

AUSTRALIA'S NATIONAL RADIOACTIVE WASTE MANAGEMENT STRATEGY

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ABSTRACT

The Australian Government is committed to establishing two purpose-built facilities for the management of Australia's radioactive waste; the national repository for disposal of low level and short-lived intermediate level ("low level") waste, and the national store for storage of long-lived intermediate level ("intermediate level") waste.

It is strongly in the interests of public security and safety to secure radioactive waste by disposal or storage in facilities specially designed for this purpose. The current arrangements where waste is stored in an ad hoc manner at hundreds of sites around Australia does not represent international best practice in radioactive waste management.

Environmental approval has been obtained for the national repository to be located at Site 40a, 20 km east of Woomera in South Australia, and licenses are currently being sought from the independent regulator, the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) to site, construct and operate the facility. The national repository may be operating in 2004 subject to obtaining the required licenses.

The national store will be located on Australian Government land and house intermediate level waste produced by Australian Government departments and agencies. The national store will not be located in South Australia. Short-listing of potentially suitable sites is expected to be completed soon.

INTRODUCTION

The Australian Government is committed to establishing two purpose-built, national facilities for the safe management of Australia's radioactive waste; the national repository for disposal of low level and short-lived intermediate level ("low level") waste which will be located near Woomera in South Australia, and the national store for storage of long-lived intermediate level ("intermediate level") waste for which a site is yet to be selected.

It is strongly in the interests of public security and safety both in Australia and internationally to secure radioactive materials by disposal or storage in facilities specially designed for this purpose. In the absence of purpose-built facilities, Australia's radioactive waste, generated from the beneficial use of radioactive materials in medicine, industry and research, will continue to be stored under ad hoc arrangements at hundreds of sites around Australia which do not represent international best practice in radioactive waste management.

Although the amount of waste which is held in numerous locations in states and territories is small, storage of waste in facilities that were not designed for the long-term management of this material poses greater potential health risks for people and the environment than waste stored in purpose-built facilities.

Governments have a responsibility to safely manage radioactive waste and that is why the Australian Government is committed to establishing national, purpose-built facilities for the safe long-term management of this material. Two facilities are in the process of being established:

- the national repository for the near-surface disposal of low level radioactive waste, which will be located at Site 40a, 20 km east of Woomera and 400 km north of Adelaide in South Australia; and
- the national store for above-ground storage of intermediate level waste generated by Australian Government departments and agencies, which will be located on Australian Government land on a yet to be selected site.

This paper briefly summarizes the background and status of the two projects.

NATIONAL RADIOACTIVE WASTE REPOSITORY

Background

A national repository represents the safest and most cost effective option for Australia to manage its low level waste, particularly as the ongoing generation of this material is expected to be relatively small and therefore technically and economically does not justify the establishment of separate facilities on a state-by-state basis.

In the 1980s, the Australian Government, states and territories agreed in principle to the establishment of a national repository for Australia's low level radioactive waste. In 1992, the Australian Government with the agreement of all jurisdictions, commenced an Australia-wide search for a suitable site for the national repository.

Australia currently has about 3,700 cubic meters of waste which would be suitable for disposal in the national repository. The material is routinely generated at a rate of about 40 cubic meters per year, and consists of items such as lightly contaminated soils, plastics, paper, laboratory equipment and clothing, smoke detectors, gauges and exit signs.

The Australian Nuclear Science and Technology Organization's (ANSTO's) preferred decommissioning options for HIFAR, the research reactor currently operating at Lucas Heights, would either involve the generation of 500 cubic meters of low level and short-lived intermediate level radioactive waste in 2035, or the generation of 2000 cubic meters of low level and short-lived intermediate level waste in 2125. The Government has yet to decide on the decommissioning option which will be used.

The first phase of the national repository project commenced in 1992, and involved the development of the methodology for siting a national repository and applying internationally accepted site selection criteria adapted for Australia on a nationwide basis. Thirteen relevant

selection criteria were published in the National Health and Medical Research Council (NHMRC) 1992 *Code of Practice for the near-surface disposal of radioactive waste in Australia* [1], based on siting the repository in an arid or semi-arid environment.

In 1994, eight broad regions of Australia likely to contain suitable sites were identified. In 1998, the central-north region of South Australia was identified for further siting work as it had the largest area of potential suitability against the selection criteria.

