Submission
No 474

EPA SUBMISSION TO THE JOINT PARLIAMENTARY COMMITTEE OF INQUIRY INTO THE TRANSPORT AND POSSIBLE STORAGE OF NUCLEAR WASTES IN NSW

SUMMARY AND RECOMMENDATIONS

The focus of this submission, consistent with the Terms of Reference of the Joint Parliamentary Committee of Inquiry, is on the radioactive and nuclear materials originating principally from the Commonwealth's reactor at Lucas Heights, and its associated activities. The latter includes radiopharmaceutical production and the production of radioactive sources destined for industrial applications such as radiation gauges and industrial radiography devices.

Risks associated with the properly managed transport and storage of nuclear wastes of the types to be found in NSW are considered to be minimal and, overall, they will be reduced by the establishment of proper national storage facilities for both low-level and intermediate-level wastes. Any hazards associated with the transport of these wastes will also be kept to a minimum by ensuring adherence with best international practice, as required by the Australian Radiation Protection and Nuclear Safety Agency's (ARPANSA) *Code of Practice for the Safe Transport of Radioactive Material*. However, the community is concerned about the Commonwealth's new proposals and the Commonwealth should take tangible steps to address these.

The Commonwealth already has a system of protocols in place with the NSW Government with regard to the transport of spent fuel elements for shipment overseas for reprocessing. However, a formal agreement is required for the transport of radioactive waste across NSW from Commonwealth sites such as Lucas Heights to any national disposal facility. The agreement would need to provide the details of roles and responsibilities of all those who would be involved in facilitating safe transport, dealing with the public and responding should an accident or loss occur. Responsibility for the costs of providing these services would be a key part of the agreement.

RECOMMENDATIONS

- The Commonwealth should request that an assessment by the International Atomic Energy Agency's (IAEA) Transport Safety Appraisal Service (TranSAS) be undertaken to verify compliance with safety requirements in the transport of wastes and ensure a high level of safety and security in its transport of radioactive wastes. Such independent and highly reputable assessments have been carried out in 2002 at the request of Brazil and the United Kingdom. Turkey and Panama have had assessments by TranSAS in 2003, and France has requested one to take place in 2004.

- The Commonwealth Government should negotiate formal agreements with the States and Territories covering the transport nuclear waste. The agreements should cover roles and responsibilities and provision of resources needed for the tracking of waste movements, prevention of accidents, dealing with the public, and any emergency responses and clean up in the event of possible accidents or incidents.

BACKGROUND

Radiation may be either electromagnetic waves (x-rays and gamma rays) or fast moving sub-atomic particles (alpha-, beta particles and neutrons). Particulate radiation causes tracks of damage in any tissues that it passes through, as a result of the particle's electrical charges and/or its energy of motion (momentum). X-rays and gamma radiation can produce similar types of damage in living organisms but they can penetrate much more deeply into tissues than particulate radiation.

Ionising radiation apparatus produces electromagnetic radiation (usually x-rays), when activated electrically. When the electric current is turned off the apparatus no longer produces radiation. In x-ray apparatus, the x-rays are produced by the sudden deceleration of electrons (or cathode rays) in an evacuated glass tube. Radiation apparatus includes diagnostic imaging x-ray equipment (including computed tomography or CT), linear accelerators, and cyclotrons. In the latter two apparatus, sub-atomic particles are accelerated to high speeds by varying electrical and magnetic fields.

Some radioactive substances occur naturally in the environment, with significant levels occurring in mineral sands. These are mostly derived from natural uranium and its radioactive decay products (thorium, radon, polonium, actinium and radium) in rocks and soil, or radioactive potassium in food. There is also a significant amount of radiation received from space as cosmic radiation.

This inquiry is understood to relate to radiation derived from artificial materials (ie, radioactive substances) and not from natural sources or radiation apparatus.

The major industrial applications of radiation include gamma irradiation sources used for the sterilisation of medical and laboratory equipment, food and blood, and industrial radiography of welds to detect faults in repairs. Radiation gauges (which usually contain encapsulated radioactive substances) are used in a broad range of industrial applications including:

- quality and quantity control processes for materials and slurries;
- oil and water detection and element analysis in borehole logging; and
- road repairs and resurfacing.

Radioactive substances decay over time and are then no longer suitable for use. These materials and others affected by radiation become wastes. Radioactive wastes are classified into three categories based on the International Atomic Energy Agency's (IAEA) *Safety Guide on the Classification of Radioactive Waste*[1]. These are:

- Low-level and short-lived intermediate-level;
- Long-lived intermediate-level; and
- High-level.

