 years, with every renewal process. Most plants have already received one renewal, meaning that most plants will generate energy for at least 60 years (IAEA). This outperforms all other forms of renewable energies, as their average life span is 20 years, before having to be discarded. In just the US alone, there will be 720,000 tons (653,173 tonnes) of wind turbine blades needing to be disposed of in the next 20 years (npr 2019). This is a significant amount of waste, taking up substantially more space and resources than what nuclear waste ever could. The production of these renewable sources are also extremely dirty, producing 2-3x more carbon dioxide than nuclear. The generation of energy that wind and solar produce is clean, but the production and disposal of these technologies are anything other than.

There is also a staggering difference in the amount of land required to generate the same amount of energy between energy sources. Coal, natural gas and nuclear require 12 acres (approximately 48,000m²), solar requires 43 acres (174,000m²), wind requires 70 acres (280,000m²) and hydro requires 315 (1,280,000m²) (Strata). These numbers are calculated based off the energy production of 1 MegaWatt. When counting the land required for

production and disposal of the energy in the equation, the true costs for land required are revealed. From MIT's report on the overall land requirements for each energy type, if the US was powered fully by each respective energy source, solar would require 33,000 sq.km (MIT ei), wind would require 66,000 sq.km and nuclear would require 440 sq.km (Society for Conservation Biology). This demonstrates that solar takes up 75x more space than nuclear, while wind takes up 150x more space. These energy sources have a much larger negative impact on the environment than nuclear, through the level of clearing required to implement them.

The final point I would like to discuss is that of the energy grid's base load. Coal power is contemporarily only useful for providing the base load energy requirements. It becomes obvious and inevitable that coal is no longer of interest when it comes to energy production, as demonstrated by the large push that other countries are having when developing their own energy networks. These coal plants are all getting decommissioned and replaced with another source of energy that can provide the base loading capacity. Unfortunately, Australia is not in a position where we have limitless amounts of Hydro or Geothermal facilities to replace these coal plants, which makes nuclear the next most obvious choice when finding an energy source to replace the current carbon power plants with. These nuclear power plants also have the added benefits of improving air quality and decreasing other pollutants in surrounding areas, improving the health of all those in the surrounding vicinity. With the assistance from nuclear power, Australia can have clean and sustainable energy, with varying forms of energy generation co-existing to bring together the best parts of each type.

Nuclear research, development and technology have made significant progress since the ban was implemented in Australia. The world today is much different than the world back when the ban was put in place. The term climate change is certainly accurate, but it does not accurately portray how severe this change will be to the world. This is a global catastrophe, which is leading to the 6th global mass extinction in earth's history (LiveScience). This will change the global environment far greater than what we have ever seen. Unless a significant change is made, my generation and each and every generation therefore after are going to face dire living situations as a direct consequence to this

decision. I hope that one day that this discussion won't be limited to just a panel of specialists, and that the people who will be directly impacted by the future environmental disasters can discuss what is right or wrong for them and their generation at the time. Thank you for your time, and I wish you all the best for the following inquiry and consequent decision you will have to make.

Best Regards,
Adam Corrie

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