Review and Assessment Processes

Following an extensive process of scientific assessment and community consultation, in 2001 three sites located on pastoral lease on raised, stony desert plateaus near Woomera in South Australia were selected for environmental assessment under the Australian Government's *Environment Protection and Biodiversity Conservation Act 1999*.

The natural environment including the geology, ground water, fauna and flora, land use and cultural heritage around the sites was examined in the Environmental Impact Statement (EIS; [2]). The design, operation, monitoring and safety of the national repository and the transport of waste to the facility were also described. Public submissions were invited on the proposal and issues raised during public consultation were responded to in the supplementary report to the EIS.

In May 2003 the Australian Government Minister for the Environment and Heritage, the Hon Dr David Kemp, found that there were no environmental, economic and social issues to prevent the national repository from being sited in central-north South Australia. He approved two sites near Woomera, Sites 40a and 45a, for the facility.

On 9 May 2003 the Australian Government Minister for Science, the Hon Peter McGauran, announced that Site 40a, located about 20 km east of Woomera in South Australia, would be the site for the national repository. This site has a number of advantages over the other site (Site 45a) including:

- better security
- a less environmentally sensitive access route
- more saline water which has no pastoral use.

In addition, proposed space activities at Woomera may affect Site 45a but will not affect Site 40a.

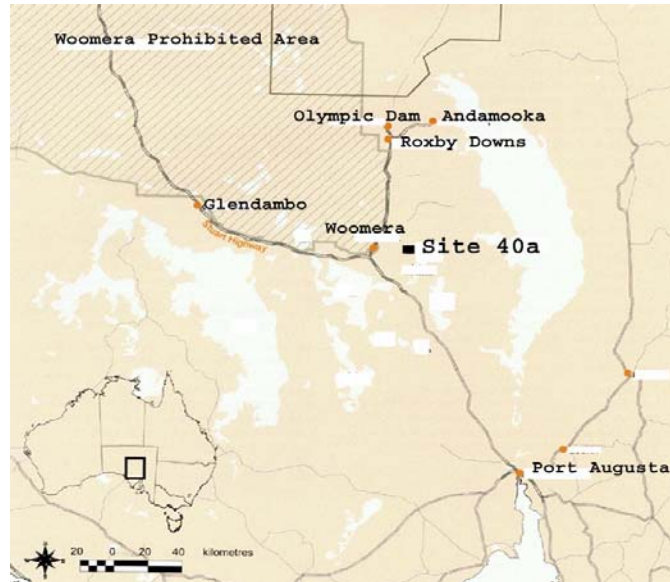


Fig. 1 Location of Site 40a, the site selected for the national repository for disposal of low level waste, near Woomera in central-north South Australia, Australia.

Conditions imposed in the environmental approval are to ensure ongoing monitoring of the site is undertaken and any impacts are identified and minimized. An Environmental Management and Monitoring Plan must be prepared and approved by the Minister for the Environment and Heritage prior to works commencing at the site.

The Australian Government has compulsorily acquired all interests in relation to the site, together with the necessary interests in relation to the access corridor into the site using the Australian Government's *Lands Acquisition Act 1989*.

In August 2003, applications to site, construct and operate the national repository were applied for from the independent regulator, the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA). The license application describes the details of the site location, the basis of the application, and provides the management system and manuals, including the safety, environment management and monitoring and operations manuals. The application also includes a review of world's best practice for disposal of low level waste, the waste acceptance plan, activity limits for the post-closure of the national repository, a radiological risk assessment for the facility, the safety analysis report, a security management plan, emergency response plan, disposal structure design concepts, and waste transfer documentation etc. The application can be downloaded from the ARPANSA website at <http://www.arpansa.gov.au/reposit/nrwr.htm>. The national repository may be operating in 2004 subject to obtaining the required licenses.

The Facility

The total area of the national repository site is 1.5 x 1.5 kilometers, most of which will be an extensive buffer zone.

The national repository will be a shallow burial facility and waste will be isolated from water by a multi-barrier approach including:

- The conditioned waste packages
- The solid waste form
- The trench/borehole design.
- The host rocks, arid environment, and groundwater and surface water characteristics of the site.

Conditioned, solid waste in steel drums will be disposed of in trenches or boreholes. Disposal structures will be located in the central part of the site, and will have a maximum depth of 15-20 meters. The trenches will have a multi-layered cap, including low permeability clay, a high density polyethylene geomembrane, and soil, mounded to facilitate water run off and designed to minimize water infiltration. Trenches will also be lined with crushed rock to serve as a drainage blanket and direct any liquid that collects at the base of the trench to a sampling point. A layer of sand at the base of the trench will provide a smooth basal layer for the placement of drums.

