

**Parliament of Australia**  
**Select Committee on Nuclear Energy**  
**Inquiry into nuclear power generation in Australia**  
**Dr Alexander R Fullarton**

Adjunct Professor, Curtin Law School, Curtin University; Adjunct Professor, ECU School of Business and Law; Proprietor Solex Solar Project Carnarvon.<sup>¶</sup>

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**Topic** The House Select Committee on Nuclear Energy was established by a resolution of appointment that passed the House of Representatives on 10 October 2024. The committee will inquire into and report on the consideration of nuclear power generation, including deployment of small modular reactors, in Australia.

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<sup>¶</sup> Note: The views expressed by the author are his own and do not necessarily reflect the views or policies the Curtin University.

## ***Abstract***

*This submission finds that ambient air temperature of the Australian continent has been rising steadily over the past 114 years. It finds that Australia has the highest per capita greenhouse gas emissions in the OECD and contributes 20 percent more GHGs than the entire population of the UK. A key method of reducing national GHG emissions is to find alternative methods to reduce emissions from fossil-fuelled based electricity generation.*

*To do that a suggestion has been made to construct small modular [nuclear] reactors (SMRs) to replace retiring coal fired electricity generation stations within the existing electricity generation, transmission and distribution system in Australia. It looks at previous parliamentary inquiries into the alternative of using nuclear fuelled electricity power technology. It finds one of the key parties that has lodged submissions to the inquiries in favour of nuclear technology is involved in promoting and marketing and the impartiality of its opinion is severely compromised. However, that opinion has been heavily relied upon in the findings in favour of SMR installations in one parliamentary report.*

*It considers a statement made by the Hon Peter Dutton in support to the concept of using small nuclear reactors in Australia by using the case of electricity prices in Ontario Canada and an interview with Prof Winfield of the York University, Ontario, Canada who refutes the economic, social and environmental wisdom of the concept.<sup>1</sup> Winfield explains many of the pitfalls and dangers of substituting nuclear energy electricity generation particularly when renewable energy alternatives are available such as hydro-electricity installations in Canada.*

*The submission briefly considers Australia's geotechnic environment and finds the considerable seismic activity present in the highly populated regions where Dutton proposes to substitute SMRs for coal fired power stations place inordinate risks on the security of the structural integrity of nuclear facilities in those locations.*

*Based on its findings, the submission concludes that the nuclear power option for Australia's electricity generation be abandoned in favour of a broad range of non-polluting renewable energy sources.*

## **Introduction**

Australia is faced with the decision of what to replace the aging and polluting coal-fired power stations with as they progressively reach the end of their effective operating life. Faced with modern technologies, and the imperative to reduce greenhouse gas emissions (GHGs), the authors suggest that the replacement technologies must meet certain criteria. The new power stations must conform to the following criteria:

- (i) Be at a low economic cost per MWh in terms of revenue and the total ownership cost of all capital and operational costs over the lifetime of the plant (economic factors);
- (ii) Be low risk in terms of human occupational health and safety (social factors); and

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<sup>1</sup> 'Should we be looking to Ontario's energy solutions here in Australia?' (ABC Radio National, 28 Oct 2024) <<https://www.abc.net.au/listen/programs/radionational-breakfast/ontario-nuclear/104524518>>.

- (iii) Produce low, or no, atmospheric GHG emissions per MWh specifically and low risk to the overall natural environment generally (environmental factors).

Recently it has been claimed by some that small modular reactors (SMRs) meet those criteria and the primary purpose of this Inquiry is to assess the veracity of those claims.

While this submission recognises the rationale for the concept and the positive short-term social and economic benefits that SMRs could potentially provide, it outlines the argument against a policy of relying on nuclear-powered electricity generation for Australia. It examines some of the long-term economic costs and detrimental environmental impacts and concludes that investment in SMR technology is neither economically nor environmentally viable or prudent.

It considers the apparent feasibility that replacing existing coal fired energy sources with SMRs as an attractive alternative energy source. The proposal might be a considerable capital saving as electricity transmission and distribution systems as well as the administration of such systems might not require any significant physical conversion. The centralised utility scale model of electricity generation transmission and sale can remain in place. The running costs of such alternative might be reduced when compared to coal as an energy source.

The submission considers a statement made the Hon Peter Dutton, Leader of the Federal Opposition, in support to the concept. He is quoted as saying ‘In Ontario that family is paying half of what the family is paying here in Perth for their electricity because of nuclear power why wouldn’t we consider it as a country?’<sup>2</sup>

That proposition appears extremely practical and attractive. However, when Professor Mark Winfield, from York University in Ontario was interviewed on ABC Radio National radio<sup>3</sup> he argued against the concept.

I don’t think we would see ourselves as examples for anybody, particularly on this front. The story around nuclear and electricity in Ontario is complicated and not necessarily a pathway other people would want to follow.<sup>4</sup>

This submission examines that interview and looks at other environmental factors to argue that while Australia must find alternative methods to using greenhouse gas (GHG) polluting fossil fuelled based electricity generation, nuclear fuelled electricity power technology is not a sound alternative. It suggests the nuclear power option for Australia’s electricity generation be abandoned in favour of a broad range of non-polluting renewable energy sources.

## **Background and Context**

The author has been involved in renewable energy electricity generation, predominately solar energy, for decades. He has been engaged in theoretic research and modelling of renewable energy sourced electricity generation and also in the design and construction of solar farms and roof top solar photovoltaic generation systems.<sup>5</sup>

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<sup>2</sup> Ibid.

<sup>3</sup> Ibid.

<sup>4</sup> Ibid.

<sup>5</sup> Lex Fullarton, *Watts in the Desert: Pioneering Solar Farming in Australis’s Outback* (Ibidem Verlag, 2016); and *[T]Axing Greenhouse Gases: An Australian Perspective* (Ibidem Verlag, 2019).

