

Nuclear Power Inquiry
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In this submission I address two subjects that I believe should be considered by the inquiry. The first is the elementary question of whether Australia should exploit its nuclear resources given vociferous opposition. The second subject is not explicitly raised by the inquiry, but concerns agricultural applications of nuclear power. I raise these issues because I believe Australia has an altruistic obligation to the world to develop its agricultural potential and become a green food basket for the growing future population of the planet and particularly the Asian continent.

Should Australia exploit its nuclear power resources?

In my view, there are three primary reasons why nuclear power is unpopular and mischaracterised by the political left as the province of the irrational looney right in Australian politics.

1. Catastrophic accidents at Three Mile Island, Chernobyl and Fukushima show that nuclear power is much more dangerous for human and animal life than other modes of electric power production.
2. We do not yet know how to use nuclear material without producing waste that is very difficult to manage safely, and
3. Nuclear power can be used to more destructive effect than any other form of power yet known to humanity; the destructive use of nuclear power is unethical; but the ethical development and use of nuclear power cannot be guaranteed.

Emotive language and personal attacks in this discussion are not constructive. To make rational decisions, we must consider and analyse the issues arising from these legitimate concerns dispassionately. In a measure they are pragmatically outweighed by the fact that nuclear power can manufacture electricity for human consumption much more cheaply than other known forms of electric power generation. But that pragmatic response does not wholly answer these concerns so I set out answers that I do believe can answer them.

The **catastrophic accidents** at Three Mile Island, Chernobyl and Fukushima are the mixed consequence of human error and design failure.

Human error. We do not make air travel illegal because human error can cause catastrophic accidents when large numbers of people are transported in jet airliners. Similarly, catastrophic possibilities have not prohibited airline design which would prevent more than say 100 people traveling on a single airplane. We weigh the risks against the costs and dangers of other forms of travel, and we decide that the risk involved is manageable and we confirm that we can manage it. We manage that risk by conducting air accident inquiries, that identify accident causes and we remediate those risks as completely as we can so they do not recur. Air accident investigators and airplane designers have been very effective in identifying and remediating air accident risks and accident levels have shown a huge decline in the last fifty years.

Design failure. I am not an engineer, but I have consulted with several engineers (including one who has supervised the design and construction of multiple nuclear power stations) and a nuclear physicist, who have advised me that we now know how to avoid the design failures involved at Three Mile Island, Chernobyl and Fukushima. They opined to me in consequence that nuclear power is now the cheapest and the safest means of manufacturing electric power known to man.

Nuclear waste. I acknowledge that the production of electricity by nuclear means produces waste in the long term that is difficult to manage safely and cheaply. I observe that those costs have been taken into account in my statement above “that nuclear power is now the cheapest and the safest means of manufacturing electric power known to man.” But I also accept that does not mean that we cannot do better. My view is that those costs and risks are currently acceptable when measured against our cost aversion to other forms of waste disposal, but that does not mean we should not try and do better. Given current advances in technology in all areas of human research including waste management and the uses of nuclear power, I believe we can further manage and reduce the residual waste cost and risk connected with the nuclear production of electric power, by creating wealthy and attractive research prizes to completely eradicate these risks.

For example, if the Australian federal government created an all comers \$10m or \$100m prize that invented ways to use all existing nuclear power production waste so that there was none left, I believe that universities and private engineering businesses all over the world would be motivated to engage with the problem. Smaller subsidiary prizes for dealing with parts of that nuclear waste could be crafted to be similarly motivating. I expect that with such incentives, the waste problem could be solved within ten years but would certainly be resolved within fifty years. I submit however, that even if there were no better solutions than we have at present in fifty years, even contemporary cost/benefit analysis says that the waste storage costs are acceptable. Even our strongest advocates of waste free living have not been able to eliminate all their own waste products or completely eliminate their carbon footprint in a manner that has convinced the rest of the community that their efforts are appropriate as would be obvious if they were copied to the letter.

The destructive effects of nuclear power. In one sense this criticism of nuclear power is the response of an ostrich to the unknown or danger. If Newton had stopped pondering gravity because it might lead to the discovery of powered flight and the loss of life in aircraft accidents, or the possibility of anti-gravity and power more destructive than that which we

are now considering, we would never have learned how to fly or otherwise stood on the shoulders of his discovery. That we are alert to these risks and are considering publicly developing them in the national interest, suggests that we have also have the reasoned capacity to manage and regulate them. Arguably, if we do not engage in them for altruistic reasons, we will not understand them sufficiently to defend ourselves if malevolent individuals or countries develop them for unvirtuous purposes. Human experience suggests that we cannot stop human discovery and technological progress and we are foolish to try.

It is irrational to propose the development of nuclear power for the three primary reasons listed above?

No. I recognise that I have not provided design specifications that prove nuclear power stations without the defects of the past are possible, but I can identify engineers who can provide those specifications if the Parliamentary Committee receiving this report do not receive such proof from other sources during the submission period. However, I do not believe the validity of my submission is compromised by that absence. My practical and philosophical reasoning does not depend on the detail of that science.

As an aside and as a quiet and ironical counter to the often polemical arguments that are made against the nuclear generation of electric power, I observe that nuclear power is arguably the most natural and ubiquitous source of power in the universe and in our solar system in particular since it is the mode of power by which the Sun gives our earth light and heat. All other sources of electric power generation are its by-product.

Australian agricultural applications of nuclear power

Australia has more land than Europe but it cannot utilise that land for agricultural or decentralised urban purposes because it does not have water in the right places. Nuclear power could be used to unlock Australia's agricultural and urban potential in two ways:

1. It could be used to pump existing water resources into areas of need, and
2. It could be used to power existing and new desalinisation plants to create more agricultural and urban water.

Cost benefit analysis of water production and pumping proposals would have to take into account the full economic benefits that could flow from both agricultural and urban applications. By full economic benefit, I refer not only to the immediate overseas earnings that would flow from additional agricultural production, but to the increase in jobs in regions and the opportunities to populate regional areas with new communities and follow on industries with lower overhead costs. Given that the land that would be released for such development is currently of negligible value, the assessment of those flow-on or secondary economic benefits to the Australian economy could not be directly compared against existing cost/benefit baselines.

Existing watersheds that could be harvested into inland Australia include the Argyle lake created by the Argyle dam in the Northern territory and existing monsoonal floods in northern Queensland and north Western Australia that could be captured for measured release inland.

Nuclear power could readily be released to operate existing silent desalinisation plants in NSW and Victoria in the same way that Manapouri power in New Zealand is used to operate the Tiwai Point aluminium centre near Bluff on the South Island.

Such electric power realisations would not interfere with existing heritage listed sites as much as would Tasmania's proposed Franklin River hydro-electric dam in the early 1980s, but it is also submitted that proposal should be revisited to see if the Franklin River's heritage value could be preserved at the same time as modern hydro-electric development is realised.

In this writer's opinion, Australia has a duty of comity to the rest of the nations of the world to realise its agricultural potential which could be unlocked with the production of industrial and residential water.

Professor Keith Thompson