Located within the site will be support facilities, such as an operations building for the receipt of the waste; a health physics building for monitoring workers and for radiological surveillance of groundwater and other environmental monitoring; a decontamination and washdown area for plant and equipment; and an administration building. A communications building to support camera surveillance will be a permanent structure, but otherwise buildings will be established for each disposal campaign and removed between campaigns, leaving only sufficient infrastructure, including two security fences, to secure the site until the next disposal operation.

Disposal operations will occur every 2-5 years, and surveillance and monitoring will be undertaken between disposal operations.

An access road will connect the site with the national road system.

The national repository will be owned by the Australian Government, with the Department of Education, Science and Training (DEST) or its successors being the department with overall responsibility for the safe and effective operation of the facility. DEST will appoint a contractor to operate the national repository on its behalf. The facility will be regulated by ARPANSA.

The preparation of waste for disposal will not be undertaken at the facility. The waste owner will be responsible for conditioning the waste and placing it in an appropriate container for burial in accordance with the waste acceptance criteria, in readiness for waste collection by an Australian Government contractor for transport to the national repository and disposal. Waste owners will need to demonstrate that the waste meets the waste acceptance criteria before the material is transported.

Transport of waste to the national repository will be safe. The transport of radioactive materials, including radioactive waste, is governed by strict regulations and codes of practice (e.g. the Australian Radiation Protection and Nuclear Safety Agency's *2001 Code of Practice for the safe transport of radioactive materials*) which are designed to ensure that radioactive materials would

be contained in the unlikely event of an accident. Only solid waste will be transported. The waste will be securely packaged with concrete as required (e.g. items such as gauges may warrant this type of packaging), in steel drums and in steel shipping containers.

The transport of radioactive materials is not unprecedented, and the number of packages and vehicles transporting waste to the national repository is small compared to the number of packages of radioactive materials routinely transported in Australia and around the world.

Over 30,000 packages of medical isotopes are transported annually (about 2,500 per month) in Australia from ANSTO alone. Over the past 40 years there have been no accidents where there has been any significant radiological release harmful to the environment or public health.

Transport of radioactive waste to the national repository will be infrequent as disposal campaigns will only occur every 2-5 years. Over half the existing inventory of 3,700 cubic meters of waste which will be disposed of in the first campaign is already at Woomera (2,010 cubic meters of soil was transported from Sydney in 1994-95 in about 120 truck movements), and only about 171 trucks will be required to transport radioactive waste from elsewhere around Australia. Subsequent campaigns will routinely involve a much smaller amount of material than the initial campaign. The annually generated volume of 40 cubic meters could be fitted into 4-5 trucks.

The risk of an accident occurring during transport of radioactive waste to the national repository was outlined in the EIS. The document stated that there was the probability of an accident occurring during an average truck trip to the national repository of 0.14%, the number of accidents divided by the number of shipments, a very low likelihood. The consequences of an accident involving radioactive waste traveling to the national repository, given its solid form and rigorous packaging, would be far less than the consequences of a comparable accident involving liquid toxic or flammable hazardous materials.

There are well established procedures in all states and territories to manage an emergency involving radioactive materials. The Australian Government can provide assistance on request from jurisdictions via Emergency Management Australia. ARPANSA and ANSTO can also assist.

The repository will operate for 50 years, after which there will be a review to determine whether the facility should continue to operate. Following closure of the repository, the radioactivity of the waste will decay to safe levels during a period of restricted access and monitoring which would be about 200 years. At the end of this period no further control of the site will be necessary.

NATIONAL STORE FOR INTERMEDIATE LEVEL WASTE

Australia has a small amount of intermediate level radioactive waste (about 500 cubic meters) which is not suitable for near surface disposal in the national repository. This waste consists of material arising from past activities such as higher activity disused radioactive sources, some radiation gauges used in research, radiotherapy sources, radium needles and mineral sands concentrates. From about 2015 waste will be returned to Australia from the overseas reprocessing of spent fuel rods from the research reactors at Lucas Heights.

Intermediate level waste is not suitable for near-surface burial and there is broad international consensus that this sort of material should be stored in purpose-built facilities and then disposed of in geological repositories at depths of several hundred meters.