To provide context for the need to substitute GHG polluting fossil fuelled generation systems to non-polluting fuel sources the authors point to rising ambient air temperatures in Australia are depicted in figure 1, which shows a consistent rise in air temperatures across the continent from generally cooler temperatures in 1910 as shown by the cooler green hues to the generally warmer temperatures in 2020s as shown by the warmer red hues.

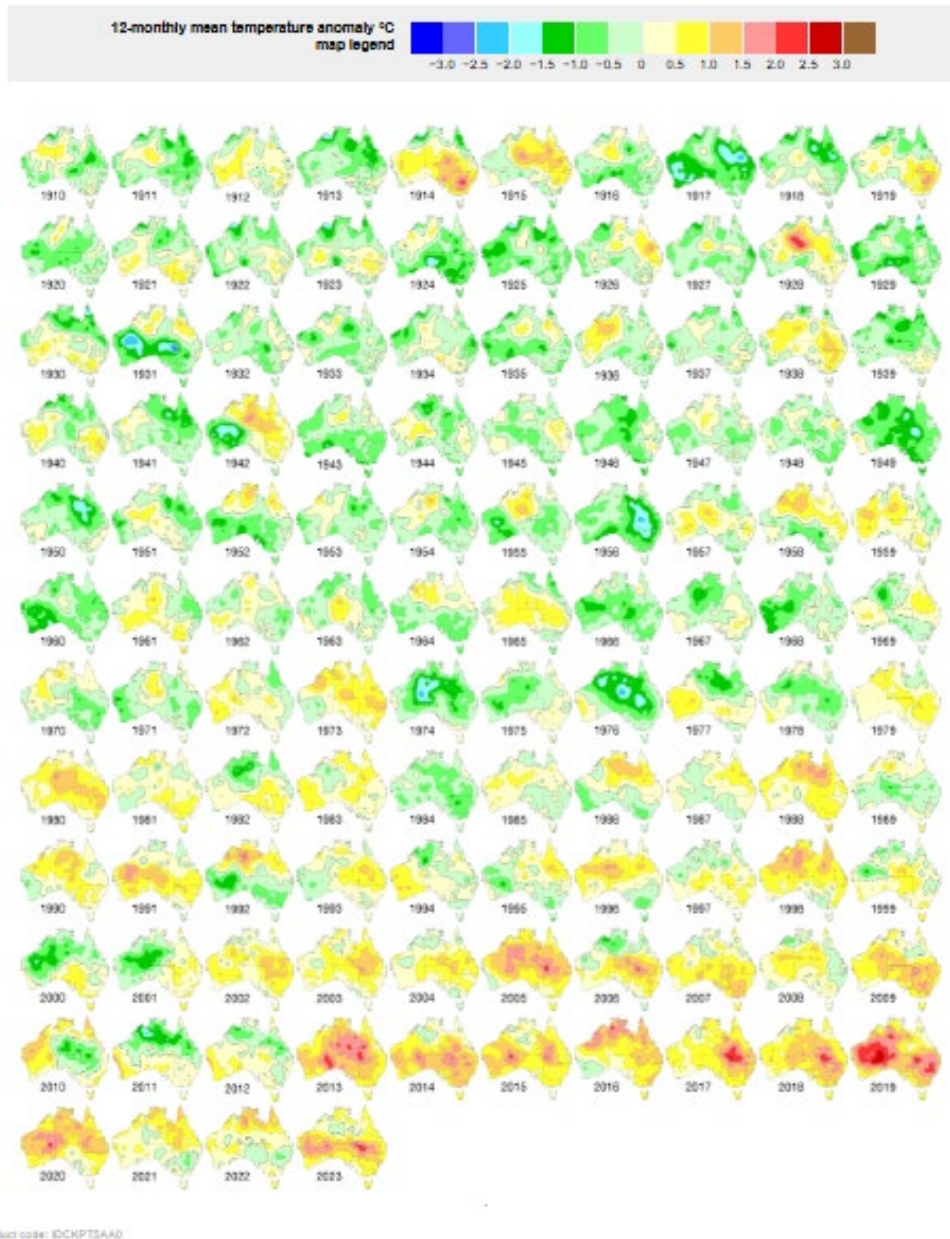


Figure 1: 114 Years of Australian temperatures (source: Bureau of Meteorology)<sup>6</sup>

Global warming attributable to human activity such as land clearing and urban developments is settled science though sectors of the world community are either unaware of the impact of such activities or for a raft of reasons are ignorant of those impacts or choose to ignore or deny the correlation. Discussion of those arguments are beyond the scope of this submission.

<sup>6</sup> Australian Government, Bureau of Meteorology, '114 Years of Australian Temperatures' (10 November 2024) <<http://www.bom.gov.au/climate/history/temperature/>>.

However, another key element, the change of atmospheric chemistry due to the burning of fossil fuels to produce what is known as GHG emissions or more simply air pollution is the focus of this submission regardless of social acceptance of the scientific findings. This submission investigates methods of reducing GHG emissions therefore the impact of GHG emissions on atmospheric warming is assumed to be true in this submission.

It might be considered that Australia’s overall contribution to GHG emissions and global warming is insignificant particularly when compared to that of China, the US and India. To refute that assertion the following brief comparative of Australia’s annual gross GHG emissions is made.

In 2022 Australia had roughly less than 40 per cent of the population of the UK, but more than twice that of Sweden. Figure 2 reveals that Australia contributed at 14.51 tonnes per person for the year compared to the UK at 4.55 tonnes per person and Sweden at just 3.16 tonnes per person. When multiplied by the recorded population of each country it is found that Australia (pop 26.01m) contributed 377.4m tonnes of GHG to the atmosphere, compared to the UK (pop 67.79m) at 308.4m tonnes and Sweden (pop 10.49m) at just 33.1m tonnes.