Low-level and short-lived intermediate-level wastes are suitable for shallow, below ground burial and pose a minimal threat to human and environmental health and safety. Site 40a in South Australia, recently designated by the Commonwealth as the National Low-Level Radioactive Waste Repository, is to take this type of waste. It consists mostly of:

- contaminated laboratory protective clothing, paper and glassware from Commonwealth facilities;
- industrial smoke detectors;

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[1] Classification of Radioactive Waste – A Safety Guide. IAEA Safety Series No. 111-G-1.1. International Atomic Energy Agency, Vienna, 1994.

- contaminated soil; and
- old instrument dials painted with radium paint.

Long-lived intermediate-level radioactive waste is not suitable for near surface burial and must be stored in an above ground purpose built facility. It is these wastes that pose a more serious threat to both human and environmental health and safety. An additional hazard posed by intermediate-level long-lived radioactive wastes is their potential for abuse in a radiological dispersal device (RDD, or 'dirty bomb'). Although the human health and environmental effects of such a device would not be immediately serious, the potential social and economic disruption caused would be significant.

Long-lived intermediate-level radioactive wastes consist mostly of:

- spent nuclear fuel rods from the Lucas Heights reactor;
- material from the Australian Nuclear Science and Technology Organisation (ANSTO) radiopharmaceutical production;
- medical radioactive sources from cancer therapy devices;
- radioactive sources removed from industrial radiation gauges; and
- radioactive sources derived from medical, industrial and research equipment.

The decision to identify a suitable national site for permanent disposal and storage of Australia's radioactive wastes was made by the Commonwealth on 1 June 1992. A discussion paper released in July 1994 identified eight regions across Australia likely to provide suitable sites. A further discussion paper released in 1997 identified Billa Kalina in South Australia and the Olary Region near Broken Hill in New South Wales as fulfilling all the requisite criteria. Billa Kalina has been chosen to accommodate the National Low-level Radioactive Waste Repository (The Repository) at Site 40a in South Australia, which is planned to be ready to receive waste within twelve months.

In a media release dated 8 February 2001[2], the then Minister for Industry, Science and Resources announced that the Commonwealth intended to build an intermediate-level waste store to house the waste produced by the Lucas Heights reactor and other Commonwealth agencies such as the Department of Defence.

In July 2001, the Commonwealth announced that an independent search would be conducted for the site of the National Intermediate-level Radioactive Waste Store (the Store), which would not be co-located with the repository. A media release issued by the Minister for Science on 3 May 2002 announced that the decision as to the location of the Store would not be made until 2003.

WASTE GENERATED IN COMMONWEALTH FACILITIES

The Commonwealth facility at Lucas Heights includes a nuclear reactor, radioisotope production facilities, and large quantities of Commonwealth nuclear waste in temporary storage. The NSW Government has consistently stated that it is opposed to the location of any radioactive waste disposal facility on land within NSW.

The Commonwealth Government's Phase 3 discussion paper for the national radioactive waste facilities site selection process released in June 1999 estimated a national total of 3,240 cubic metres of low-level wastes. It estimated a total of approximately 500 cubic metres of long-lived intermediate-level radioactive waste in Australia, approximately 205 cubic metres of which originated at Lucas Heights.

[2] Media Release, Senator Nick Minchin, Minister for Industry, Science and Resources *'Intermediate Radioactive Waste Store to be Built on Commonwealth Land'* 8 February 2001. Release No. 01/049.

The remainder of this waste is principally made up of encapsulated radioactive sources (from radiation gauges), and the waste from radiopharmaceuticals.

The Commonwealth facility at Lucas Heights contains the HIFAR (High Flux Australian Reactor), which was constructed and commissioned from 1955 – 1958, and a radiopharmaceuticals production facility, amongst other works. A new research reactor is currently under construction to replace HIFAR when it is decommissioned in 2005.

One of the major issues raised in the Environmental Impact Statement in 1998 for the application by ANSTO to the Commonwealth for the site licence for the new reactor is the lack of facilities for storage of radioactive waste material. This problem has been accumulating over the nearly fifty years of operation of the Lucas Heights facility and is especially marked in relation to spent fuel elements.

