NUCLEAR FUEL CYCLE
ROYAL COMMISSION

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 make particular reference to the Jervis Bay nuclear power station project in NSW and the Maralinga rehabilitation project in SA. 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. My submission addresses Issues Paper Four - Management, Storage, and Disposal of Nuclear and Radioactive Waste, with particular reference to Questions 4.5, 4.7, and 4.8 posed in that paper.

- 4.5 - What are the specific models and case studies that demonstrate the best practice for the establishment, operation and regulation of facilities for the storage or disposal of nuclear or radioactive waste? What are the less successful examples? Where have they been implemented in practice? What new methods have been proposed? What lessons can be drawn from them?

- 4.7 - 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?

- 4.8 - Bearing in mind the measures that would need to be taken in design and siting, what risks for health and safety would be created by establishing facilities to manage, store and dispose of nuclear or radioactive waste? What needs to be done to ensure that risks do not exceed safe levels? Can anything be done to better understand those risks?

4. 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 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.

5. In 1989, I prepared costed estimates for some thirty options to rehabilitate the nuclear test sites at Maralinga in South Australia. My work formed a major part of the

department's report tabled in the House of Representatives in 1990 - see *Department of Primary Industries and Energy, Rehabilitation of Former Nuclear Test Sites in Australia, Report by the Technical Assessment Group, 1990, ISBN 0 644 12695 7.* One of those options, a partial clean-up known as Option 6 (c), was selected to be implemented.

6. In 1993, I was appointed the department's representative to oversee the Maralinga project. I was also appointed by the Minister to be a member of the Maralinga Rehabilitation Technical Advisory Committee (MARTAC), set up to advise him on progress of the project.

7. Reflecting on my experience with nuclear projects in Australia, and the above two projects in particular, I continue to hold two main concerns. These are the need to have a properly established and functioning 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 both the Jervis Bay project and the Maralinga project suffered from the twin problems of regulation and experienced personnel. There was no regulatory organisation established to define the framework within which either project should be carried out. And, particularly in the case of management of the Maralinga project, there was a distinct shortage of nuclear expertise.

8. 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.

9. We also had a cadre of engineers and scientists 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.

10. After the Jervis Bay project was cancelled, I worked for a short time in the newly formed Nuclear Safety Bureau (NRB) which operated within the Australian Atomic Energy Commission (AAEC), examining safety matters concerning the Hifar reactor at Lucas Heights.

11. 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."*

12. 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.

13. 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.

14. 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.*

15. When the Maralinga rehabilitation project started in earnest in 1993, there was still no regulatory organisation in existence. The first phase of the project was already complete when ARPANSA (Australian Radiation Protection and Nuclear Safety Agency) was formed in February 1998 by the combination of the Nuclear Safety Bureau (NRB) and the Australian Radiation Laboratory (ARL).

16. In the absence of a regulatory organisation, the end-state criteria for the partial clean-up were proposed by ARL and adopted by MARTAC. I always considered ARL to be the de facto regulator for the project, but they were not keen to accept that role. Since the ARL staff were all generally in research disciplines this is understandable. Neither did they have any regulatory powers to apply in oversight of the project. [Note that nobody from the NRB, who might have been more recognisable as regulators, was ever involved in the Maralinga project.] As a result, the clean-up criteria were always referred to by ARL staff as 'MARTAC criteria'. Indeed, in a statement released by ARPANSA, the then head of that organisation, Dr Loy, stated *"The 'end-state criteria' against which the Sites have been cleared are those set by the Maralinga Technical Advisory Committee (sic) (MARTAC)."* See: *Summary Statement for Clearance Monitoring, Maralinga Rehabilitation Project, 29 February 2000.* So any future questioning of the suitability of those criteria will now have to be directed to a non-existent body. And this strengthens my view of the need for a regulatory organisation to be established before any nuclear project commences.

17. While I do not have first-hand knowledge of the collection of contaminated soil now stored in drums at Woomera, I understand that the specification for collection of that soil was poorly defined. That is the end-state criteria were not specified in clear technical terms. As a result, more soil was collected than was necessary and that soil has been awaiting disposal for several years. Colleagues from ARL claimed that most

of the soil collected could be safely spread in suburban back yards. If the criteria had been properly defined, then the problem of disposal would be very much reduced.

18. When the first part of the Maralinga project was completed, the department extended the contract of the project manager company appointed for the first phase to oversee the second phase. This extension was done against my advice to the department and in spite of the fact that nobody from the contractor's team had been involved in the three year development of a scheme of *in situ* vitrification of thousands of tonnes of debris contaminated with plutonium and uranium. Nor had anybody from that organisation even seen the full size equipment to be used, and yet their contract was extended.