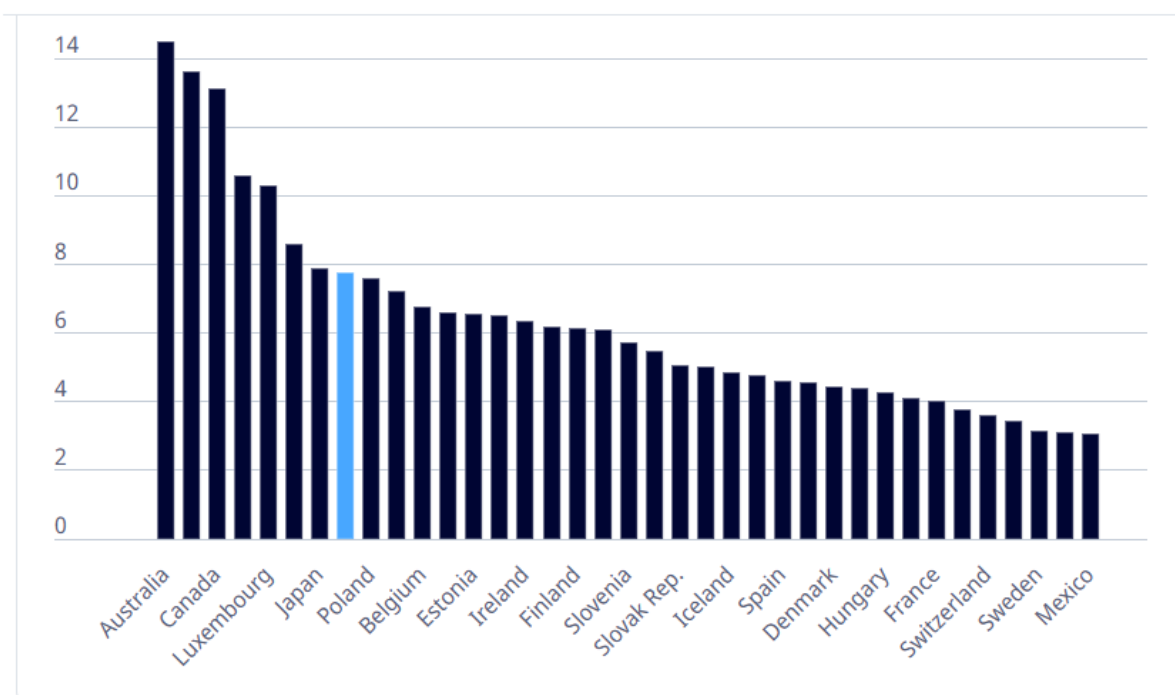


Figure 2: Air and GHG emissions Carbon dioxide (CO<sub>2</sub>), Tonnes/capita, 2022<sup>7</sup>

Therefore, despite having less than 40 per cent of the population of the UK, Australia currently contributes over 20 per cent more GHG emissions towards global warming than the UK and 1140 per cent more than Sweden despite having just 250 per cent more people. Australia’s contribution to GHG emissions can hardly be considered ‘insignificant’.

<sup>7</sup> OECD, Air and GHG Emissions ( 10 November 2024) <<https://www.oecd.org/en/data/indicators/air-and-ghg-emissions.html?oecdcontrol-00b22b2429-var3=2022>>.

Further, given its ‘developed economy’, must not only significantly reduce its GHG emissions for environmental reasons but it must demonstrate leadership in doing so. Transitioning to 1950s technology to address a 21<sup>st</sup> century problem does not appear to be a demonstration of global leadership by a developed nation.

As to existing programs to reduce GHG emissions, Table 1 shows the proportion of GHG emissions from electrical generation to the total national GHG emissions from all sectors including carbon sequestration offsets from land use, land use change and forestry. After removing the negative effect from the agricultural and forestry sectors the contribution from electrical generation table 1 reveals that contribution to be in excess of 28.5 per cent (151.1/528.6).

| Sector   | Annual emissions (Mt CO <sub>2</sub> -e)<br>year to March 2023 | Annual emissions (Mt CO <sub>2</sub> -e)<br>year to March 2024 | Change (%) |
|--|--|--|------------|
| Energy – Electricity                             | 153.8  | 151.1  | -1.7%      |
| Energy – Stationary energy excluding electricity | 101.6  | 100.7  | -0.9%      |
| Energy – Transport                               | 95.7   | 98.2   | 2.6%       |
| Energy – Fugitive emissions                      | 47.9   | 47.1   | -1.7%      |
| Industrial processes and product use             | 32.7   | 32.5   | -0.6%      |
| Agriculture                                      | 85.7   | 85.1   | -0.7%      |
| Waste  | 13.9   | 13.9   | 0.0%       |
| Land Use, Land Use Change and Forestry           | -88.4  | -88.4  | 0.0%       |
| National Inventory Total                         | 442.9  | 440.2  | -0.6%      |

Table 1: Australian Annual GHG Emissions by Sector <sup>8</sup>

However, data from the same source,<sup>9</sup> reveals that in 2009 the percentage of GHG emissions from the electricity generation sector exceeded 33.9 per cent. Since 2009 the reduction in GHG emissions from 222 Mt CO<sub>2</sub>-e to 151.1 Mt CO<sub>2</sub>-e has to have been from either a decline in electricity consumption or by way of transitioning electricity generation some other non-polluting energy source. As no existing nuclear energy sourced electricity generation installations exist in Australia and there have not been any significant hydro-electric

<sup>8</sup> Australian Government, Department of Climate Change, Energy, the Environment and Water, Quarterly Update of Australia’s National Greenhouse Gas Inventory: March 2024 Incorporating preliminary emissions up to June 2024 Australia’s National Greenhouse Accounts (13 November 2024)

<<https://www.dceew.gov.au/sites/default/files/documents/nggi-quarterly-update-march-2024.pdf>> 10.

<sup>9</sup> Australian Government, Department of Climate Change, Energy, the Environment and Water, National Inventory by economic sector: data tables and methodology (13 November 2024)

<<https://www.dceew.gov.au/climate-change/publications/national-greenhouse-accounts-2019/national-inventory-by-economic-sector-data-tables-and-methodology>> (2024).

installations commissioned in that time, it is only possible that the reduction is attributable to the roll-out of renewable energy systems, primarily wind and solar.

