

NUCLEAR FUEL CYCLE ROYAL COMMISSION

Submission in Response to Issues Paper Three Electricity Generation from Nuclear Fuels

1. This submission is made by me, Alan Parkinson, and draws on my extensive experience in nuclear projects in the UK, Canada and Australia. I am a retired Mechanical and Nuclear Engineer and I have no allegiance to any organisation.
2. My first employment after graduating in mechanical engineering was with the UK Atomic Energy Authority. Naturally, I am very much pro-nuclear and I welcome the SA government's decision to hold this Royal Commission. The government should be encouraged to pursue opportunities in any or all phases of nuclear projects. There are numerous possibilities for commercial enterprises.
3. After working for the UKAEA for seven years, I was recruited by the Menzies government in 1965 to help build a nuclear power station in Australia. This was to have been built at Jervis Bay in NSW. Drawing on my experience on the Steam Generating Heavy Water Reactor (SGHWR) in England and the CANDU type Pickering and Bruce nuclear power station projects in Canada, I was a member of the team which assessed tenders for the plant to be built at Jervis Bay. I was to have been seconded back to England to work on the selected design of power station, but the project was cancelled before that could eventuate.
4. My submission is in response to Issues Paper Three - Electricity Generation from Nuclear Fuels.
5. Question 3.8 asks "*What issues should be considered in a comparative analysis of the advantages and disadvantages of the generation of electricity from nuclear fuels as opposed to other sources? What are the most important issues? Why? How should they be analysed?*" I have long said that electricity utilities should be free to provide electricity to the consumers at the lowest possible price. They should be free to select how they generate that electricity consistent with environmental and other considerations. I cannot recall ever seeing a valid comparison of costs of electricity from all sources stripped of the various sanctions, assistance packages or subsidies.
6. Question 3.9 asks "*What are the lessons to be learned from accidents, such as that at Fukushima, in relation to the possible establishment of any proposed nuclear facility to generate electricity in South Australia? Have those demonstrated risks and other known safety risks associated with the operation of nuclear plants been addressed? How and by what means? What are the processes that would need to be undertaken to build confidence in the community generally, or specific communities, in the design, establishment and operation of such facilities?*"
7. Clearly the accident at Fukushima resulted from a tsunami hitting the site and

flooding the stand-by power, thus resulting in a loss of shut down coolant and subsequent explosion. So the accident points to considerations in siting of the power station, and on that score, I would have thought that South Australia would be immune from tsunami surges. The accident does however point to the question of the stand-by power supply and perhaps greater consideration given to where it should be positioned.

8. The lead up in the issues paper to this question mentions Chernobyl. The lesson from that accident is quite clear. That reactor had a graphite moderator and water coolant, so it had a positive power coefficient making the reactor difficult to control. The accident was aggravated by the inexperienced staff in charge of a difficult operating procedure. Reactors with such a positive power coefficient should not be built. Even so, in saying that I am aware that the Candu - BLW reactor built at Gentilly in Canada did have a positive power coefficient resulting from the use of natural uranium fuel, heavy water moderator and light water coolant. The reactor did not go into operation with that configuration. In 1967 - 69, a team was sent by the then Australian Atomic Energy Commission to the UK to work on the feasibility of a version of a steam generating heavy water reactor for construction in Australia. The reactor would have had a positive power coefficient and we knew it would never be built. What we did not know was that the choice of natural uranium fuel was made for other reasons.
9. Question 3.10 asks *“If a facility to generate electricity from nuclear fuels was established in South Australia, what regulatory regime to address safety would need to be established? What are the best examples of those regimes? What can be drawn from them?”*
10. The preamble in the issues paper leading to posing of this question notes that “the construction or operation of a commercial nuclear power plant is effectively prohibited under Australian law”. Earlier the paper quotes the *Environment Protection and Biodiversity Conservation Act 1999 (Cth)*. The paper also notes that ARPANSA is similarly prohibited from authorising a Commonwealth entity to construct or operate such a facility. [Note that ARPANSA has responsibility only for Commonwealth projects and interests.] Clearly there needs to be some changes to these Acts before any moves towards the introduction of nuclear power can be considered.
11. In addition, I believe there has to be bipartisan support by the major political parties so that nuclear power stations can be considered.
12. Quite apart from the above, I continue to hold two main concerns with any suggestion of the possible establishment of a nuclear power station in Australia. These are the need to have a properly established and functioning nuclear regulatory organisation, staffed by persons experienced in nuclear safety and regulation, and secondly to ensure that only suitably qualified people are engaged on any nuclear projects that might ensue. In my view the proposed Jervis Bay project suffered from the twin problems of regulation and experienced personnel. There was no regulatory organisation established to define the framework within which the project should be

carried out.