The September 1999 *Report by the Senate Economics References Committee on a New Reactor at Lucas Heights* and the May 2001 *Report of the Senate Select Committee for an Inquiry into the Contract for a New Reactor at Lucas Heights* recommended that the proposed new reactor not be built until the issue of off-site storage of radioactive waste is resolved. The NSW Government has consistently supported this position.

This requirement for the resolution of the issue of management of intermediate level radioactive waste was also proposed by K R McKinnon et al[3]. The Commonwealth has so far failed to take account of these recommendations.

It was noted in the Preliminary Safety Analysis Report accompanying the application by ANSTO for a licence to construct the new reactor that the new reactor has the capacity to store spent fuel in the service pool over a period of 10 years after the reactor is commissioned. However, there is already considerable high-level and intermediate-level nuclear waste stored at Lucas Heights and addition of further spent fuel storage contributes to an increase in the possible consequences of an incident or accident.

In the Australian National Report to the IAEA, under the terms of the *Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management* of July 2003, the estimate of the inventory was that it had been reduced to 904 spent fuel elements from HIFAR, with a total weight of 192 kilograms of uranium. 114 elements had by this time been shipped to Dounreay in Scotland (total mass of 16 kilograms of uranium) and 668 (total mass of 104 kilograms of uranium) had been shipped to the reprocessing organisation, COGEMA, in France. These elements are to be reprocessed for return to Australia in the future as intermediate-level wastes for permanent disposal in the national store.

In addition to HIFAR and the new research reactor (referred to as the Replacement Research Reactor), ANSTO also has the remains of the Moata reactor from 1961. This experimental reactor was shut down in 1995 and the fuel elements removed. The Moata reactor remains to be decommissioned by ANSTO and the decommissioned material removed from Lucas Heights to permanent disposal at the Commonwealth's proposed intermediate-level waste store. There are currently 177 spent fuel plates removed from Moata (with a total mass of 4 kilograms of uranium) at Lucas Heights awaiting overseas shipment and reprocessing into intermediate-level waste.

[3] K. R. McKinnon, et al. *Future Reaction: Report of the Research Reactor Review,* August 1993.

This 2003 Report to the IAEA also lists the total amounts of radioactive wastes *'...in storage at ANSTO's radioactive waste management facility...'* (Lucas Heights). These are listed as:

Type of Waste	Volume	Generation rate
Low-level solid	1185 cubic metres	30 cubic metres per year
Intermediate-level solid	216 cubic metres	2 cubic metres per year
Thorium and Uranium residues (Intermediate-level waste)	165 cubic metres	None
Intermediate-level liquid waste (to be solidified)	6 cubic metres	0.5 cubic metres per year

Spent fuel elements from the new replacement research reactor under construction at Lucas Heights will be retained in storage under water in the service pool adjacent to the reactor for 10 years after the reactor has been commissioned, before overseas shipment and reprocessing. It has been estimated (1999 report of the Parliamentary Standing Committee on Public Works) that the replacement reactor will generate approximately 40 spent fuel rods every year, giving a total of 360 elements over nine years for shipment and reprocessing. This is estimated to produce around 0.1 cubic metre of reprocessed intermediate-level waste, as borosilicate glass or synroc, every year for permanent storage.

Of the remaining wastes held at Lucas Heights, a total of approximately 150 drums of 200 litre capacity are produced annually of low-level solid waste, comprised of mostly compactable material (approximately 100 drums per year), non-compactable contaminated items (approximately 30 drums per annum), and approximately 20 drums per year of sludge from solar-drying waste water ponds.

WHAT ARE THE RISKS?

The transportation of radioactive and nuclear wastes can be a very safe process, provided that international standards (in the form of compliance with the national Code of Practice for the Safe Transport of Radioactive Material) are strictly adhered to. For example, it is understood that there are approximately 0.5 million transports of radioactive material in Germany in each year while there are very few accidents or incidents[4].

The lifetime of nuclear material covers distinct phases from manufacture to permanent disposal. Based on a recent analysis conducted from a security point of view[5], the following stages of the life cycle of radioactive material and the risks associated with each stage are outlined as follows:

1. Manufacture at a government site where standard security measures are in place. For the research reactor fuel rods at Lucas Heights, these are manufactured overseas (the United States or the United Kingdom). Because of the standard security measures in place for their manufacture, the risks involved in this stage are minimal.

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[4] G. Schwartz, H.-J Fett, & F. Lange; *Occupational and Public Exposures Arising From the Normal Transport of Radioactive Material: Experience in Germany.* IAEA – CN – 101/21.