This submission recognises that Australia must significantly increase the rate of reduction of GHG emissions and its contribution to global warming and points to the success in achieving that objective in the past 15 years. The data in table 1 reveals a reduction of over 30 per cent which is likely attributable the adoption of renewable energy sources. Therefore, is suggested that the objective of reducing GHG emissions from the electricity generation sector is being achieved with current technology and renewable energy programs.

This submission moves to consider the purpose of this inquiry – to consider the adoption of nuclear power generation which includes deployment of SMRs to substitute fossil-fuelled energy sources for existing electricity generation installations and in particular coal fired electricity stations.

### **The Nuclear Option**

Despite the success of the transition of renewable energy sources which has been demonstrated throughout the world, and in Australia in the past two decades, it has been suggested that Australia adopt nuclear energy-based systems as a substitute for coal at existing generation facilities. It appears the proposal broadly exchanges one environmentally toxic fuel source for another, even more toxic, substitute. Other than for the convenience of substituting nuclear energy for coal at existing electricity generating facilities which in turn may obviate the necessity to make significant adjustments to the existing generation, transmission and distribution framework there is no valid rationale for the proposal.

However, as the proposal is being considered as a policy to be adopted by a future Australian government this inquiry has been commissioned to examine it. The scope of this inquiry is to seek evidence and investigate public opinion for the introduction of nuclear energy powered electricity generation and in particular the construction of SMRs.

To conduct an investigation this submission suggests a number of issues that should be addressed:

- (i) Can SMRs be used to produce electricity at a cost lower than those of the alternatives, particularly solar and wind combined with energy storage;

To address that question this submission looked at the South Australian Nuclear Fuel Cycle Royal Commission Report of 2016 which states that

A small nuclear power plant was not viable. This is not due to its effect on reducing wholesale prices, which fell by only 6 per cent (see Figure 4.12). Rather, its viability was mainly affected by its anticipated 15–30 per cent higher construction cost per kilowatt when compared with a large plant. This underscores the need to carefully follow the actual costs in small nuclear plant developments globally and any potential relevance to South Australia.<sup>10</sup>

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<sup>10</sup> Nuclear Fuel Cycle Royal Commission, Government of South Australia, *Nuclear Fuel Cycle Royal Commission Report*, (May 2016) <<https://nuclearforclimate.com.au/wp-content/uploads/2019/09/Prelim-Report.pdf>>58.

However, that report did recommend the removal of legislative prohibitions on nuclear power generation as part of its list of 12 recommendations which focusses on ‘as orderly, detailed and thorough analysis and discussion of the opportunity to establish [nuclear] facilities in South Australia.’<sup>11</sup> It appears the recommendations intend the viability of SMRs to be further researched and analysed rather than a specific recommendation to construct nuclear facilities. Indeed recommendation 10 expressly states to

collaborate with the Australian Government to commission expert monitoring and reporting on the commercialisation of new nuclear reactor designs that may offer economic value for nuclear power generation.<sup>12</sup>

No general support for the immediate construction or support for SMRs specifically can be construed from that report, other than to suggest the report recommends further investigation.

Further, the later 2022 investigation of The Senate Environment and Communications Legislation Committee: Environment and Other Legislation Amendment (Removing Nuclear Energy Prohibitions) Bill 2022 report quantifies that cost and states

The 2022-23 GenCost report was released updating estimates for the levelized cost for electricity generation technologies. In 2030, SMRs are projected to cost \$198 to \$349 per MWh and integrated renewables, \$65 to \$100 per MWh.<sup>13</sup>

Ultimately, the report decided that

nuclear energy is expensive. Australia has access to plentiful, affordable, and readily available renewable technologies. The latest CSIRO GenCost report into the cost of electricity generation based on technology type found that firmed renewable energy was the cheapest option for Australia, while nuclear technology was the most expensive.<sup>14</sup>

An interview with Professor Winfield as to the Ontario case study indicates that once government subsidies are removed and the costs of construction, refurbishment, decommissioning and decontamination are included in the per unit cost to the consumer is considerable if not prohibitive.<sup>15</sup>

- (ii) What is the actual GHG emission intensity (tonne of CO<sub>2</sub>-e /MWh) of electricity produced from SMRs;

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<sup>11</sup> Ibid 169.

<sup>12</sup> Ibid

<sup>13</sup> Paul Graham, Jenny Hayward, James Foster and Lisa Havas, GenCost 2022-23: Final report, CSIRO, July 2023, p. 73. Note: the GenCost 2022-23 report was made public after the committee had gathered its evidence. Submitters and witnesses referenced the GenCost 2021-22 report in The Senate Environment and Communications Legislation Committee Environment and Other Legislation Amendment (Removing Nuclear Energy Prohibitions) Bill 2022 <[https://parlinfo.aph.gov.au/parlInfo/download/committees/reportsen/RB000114/toc\\_pdf/EnvironmentandOtherLegislationAmendment\(RemovingNuclearEnergyProhibitions\)Bill2022.pdf](https://parlinfo.aph.gov.au/parlInfo/download/committees/reportsen/RB000114/toc_pdf/EnvironmentandOtherLegislationAmendment(RemovingNuclearEnergyProhibitions)Bill2022.pdf)> 5.

<sup>14</sup> The Senate Environment and Communications Legislation Committee Environment and Other Legislation Amendment (Removing Nuclear Energy Prohibitions) Bill 2022 <[https://parlinfo.aph.gov.au/parlInfo/download/committees/reportsen/RB000114/toc\\_pdf/EnvironmentandOtherLegislationAmendment\(RemovingNuclearEnergyProhibitions\)Bill2022.pdf](https://parlinfo.aph.gov.au/parlInfo/download/committees/reportsen/RB000114/toc_pdf/EnvironmentandOtherLegislationAmendment(RemovingNuclearEnergyProhibitions)Bill2022.pdf)>.