13. Although at the commencement of the Jervis Bay project, we had a couple of engineers in the team with experience in the safety of nuclear power stations, there was no regulatory organisation in being. There were no siting criteria specified for the project, and this meant that, as we assessed the tenders, we worked somewhat in the dark because we had no guidance as to what would be accepted by way of such things as site emissions.
14. We also had a cadre of engineers with some nuclear experience but we could hardly be called a project team. So we had to rely on a large input from the overseas supplier of the reactor.
15. On 19 September 1978, I presented a paper at a symposium held by the Institution of Chemical Engineers in Adelaide, see *A Parkinson, Nuclear Energy in Australia*. In that paper, I stated *“If there is to be an orderly introduction of nuclear power, a number of very important activities must be undertaken. The first most important step is the establishment of the legislative framework within which nuclear power plants can be introduced, licensed and operated.”*
16. I continued with a suggestion that *“there are significant advantages in having a National Nuclear Regulatory Office operated as joint responsibility of the Commonwealth and State governments.”* And I indicated that the decision to proceed with a nuclear project *“requires a commitment to policies that will [among other things] establish the legislative framework and regulatory authority responsible for the establishment of standards for all stages of the project, to protect the environment as well as the health and safety of plant personnel and general public, and for conducting any reviews and audits deemed necessary.”* My view on these matters has not changed.
17. My 1978 paper concluded with an indicative schedule of all the steps which I considered necessary leading to the introduction of nuclear power. The schedule was based on international views of that time, but I doubt that the essentials will have changed much.
18. The issues paper notes that Australia is party to several relevant international treaties and conventions, and so would be able to draw on the various international technical standards that are available. But such standards cannot simply be adopted as suitable for Australian conditions. And that means that engineers employed by the Australian nuclear regulatory organisation will have to vet all the codes and standards before adopting them. And this points to my second concern and that is the need to have experienced personnel employed in the project, and particularly in the early phase of establishing the regulatory organisation.
19. In 1981, I drafted a report for the National Energy Advisory Committee, see *Nuclear Power in Australia: Regulation and Control, NEAC Report No 16*, and again stressed the need for a regulatory organisation.

20. On 5 February 1993, I made a submission to the Research Reactor Review Committee with my common theme of the need for a regulatory organisation to be established. I attended public hearings of the review committee in Canberra and then made a supplementary submission again pressing the case for such an organisation. See *A Parkinson, Submission to the Research Reactor Review, 5 February 1993*, and *A Parkinson, Supplementary Submission to the Research Reactor Committee, 22 April 1993*.
21. I continued making statements about the need for a regulatory organisation in my second talk in the *Ockham's Razor* series on ABC Radio National which aired on 30 October 2005 - see *Alan Parkinson, Nuclear Power - Rational or Irrational? Ockham's Razor, ABC Radio National*. I again made the point that the regulatory organisation needs to be a joint concern of Commonwealth and State authorities. In this I noted the hypothetical construction of a nuclear power station on the banks of the Murray river in NSW. Surely Victoria would have concerns for the safety of its residents on the southern bank.
22. In 2007, I was successful in having my book about the Maralinga partial clean-up published under the title *Maralinga - Australia's Nuclear Waste Cover-up*, by *Alan Parkinson, ISBN 978 0 7333 2108 5*. I followed publication of my book with a third talk in the *Ockham's Razor* series and, while my broadcast was really about my book, I included a comment by Dr Switkowski about the need for an independent nuclear regulator. I also made the point about the need to employ personnel with experience in the nuclear industry (which I see as a major problem in Australia). See *Alan Parkinson, Maralinga - Australia's Nuclear Waste Cover-up, Ockham's Razor ABC Radio National, 2 September 2007*.
23. Question 3.13 asks "*What risks for health and safety would be created by establishing facilities for the generation of electricity from nuclear fuels? What needs to be done to ensure that risks do not exceed safe levels?*" Of course there would be a health physics regime established within the staff structure for the power station, and recognised radiation dose limits would be applied. But there needs to be strict adherence to the health physics protocols that are introduced. I noted that the preamble in the issues paper leading to this question made no mention of training and yet this is most important.
24. Three incidents in my experience illustrate this need. One was at the Windscale (Sellafield) site in the UK in which a worker went into the base of one of the plutonium production reactors (the old *Windscale piles*) with his torch shining up to the roof of the chamber. When he eventually pointed his torch to the floor, he found he was close to many spent fuel rods that had been pushed through the reactor core and had missed the skip placed to catch them. The second was an incident at Lucas Heights in which a worker checked his hands for contamination and found a reading indicating contamination on his hands. He thought this could not be so, and checked his hands using the clothing monitor and got a zero reading. His conclusion was that the hand monitor was faulty and he went home. When he sat at home that evening, he realised that it could have been the clothing monitor that was faulty (as it was). And the third incident was at the Maralinga project which only came to light over a

thousand kilometres away from the site. A worker had to attend the Australian Radiation Laboratory for a lung monitor and the high readings led to the discovery that his shirt was contaminated with plutonium. He had travelled from Maralinga to Melbourne wearing a shirt contaminated with plutonium. He had been working on some plant in his own clothing and had put a spanner in his shirt pocket thus transferring the contamination to his pocket. It is not known if others were also deficient in their observation of procedures because this particular incident only came to light because of the requirement for the off-site lung monitoring. All of this points to the need for adequate training in the application of health physics and for periodic retraining.