The Australian Government made an in-principle decision to have a national store for intermediate level waste in 1996, following a Senate inquiry into radioactive waste management.

In 1997, the need for a national store was supported by the Commonwealth/State Consultative Committee on the Management of Radioactive Waste, a body with representatives responsible for the regulation of radioactive materials in all states and territories and the Australian Government.

The national store project for the storage of Australia's intermediate level radioactive waste was announced in 2000, and cooperation of states and territories was sought, given the benefits which all Australians receive from radioisotopes used in medicine, industry and research. Some jurisdictions indicated that they would not support the national search for a site for the facility, and, in 2001, the Government announced that a national store for Australian Government intermediate level waste (about 400 cubic meters of existing waste) would be established on Australian Government land.

The annual amount of intermediate level waste produced by Australian Government agencies on a routine basis is a few cubic meters per year. In the longer term, intermediate level waste arising from future spent fuel management is about 26 cubic meters of waste arising from the reprocessing of spent fuel from HIFAR, and about 20 cubic meters of waste arising from the reprocessing of spent fuel from the Replacement Research Reactor.

The Australian Government has given an undertaking that the waste arising from the overseas reprocessing of HIFAR spent fuel will not be returned to Lucas Heights.

In July 2001, a public discussion paper was released on the proposed method for finding a site for the national store [3]. A paper responding to public comment on the public discussion paper and outlining the final site selection methodology was released on 2 May 2002 [4].

The selection criteria for the national repository and national store are somewhat different. While ground water and geology were extremely important in the siting of a below ground disposal facility for low level radioactive waste, they are not as important to the siting of an above ground store for intermediate level waste. Selection criteria for the national store for intermediate level waste include the operational requirements for transport, safe handling, storage and retrieval of waste packages; the security of the facility; social impacts; Australian Government land ownership and compatibility with adjacent land use, among others. Therefore, it cannot be assumed that sites or regions suitable for the national repository will necessarily be suitable for the national store.

On 9 May 2003, the Australian Government Minister for Science, the Hon Peter McGauran, announced the national store would not be located in South Australia. His decision was based on

advice from an expert committee that no sites in South Australia had been identified as being highly suitable for the facility. He further indicated that no other state or territory was being ruled in or out at this stage.

Short-listing of potentially suitable sites is expected to be completed soon. More detailed consideration of short-listed sites is expected to be undertaken during 2004.

The national store will be designed to operate for a period of 50-100 years until a suitable geological repository for the disposal of the waste is established. The selection criteria for a geological repository would be different from those used to site the national store, and finding a site for such a disposal facility would be the product of a site selection study separate to that undertaken for the national store.

NO INTERNATIONAL RADIOACTIVE WASTE FOR AUSTRALIA

Unlike low level and intermediate level waste, Australia does not generate high level radioactive waste, and has no responsibility to store or dispose of this waste in Australia.

The Australian Government has indicated that it has no intention of accepting the nuclear wastes of other countries for storage or disposal in Australia.

CONCLUSION

After an 11-year nationwide site selection study, Site 40a located 20km east of Woomera in South Australia has been selected for the national repository for disposal of low level waste. Environmental approval has been obtained for constructing the facility at the site, and licenses have been applied for from ARPANSA to site, construct and operate the facility. The national repository may be operating in 2004 subject to obtaining the required licenses.

A separate project is being undertaken to identify a site for a national store for Australian Government intermediate level waste not suitable for near-surface disposal. A nationwide search of Australian Government land is being undertaken to identify a site for the national store. The store will not be sited in South Australia. Short-listing of potentially suitable sites is expected to be completed soon. The national store will be designed to operate for a period of 50-100 years until a suitable geological repository for the disposal of the waste is established.

REFERENCES

- 1 National Health and Medical Research Council (NHMRC), Code of Practice for the near-surface disposal of radioactive waste in Australia, Radiation Health Series No. 35, Australian Government Publishing Service, Canberra (1992).
- 2 PPK Environment and Infrastructure, National Radioactive Waste Repository EIS (2003).

- 3 Industry, Science and Resources, Safe Storage of Radioactive Waste. The National Store Project: Methods for Choosing the Right Site. A Public Discussion Paper, Industry, Science and Resources (2001).
- 4 Department of Education, Science and Training, Safe Storage of Radioactive Waste. The National Store Project: A Report Responding to Public Comment, Department of Education, Science and Training (2002).