<sup>15</sup> ABC Radio National (n 1).



According to a submission by SMR Nuclear Technology Pty Ltd to the House of Representatives Standing Committee on Environment and Energy in May 2021 nuclear has zero operating GHG emissions and a whole of life cycle GHG emissions comparable with renewables. The submission state that ‘nuclear power, like wind and solar, has zero operating [GHG] emissions.’<sup>16</sup>

Further, in its submission to the New South Wales Inquiry into electricity supply, demand and prices in New South Wales in 2018 SMR Technology Pty Ltd stated that despite nuclear power having zero operating [GHG] emissions the whole of life cycle [GHG] emissions median value for nuclear is 12kg/MWh, [which is] the same as wind. Solar is slightly higher at 18-50 kg/MWh.<sup>17</sup>

It appears as to GHG emissions SMRs technology might have an advantage over solar energy systems however the South Australian investigation into nuclear technology addressed the issue of radiotoxicity and found that

Given that there are five plausible relationships, there is a large degree of uncertainty in attributing health effects to moderate radiation doses or lower.

At high doses of radiation, the dose–response relationship is far more certain and stochastic effects are much more likely to arise.<sup>27</sup> Very high doses will lead to deterministic effects in addition to an increased risk of cancer<sup>18</sup>

It is noted that the submissions of SMR Technology Pty Ltd are from a vested interest party<sup>19</sup> and likely only contain evidence that supports its case. However, in that event the data is likely to be biased in the favour of nuclear energy it can be accepted as being in the higher range of cost comparatives and is accepted for the purposes of this submission. The evidence suggests SMRs do not produce an economic benefit significantly greater than other existing renewable technologies.

(iii) Are the potential environmental impacts of SMRs low enough to be acceptable;

The South Australian Royal Commission report considered the broader health impacts of the three major reactor accidents: Three Mile Island (March 1979); Chernobyl (April 1986); and Fukushima Daiichi (March 2011).

It found that Three Mile Island was due to a loss of coolant water flow and that though the reactor has remained out of operation since the accident was no significant release of radiation and there have been many improvements in plant design and safety standards since.<sup>20</sup>

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<sup>16</sup> Parliament of Australia (n14) submission 18.

<sup>17</sup> Ibid.

<sup>18</sup> Nuclear Fuel Cycle Royal Commission (n10) 308.

<sup>19</sup> SMR Nuclear Technology Pty Ltd whose management has been closely associated to the nuclear generation and uranium industries for decades. It has made a considerable number of submissions to government and parliamentary inquires as well as presentations to industry and the community. It has a strong commercial interest in promoting nuclear energy use and as such is significantly compromised in its submissions. <<https://www.smrnuclear.com.au/>> (2023).

<sup>20</sup> Nuclear Fuel Cycle Royal Commission (n10) 43.

The Chernobyl accident was due to poor safety standard compliance causing the reactor to overheat and explode. A significant amount of radioactive material was released into the environment. The accident was due to serious deficiencies in safety culture.<sup>21</sup>

The report also attributed the Fukushima Daihchi in March 2011 mainly to weaknesses in plant design and weaknesses in Japan's regulatory framework. It points to abnormal flooding and proximity to the coast and recognises the primary cause of the accident – seismic activity. The Tsunami mentioned in the report was caused by the Great East Japan earthquake.<sup>22</sup>

It is suggested that these reported, and significant accidents, give no assurance they cannot reoccur and given one of the proposed sites for an SMR is at Collie in Western Australia where seismic activity is a significant risk to nuclear facilities. Safety standards and protocols can be, and have been, breached.

- (iv) Are the potential risks of SMRs to human safety and health sufficiently low to be acceptable;

In the light of the three major accidents, and possibly countless unreported near misses, no guarantee can be made that similar accidents could not occur in Australia should nuclear facilities be constructed in the future.

- (v) Can the other issues associated with the use of nuclear power technology, such as the production of fissile materials, be adequately managed;

The South Australian Royal Commission report acknowledges significant public health issues caused from the management and storage of radioactive waste<sup>23</sup> but reflected on it from an economic perspective as an opportunity for South Australia to benefit from constructing a waste facility. It described a range of prominent difficulties but placed possible, unquantified economic benefits over known social and environmental costs. The authors do not agree with that philosophy.

### **Interview with Professor Winfield**

In response to Dutton's references to how successful Ontario's nuclear transition has been the ABC Radio National interviewed Professor Mark Winfield.<sup>24</sup> Prof Winfield co-chairs the sustainable energy initiative at the Faculty of Environmental and Urban Change (EUC) at York University in Ontario, Canada.

Winfield commenced with the statement above and added that when the initial build out of the nuclear power plants happened in the 1960s and the 1990s the state-owned utility effectively bankrupted itself. He stated that CAN21billion of debt had to be written off to make the successor economically viable. He pointed to electricity rates increasing due to the cost of refurbishment of the older seven of the original fleet of 20 nuclear power plants and they had to take out the seven power plants simultaneously.

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<sup>21</sup> Ibid 44.

<sup>22</sup> Ibid.

<sup>23</sup> Nuclear Fuel Cycle Royal Commission (n10) 306-9.

<sup>24</sup> ABC Radio National (n1).

He added there were cost overruns and delays in the completion of works. Those delays resulted in an increase in coal generation to meet demand. He added that a medical crisis developed, which resulted in the deaths of 1,600 people a year as a result. He did not point to how that is connected to coal fired generation but it might be assumed it is by way of pollution and the handling of coal ore.

The remaining nuclear plants are now due for refurbishment and a consequential increase in electricity charges to cover the costs of the refurbishments. Further, there is an increase in GHG emissions as gas-fired generation has had to be ramped up to cover the loss of nuclear generation due to being off-line for refurbishments.