[5] *Reducing the Threat of RDDs;* by Charles D Ferguson International Atomic Energy Agency Bulletin, volume 45 number 1, pp 12 – 15, June 2003.

2. Processing into useful radioactive sources. This also usually takes place at the site of manufacture and is also therefore relatively secure. In addition to the processing of the fuel rods overseas, the radiopharmaceuticals and other facilities at Lucas Heights routinely manufacture radioactive sources for medical and industrial purposes.

3. Transportation from the reactor site to the user or to companies that manufacture equipment incorporating the sources. In Australia there are few companies carrying out this work but a significant amount takes place at Lucas Heights, for example, the replacement of radioactive sources in radiation gauges. This stage and the transport are considered to be safe.

4. The next stage in the life cycle is its use in an application such as food irradiation or medical equipment sterilisation, or industrial radiography. Because many of these sources are of high specific activity, the safety and security arrangements at the companies and during transport to where they are used are usually of a high standard. However, the safety and security of these sources depends on the type of application and facility. For example, a hospital is more accessible to members of the general public and is therefore more difficult to secure than is a private facility.

5. At the end of the useful life of a radioactive source, when they become disused and are kept in temporary storage at the site of use, they become most vulnerable from a safety and security point of view. It is at this stage of the life cycle of radioactive sources and nuclear material that oversight is often at its weakest. This loss of oversight contributes significantly to the risks of accidents and incidents. The longer such disused sources remain in temporary storage, the more risks that they pose to human and environmental health and safety, and to security.

   The IAEA has advised that these sources have become a widespread problem in the states of the former Soviet Union. In the United States, the Nuclear Regulatory Commission has reported that companies have lost track of nearly 1,500 sources since 1996 and more than half of these were never recovered. Serious accidents involving such sources have occurred in the following countries:

   - Brazil in 1987 (where a significant area of a town was contaminated with caesium-137 from a cancer radiotherapy unit and four people (including children) died);
   - China in 1992 where a lost cobalt-60 source caused the death of three members of a family;
   - Istanbul in 1998 (where 10 people suffered acute radiation syndrome); and
   - Georgia in the former Soviet Union in 1997 (where eleven servicemen had to be transported to France and Germany for treatment and one died).

   It is emphasized that these accidents arose due to inadequate systems of control in use, transport or storage.

6. Government operated dedicated permanent disposal or storage facilities, such as the national facilities being developed by the Commonwealth, where sources can be placed at the end of their useful life, can provide a high degree of safety and security.

Any radioactive sources or nuclear material that do not follow this pattern throughout their lifetimes, ending in permanent disposal at secured government sites, can pose a serious risk to human health or the environment.

ISSUES TO BE ADDRESSED

The seriousness of the risks and the ability to reduce the risk to very low levels underlines the need for strong regulatory framework and effective enforcement and compliance measures.

1. The safety framework

NSW has a strong regulatory and policy framework in place to protect the environment and human health from the impacts of radiation. Radioactive substances and radiation apparatus are regulated in NSW through the application of the *Radiation Control Act 1990* (the Act) and the *Radiation Control Regulation 1993* (the Regulation). The object of the Act is to *'secure the protection of persons and the environment from exposure to harmful ionising and non-ionising radiation to the maximum extent that is reasonably practicable taking into account social and economic factors and recognising the need for the use of radiation for beneficial purposes'.*

In addition to the Act and Regulation, the following legislation and legislative instruments apply to various aspects of radiation and radioactive substances:

- *Road and Rail Transport (Dangerous Goods) Act 1997*, administered by the EPA (radioactive substances are classified as dangerous goods of Class 7).
- *Dangerous Goods Act 1975,* administered by WorkCover NSW.
- *Protection of the Environment Operations Act 1997,* administered by the EPA, regulates the discharge of pollutants into the environment, including radioactive wastes.
- The national (ARPANSA) *Code of Practice for the Safe Transport of Radioactive Material* is referenced in the Radiation Control Regulation and is derived from IAEA recommendations.
- *Uranium Mining and Nuclear Facilities (Prohibitions) Act 1986*, administered by the Department of Mineral Resources, prohibits the prospecting for, or mining of, uranium and its ores, and the construction of any nuclear facility in NSW.

The *Code of Practice for the Safe Transport of Radioactive Material* takes precedence over the dangerous goods legislative provisions in NSW. Radioactive waste is currently excluded from the National Environment Protection Measure for the tracking of movements of controlled wastes between the States and Territories.