19. For my part, my contract with the department was terminated. That was one month before ARPANSA was established. My removal from the project meant that the department no longer had any nuclear expertise in their ranks to oversee the project. Different members of the department's team (a) did not know what is meant by alpha radiation (plutonium-239, the main contaminant at Maralinga, emits alpha radiation), (b) thought that a milliSievert (a unit of radiation dose) could be converted to a picoCurie (a unit of radioactivity) and (c) stated that soda ash (an alkaline substance) would be neutralised by the limestone (another alkaline substance) at the site. The person who made the last statement also told a Senate committee that limestone is 'rich in sodium and carbonate' with no mention of calcium (limestone is calcium carbonate). One of those people told me *"When dealing with contractors, you should always seek compromises."* Further details of such ignorance are related in *Alan Parkinson, Submission to The Senate Select Committee for an Inquiry into the Contract for a New Reactor at Lucas Heights, September 2000.* In that submission, I again made the point about the need for an independent regulatory organisation, even though by then ARPANSA had been created, but with responsibility only for Commonwealth projects.

20. 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.*

21. After my appointment as the department's representative was cancelled, I became an adviser to the traditional owners of the Maralinga lands, and so continued my association with the project. However, I found that the project quickly started to founder as the project management team, with no nuclear expertise, put forward a scheme to cut the cost by simply burying the contaminated debris in a large trench. Simple burial of plutonium contaminated debris would not be tolerated in the UK (the origin of the plutonium) nor in the USA, but that disposal method was adopted by the department.

22. I found it so distressing to witness the path of the Maralinga project that I spoke out initially in a broadcast on ABC Radio, see *G Borschmann, Maralinga: The Fall-out Continues, ABC Radio National, Background Briefing, 16 April 2000.* I then

resigned as an adviser to the Maralinga Tjarutja, and severed all contact with the project.

23. But that was not the last time I commented about the outcome of the Maralinga project. On 25 March 2003, the then Minister, Mr Peter McGauran, tabled a report of the project in the House of Representatives, see *Rehabilitation of Former Nuclear Test Sites at Emu and Maralinga (Australia), Report by the Maralinga Rehabilitation Technical Advisory Committee*. In presenting the report to Parliament, Mr McGauran said *"The project achieved its goals and a world's best practice result."* I was not able to purchase a copy of the report from the government's bookshop (I was told it was under embargo, even though I had been reading it on the net), but within half an hour, I was given three copies by Senator Kim Carr.

24. Since MARTAC did not have day-to-day contact with the project, they relied on what the project management company told them and this lack of knowledge was apparent in their report. When I read the report, I found it was full of mistakes, misleading statements, or incomplete descriptions that I felt I had to respond. The result was the publication in 2007 by ABC Books of my response 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.*

25. Question 4.7 asks specifically about building confidence in the community should there be further nuclear facilities established in the state. I can think of no better way to give the public confidence than to set up a regulatory organisation staffed with suitably qualified persons, and to inform the general public of such expertise, and then ensure that persons employed on the project have appropriate experience.

26. Another way to give confidence to the general public or to specific communities is something I did on the Maralinga project. I was in a meeting with a group of Aboriginal elders and their legal adviser. I showed them a sample of vitrified waste which contained plutonium and uranium. They were hesitant to handle the sample. So, after explaining that I care about my safety, I proceeded to lick the sample and then they all wanted to hold and inspect it. Of course, I would not do that with other types of radioactive waste.

27. 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 nuclear regulatory experience before any nuclear projects are commenced.

28. While that is really the totality of my submission to the Royal Commission, may I

make another plea and that is to avoid the term *"world's best practice"*. This is a term loved by politicians, but it has no meaning. If I may refer again to the Maralinga project to make my point. The ARPANSA Act apparently requires the organisation to ensure that any project to which they give approval has to be to "world's best practice". On completion of the project, Dr Loy stated *"Claims that the clean-up of Maralinga is not to world best practice are not well founded ..."* see *John Loy, Media Release, Maralinga cleaned up to acceptable standards, 17 April 2000.* This claim was echoed by Mr McGauran as I repeated above (see paragraph 23) - in fact, on one occasion Mr McGauran said the project exceeded "world's best practice". The Maralinga project was only ever a partial clean-up and only one per cent of the land contaminated with plutonium **above** the clean-up criteria has been cleared, so if that is "world's best practice" then a total clean-up in which the whole is scraped would be far from "world's best practice". In addition, in their bid to cut the cost of the project, the move from vitrification of the plutonium-contaminated debris, which all of MARTAC considered a far superior method of disposal, to one of simple shallow burial is also claimed to be "world's best practice". The debris is just two to three metres below ground and since that depth is claimed to be "world's best practice", then deeper burial, which the rest of the world might adopt, cannot, by definition, be an improvement. In the UK, plutonium contaminated debris is placed in steel drums and is stored above ground in an air-conditioned building on a guarded site awaiting final geological disposal. Further, various international standards state that nuclear waste should not be disposed of in a corrosive environment, but at Maralinga thousands of tonnes of debris contaminated with plutonium have been buried in limestone and dolomite, with many cracks and fissures, and this is claimed to be "world's best practice". One wonders why the Commonwealth government has taken over twenty years to find a site for the burial of low-level radioactive waste when such a "world's best practice" solution is readily available.

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.)

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 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.