When asked which provinces had the cheapest power bills, Winfield listed Quebec; Manitoba; British Columbia as they are almost 100 per cent hydro-electric. He said Ontario originally had hydro-electric but moved to nuclear and that drove electricity charges up. He further stated that Canadian electricity rates were heavily subsidised by state government and had a raft of supply issues. He concluded that the Canadian electricity generation and distribution model would not be a good example for other nations to follow.

Winfield's conclusion therefore contradicts Dutton's economic comparative between Australia and Ontario as a basis for the transition to nuclear powered electricity generation plants. This submission suggests that many of the issues raised by Winfield may not have been known by Dutton when he made the observation that consumers in Ontario are paying half that of consumers in Perth. In particular he may have been unaware of the existence of the Ontario Government's electricity support program.<sup>25</sup>

The reality is that electricity consumers in Ontario are likely to be paying less than electricity consumers in Perth due to the Ontario government's electricity subsidies. However, it needs to be acknowledged that Australian state and federal governments currently provide subsidies to reduce consumer electricity prices.

### **Australian Renewable Energy Agency (ARENA) Submission to this Inquiry**

This submission concurs with a statement in a submission to this inquiry by the Australian Energy Agency (ARENA) states that

As nuclear energy is not considered a renewable energy technology, supporting nuclear power is not within ARENA's statutory mandate.

and

ARENA's work over the past 12 years gives us confidence that Australia can successfully transition its energy systems to zero or low carbon alternatives in an economically and technically feasible way. In particular, the combination of solar, wind, batteries and other energy storage technologies, transmission lines, and advanced ways of managing energy flows are technically proven and economically competitive. Collectively these technologies represent our best opportunity of achieving low emissions and reliable energy at a reasonable cost.<sup>26</sup>

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<sup>25</sup> Ontario Energy Board 'Ontario Electricity Support Program' (10 November 2024) <<https://ontarioelectricitysupport.ca/faq>>.

<sup>26</sup> Parliament of Australia, Submission 1 Australian Renewable Energy Agency (ARENA) (10 November 2024) <[https://www.aph.gov.au/Parliamentary\\_Business/Committees/House/Select\\_Committee\\_on\\_Nuclear\\_Energy/Nuclearpower/Submissions](https://www.aph.gov.au/Parliamentary_Business/Committees/House/Select_Committee_on_Nuclear_Energy/Nuclearpower/Submissions)>.

## Senate Environment and Communications Legislation Committee Report 2023

Submissions to the Senate Environment and Communications Legislation Committee on the Environment and Other Legislation Amendment (Removing Nuclear Energy Prohibitions) Bill 2022 focussed on small modular reactors are noted and it is suggested that those arguments and perspectives remain valid as little has changed in the intervening 15 months that would serve to address or refute those arguments.

The Committee's report, published in August 2023,<sup>27</sup> recommended against the removing the ban on nuclear power in Australia were and gave the following reasons:

- The high and uncertain costs of electricity produced from SMRs (including the likelihood of significant construction cost blowouts and high decommissioning costs);
- The lack of a need to rely on SMRs given Australia's abundant renewable energy resources;
- The length timeframes required to bring a nuclear power plant could be brought on line;
- The need to develop and put into place the necessary regulatory framework;
- The considerable water quality and consumption requirements for cooling nuclear power plants and the long ramping lead-times of a nuclear plant;
- The inherent safety risks of a nuclear power plant;
- The potential negative impacts on Australia's national security given that nuclear power plants are associated with fissile material used in nuclear weapons; and
- The lack of a social licence in Australia for nuclear power technology.

However, it is noted that a member of the Committee dissented from those recommendations and provided opposing views to those above and supported removal of the ban. The member concluded:

In a nutshell, even the arguments used against nuclear are not grounds for its prohibition. Cost is not grounds for prohibition. There are likely vested interests seeking to kill off a real discussion on nuclear because it will be a direct energy competitor to a number of industries including renewables.<sup>28</sup>

And

If we are serious about the reduction of emissions to meet targets, we should explore all low-carbon options—and it is a bonus that nuclear is also a fantastic source of reliable baseload power. Why are we limiting ourselves to renewables and hedging our bets, unless there is a political or financial agenda with the renewable industry?<sup>29</sup>

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<sup>27</sup> The Senate Environment and Communications Legislation Committee Environment and Other Legislation Amendment (Removing Nuclear Energy Prohibitions) Bill 2022 Environment and Other Legislation Amendment (Removing Nuclear Energy Prohibitions) Bill 2022 August 2023.

<sup>28</sup> Ibid 86.

<sup>29</sup> Ibid.

It is also noted that the member relied heavily on the submission of SMR Technologies which has been considered an interested party to the promotion and marketing of SMR Technology and is not unbiased. Further the conclusions appear to be somewhat philosophical rather than based on scientific research findings.

Despite those caveats this submission concedes that the members' final conclusion that

Nuclear is fit-for-purpose from the moment it is brought online. We are spending billions to Rewire the Nation and pave our agricultural land with transmission lines, because it doesn't work with existing infrastructure. Nuclear does, and not only is it fit-for-purpose, but when we move to the next generation of energy technology it will be a direct exchange, rather than the billions likely to be required to again change the energy infrastructure to future technologies.<sup>30</sup>

Might be an attractive argument and if it were not for a raft of inherent unknown and identified risks and dangers with nuclear generation, as well as the experiences of other nations as the move to roll back and decommission their nuclear-powered electricity stations, SMRs might be an extremely practical solution. Unfortunately, that cannot be the only consideration on which to base the adoption of SMRs to replace coal as an energy source for Australia's existing electricity generation stations.

In any event tectonic plate activity which creates and exposes coal seams and hence becomes a key factor in the siting of fired electricity generation installations is at odds with the safe operation of SMRs. The impact of earthquakes eliminates the advantages of a simple swap out of energy source from coal to nuclear. The following section looks at the location of Collie in Western Australia from a seismic perspective as a suitable site for the proposal.

### **Collie Western Australia – Reported Seismic activity**

To consider the impact of earthquake activity this submission looks briefly at the Collie electricity generation site in Western Australia from a tectonic perspective and the likelihood of earthquake damage to any future SMR plant constructed there.