25. Question 3.14 refers to the question of nuclear safeguards should a nuclear power station be operated in SA. While safeguards are the province of the Commonwealth government, the state ensures the security of the station. While there is no hazard from the potential of nuclear weapons from such a power station, there is the security of the waste products should intruders want to make a 'dirty' bomb.
26. Question 3.17 asks "*Would the establishment of such facilities give rise to impacts on other sectors of the economy? How should they be estimated and using what information? Have such impacts been demonstrated in other economies similar to Australia?*" The preamble notes the possibility of using process heat from the reactor. This has been done in the past for example while it was not high temperature, the Calder Hall reactors delivered low temperature heat to the rest of the site. The now decommissioned Trawsfynydd nuclear power station in Wales was a dual purpose plant in a pumped storage scheme pumping water back up to a reservoir over night and producing nuclear electricity and hydro electricity during the day.
27. The preamble also notes the need to have international expertise and cooperation should there be the establishment of a nuclear facility in SA. It was obvious in the Jervis Bay project that there would be a large involvement by the supplier of the plant. There is another point in this same context and that is that the continuity of construction is not sufficient from one station to the next for the retainment of expertise in this country, unless other states join the venture and build nuclear facilities, and even if they did, it is doubtful if the expertise could be retained - again pointing to the support needed from overseas.
28. The preamble also suggests there could be damage to tourism and agriculture should a nuclear power station be built. I doubt if tourism would suffer. In fact it offers a new place to visit. In this I am mindful of visits as an individual member of the public to a nuclear power station in Britain, and there is a resource centre established at the Sellafield site in Cumbria which attracts many visitors every year. Closer to home, the traditional owners of the Maralinga site have attracted visitors to the site since the return of their land, providing guided tours of the bomb sites.
29. In summary, I am fully supportive of the SA government's investigation of nuclear matters for South Australia, but I urge the government to act in forming a nuclear regulatory organisation staffed by engineers with regulatory experience in nuclear power stations before any projects are commenced.

ALAN PARKINSON
BRIEF OUTLINE OF QUALIFICATIONS
AND RELEVANT EXPERIENCE

- 1957 Bachelor of Technical Science (BScTech) with Honours in Mechanical Engineering, Manchester University (UK)
 1980 Master of Science and Society (MScSoc), University of New South Wales

Previously:

Member of the Institution of Mechanical Engineers (UK)
 Member of the Institution of Nuclear Engineers (UK)
 Chartered Engineer (UK)
 Fellow, Australian Institute of Energy

- 1957 - 64 UK Atomic Energy Authority - Employed on design of various reactor systems, in particular the Steam Generating Heavy Water Reactor later built on the south coast of England. (Note, later I had a brief involvement in commissioning of that reactor.)

Developed a scheme to dismantle the prototype Advanced Gas-cooled Reactor (AGR) then in construction at Windscale (Sellafield) in the UK. Note: When I visited that site in August 2003, I noted that the reactor had been decommissioned and was being dismantled.

Design, construction and commissioning of various rigs to study safety aspects of nuclear power reactors. Most of this work was in the plutonium separation area of the Sellafield site.

- 1965 - 81 Australian Atomic Energy Commission - Studies of various reactor systems which might be suitable for construction in Australia.

1967 - 69 - Seconded to the UKAEA to work on a design of a reactor to be built in Australia. My responsibility was the reactor core.

1969 - 70 - Seconded to Atomic Energy of Canada Limited (AECL) to work on two nuclear power stations (Pickering and Bruce). My responsibility was the steam generators of both power stations.

1970 - Seconded to Bechtel Engineers in San Francisco to work on the assessment of tenders for the proposed Jervis Bay nuclear power station.

- 1981 - 87 Marketing Systems Manager at CMPS (Crooks Michell Peacock Stewart) in Sydney.

- 1987 - 99 Self employed (Kylwind Pty Limited) working on several projects including the Anzac Ship project in Melbourne, and the M4 Motorway in Sydney. In

1989, I prepared costed estimates for some thirty options for rehabilitation of the Maralinga atomic bomb test site. From 1993 to 98 - I was contracted to the Department of Primary Industries and Energy and appointed the department's representative to oversee the partial clean-up of the Maralinga site. Also appointed by the Minister to be a member of the Maralinga Rehabilitation Technical Advisory Committee (MARTAC) to advise him on progress of the project. From 1998 to 2000, I was an adviser to the traditional owners of the Maralinga lands.