The requirements of the *Code of Practice for the Safe Transport of Radioactive Material* are based on the levels of radioactivity emitted by the packaged material at the surface of the package and at one metre distance from the surface of the package. It applies the *'Transport Index'*, which is the radiation dose rate at a distance of one metre from the surface of the package divided by ten. Given that Australia has a good safety framework, the key point is to be sure that it is being put into practice.

The IAEA General Conference in 1998 adopted a resolution which recognised that *'compliance with regulations which take account of the Agency's transport regulations is providing a high level of safety during transport of radioactive materials'.* The Conference also requested that the Secretariat provide an appraisal service, at the request of any member state, of their compliance / implementation of the transport regulations by that state.

This service is known as the Transport Safety Appraisal Service (TranSAS) and it is recognised as an important tool for assessing and assuring compliance at the State (ie, national) level. The TranSAS mission can provide member states, upon request, with an appraisal of their activities in comparison to the IAEA transport regulations (which the Code of Practice used in Australia is based on) and related safety standards.

At the recent IAEA *International Conference on the Safety of Transport of Radioactive Material,* held in Vienna in June 2003[6], it was stated that *'The public and other involved parties are, quite rightly, concerned to know that the stringent applicable regulations – the IAEA's and others – are being effectively and consistently applied'.* The Conference found that *'robust compliance assurance and quality assurance programs are essential foundation stones in building trust and confidence in the safety and effective regulation of the transport of radioactive material'.*

It is recommended that the Commonwealth should complete an evaluation by TranSAS in the interests of allaying the fears of members of the public and NSW authorities with regard to the transport of radioactive and nuclear wastes. Such missions were carried out to Brazil and the United Kingdom in 2002, Panama and Turkey in 2003, and a mission to France is planned to take place in 2004.

2. The arrangements to assign roles and responsibilities

There is currently an established liaison system under the State Emergency and Disaster Plan (DISPLAN), which includes ANSTO and Lucas Heights. There is also a system whereby the Commonwealth provides advice to NSW on the intended transport of spent fuel elements from the reactor at Lucas Heights for shipment overseas for reprocessing. A similar system should be developed to cover the transport of radioactive wastes from Lucas Heights to the new disposal facility. This is most important in the transport of intermediate-level radioactive waste when the Commonwealth's intermediate-level radioactive waste storage facility is determined in the future. This will also be of particular importance if the Commonwealth determines to build this store on land within NSW.

However, NSW is concerned that the broad legal exemptions from State laws provided to Commonwealth agencies like ANSTO and ARPANSA will reduce the capacity to ensure compliance with NSW and national requirements, and provide information related to emergency response preparedness.

These exemption powers are interpreted to include activities that ANSTO engages in even outside of the boundaries of the Lucas Heights Science and Technology Centre, and place no limits on this exemption. In addition, ARPANSA notified the EPA in a letter of 21 September 2001 of its intention to classify ANSTO facilities as *'controlled facilities'* under the terms of section 83 of the *Australian Radiation Protection and Nuclear Safety Act 1998* (the ARPANS Act) and this raises the same issues of jurisdiction and responsibility as for the ANSTO Act.

Consistent with the enactment by the Commonwealth of the ANSTO exemption from State and Territory laws, and the oversight provided by ARPANSA, the NSW EPA does not undertake off-site monitoring associated with the Lucas Heights site. Should there be any off-site incident, or on-site incident with off-site consequences, the EPA would rely on ANSTO and/or ARPANSA for information on any radionuclides released into the environment.

To ensure appropriate prevention and response capabilities are in place, it is recommended that formal agreements should be negotiated between the States and the Commonwealth covering all aspects of the safe transport of any radioactive and nuclear material from Lucas Heights to any national disposal facility.

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[6] International Conference on the Safety of Transport of Radioactive Material, Vienna, 7 – 11 July 2003, unedited *Summary and Findings of the Conference President.*

Agreements should clarify the roles and responsibilities of the Commonwealth and State in prevention of accidents, emergency responses and clean up, dealing with the public, and the resources required for this.

The transport of nuclear waste is also likely to attract significant attention and concern from anti-nuclear, environment and community groups wherever it is sited with attendant resource issues for the NSW, and there will be costs in ensuring safety is maintained. This means that the Commonwealth's transport activities will cost more than might be expected if they were viewed as routine. For example, information provision for the community and extra security personnel will be required. An agreement should recognise that the full costs of managing transport issues should be met by the Commonwealth.