Figure 3 shows Collie in Western Australia to be on the Darling Scarp and within 50km of the major fault-lines depicted in red and clearly visible running roughly north south between the coastal city of Bunbury and the town of Collie.

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<sup>30</sup> Ibid.



Figure 3: Great Southern Region of Western Australia showing Collie in relation to the City of Bunbury<sup>31</sup>

The coastal plain to the west of the escarpment is a significant agricultural region of Western Australia, and due to its high rainfall predominantly dairying. It is one of the highest populated rural regions of the state. Bunbury is also a key sea port servicing the Great Southern agricultural and mining industries of the hinterland. Any nuclear accident in that region would have considerable impact not just for the region, but the state and the Nation generally.

The following figure 4 looks closer at the previous seismic activity more broadly to most of the south west of Western Australia including its capital city Perth. For reader convenience Collie is shown at the end of the red arrow. The white dots are the sites of earthquake activity in the past 10 years and yellow dots those occurring within the last 30 days of 12 November 2024. Seismic activity in the region is comparatively high and significantly Collie has experienced two earthquakes on 10 November 2024, with another Darkan around 60 km east of Collie on 16 October.

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<sup>31</sup> Australian Government, Geoscience Australia Neo tectonic Features (13 November 2024) <<https://neotectonics.ga.gov.au/?execution=e1s1>>.

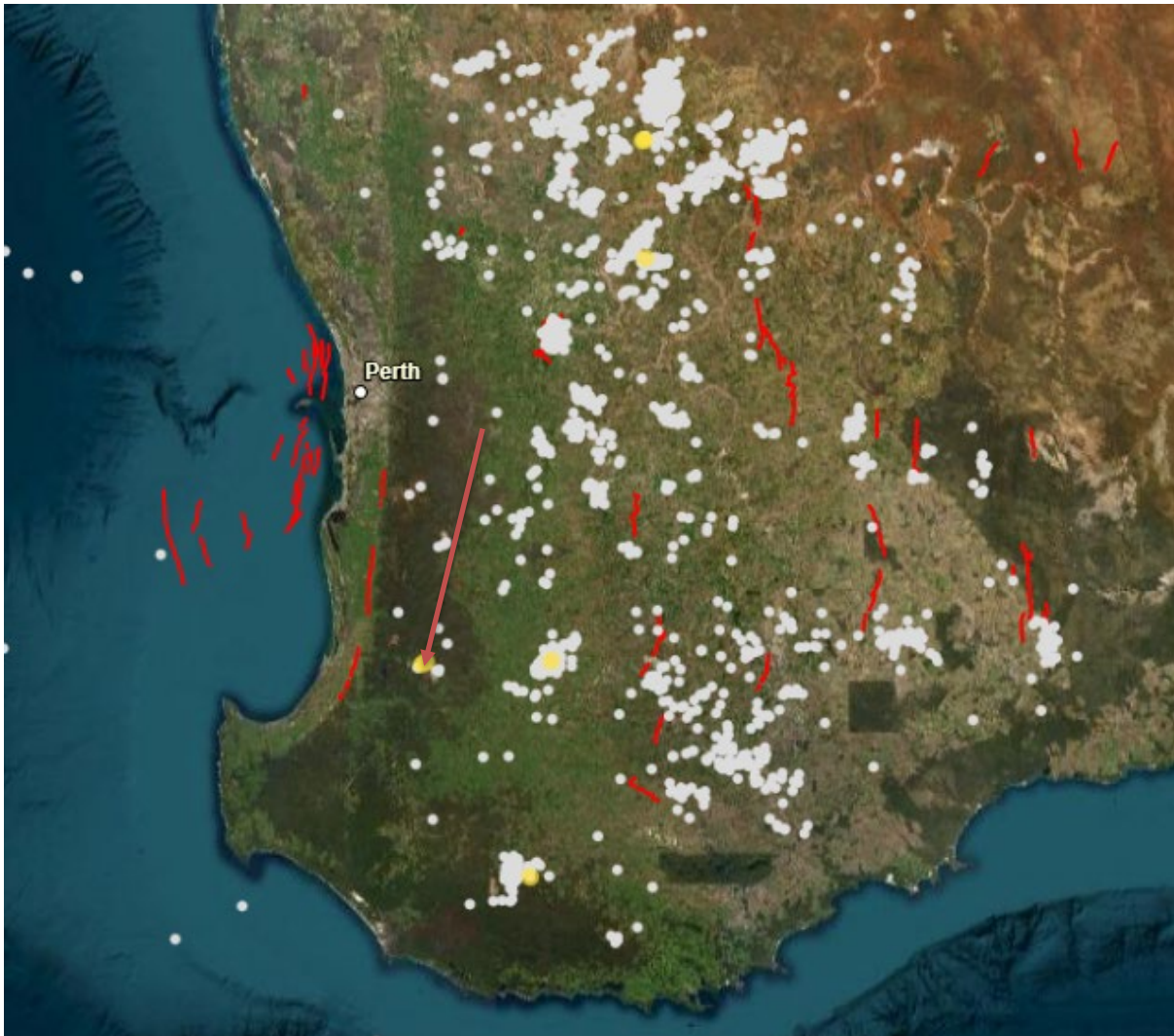


Figure 4: Seismic Activity Great Southern Region of Western Australia<sup>32</sup>  
 (red line: known fault lines; white dots: Earthquakes last 10 years; yellow dots: last 30 days 12 Nov 2024)

Given such a high level of tectonic plate activity and the inherent dangers of placing a nuclear facility not only in a region of high earthquake activity but within close proximity to the highest population region of Western Australia which includes the state capital city with known catastrophic consequences in the event of structural failure, the proposal might be viewed as grossly negligent in the almost certain event of an ‘accident’.

Further, to provide a broader perspective of earthquake activity on the Australian continent figure 5 reveals that the highest centres of earthquakes are focused around the capital cities of Perth (WA); Adelaide (SA); Melbourne (Vic) and Sydney (NSW). Brisbane and Darwin are possible sites from a tectonic perspective however Brisbane is in a high rainfall region and is constantly subject to tropical cyclones and flooding. That might provide an opportunity for further hydro-electric installations rather than nuclear.

Darwin is also subject to severe tropical cyclones, but the nuclear facilities could be designed to resist such weather events. However, the region is rather inclement from a climate

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<sup>32</sup> Ibid.

perspective and has a relatively low population density. Therefore, the economic viability to service the Northern Territory electricity market might not warrant such a facility.

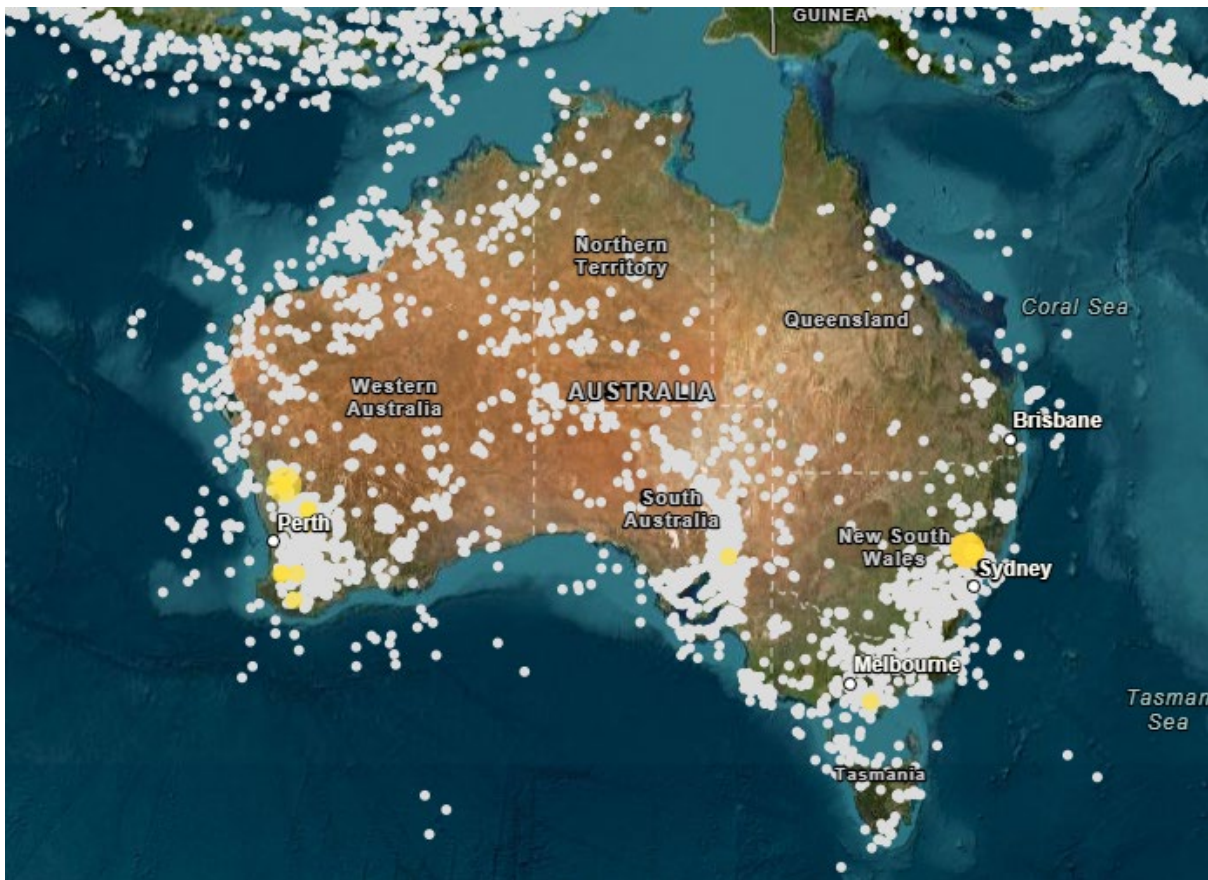


Figure 5: Seismic Activity on the Australian continent<sup>33</sup>

## Conclusion

This submission acknowledges that the supporting research is not extensive but rather relies on reports presented by a range of previous parliamentary committees in recent years, one as recent as 2023. It also finds one of the key parties that has lodged a number of submissions to the previous inquiries in favour of nuclear technology is involved in promoting and marketing small modular reactors (SMRs) and the impartiality of its opinion is severely compromised. Further that opinion has been heavily relied upon by a dissenting member in finding in favour of SMR installations in one of the parliamentary reports. That conclusion is therefore also compromised.

Given the reports rely on a broad range of submissions, and are supported by a recent Canadian academic authority, it is concluded that nuclear power and specifically SMRs do not produce an economic benefit superior to other existing renewable technologies.

The submission also considers a statement made the Hon Peter Dutton in support to the concept of using small nuclear reactors to replace retiring coal fired electricity generation stations in Australia by using the case of electricity prices in Ontario Canada and an interview with Prof

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<sup>33</sup> Ibid.



Winfield of the York University, Ontario, Canada who refutes the economic, social and environmental wisdom of the concept.<sup>34</sup> Winfield explains many of the pitfalls and dangers of substituting nuclear energy electricity generation particularly when renewable energy alternatives are available such as hydro-electricity installations in Canada.

The submission briefly considers Australia's geotechnic environment and finds the considerable seismic activity present in the highly populated regions where Dutton proposes to substitute SMRs for coal fired power stations place inordinate risks on the security of the structural integrity of nuclear facilities in those locations.

Australia must find alternative methods to using greenhouse gas (GHG) polluting fossil fuelled based electricity generation and concludes that the nuclear power option for Australia's electricity generation be abandoned in favour of a broad range of non-polluting renewable energy sources.

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<sup>34</sup> ABC Radio National (n1).