SUBMISSION TO THE JOINT SELECT COMMITTEE ON THE TRANSPORTATION AND STORAGE OF NUCLEAR WASTE

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Lucas Heights, Sydney

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Preface

The PARLIAMENT OF NEW SOUTH WALES

JOINT SELECT COMMITTEE ON THE TRANSPORTATION AND STORAGE OF NUCLEAR WASTE

The Committee has been appointed to consider and report upon proposals by the Commonwealth Government to transport nuclear waste through and potentially store nuclear waste within New South Wales, with specific reference to the following matters:

(a) logistical arrangements associated with the proposals, including sourcing, transport and storage of waste;

(b) health and safety risks associated with the transportation and storage of nuclear waste in New South Wales;

(c) extent of possible resource implications associated with the transportation and storage of nuclear waste within New South Wales; and

(d) any other relevant matter.

ANSTO's experience and expertise in nuclear matters, including long experience in the transportation of radioactive materials, pertains particularly to points (a) and (b) and as such this submission will focus on these matters.

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Executive Summary

1. ANSTO and other organisations and individuals transport radioactive materials in Australia every day. The most significant of these materials are radioisotopes for use in medicine or industry.

2. On average, ANSTO sends about 2,500 packages per month of radioisotopes for medical and industrial uses to destinations around Australia and overseas. A typical package would be a Gentech Molybdenum /Technetium Sterile Generator. These generators, used in a variety of medical diagnostic procedures, are transported to hospitals and medical clinics around NSW. The typical activity of such a generator is around 40 GBq.

3. ANSTO understands that, under regulation of the NSW Environment Protection Authority, around 2,200 further (ie, non-ANSTO) movements of radioactive material used for medical and industrial purposes take place each month in NSW. Many of these movements involve high activity industrial sources. An individual source of this type contains much more activity than an entire truckload of low level waste (LLW). For example, the nominal activity of an industrial radiography Iridium-192 source measuring 3mm x 3mm is 2700 GBq.

4. The transport of that material – whether undertaken under Commonwealth or state regulation - is in accordance with the Australian *Code of Practice for the Transportation of Radioactive Materials 2001* ("the Code of Practice"), which is based on strict, internationally accepted guidelines. The basic approach of those guidelines is that the package is the primary means of providing safety, both during incident-free transport and during accidents.

5. Transport incidents involving radioactive materials in Australia have been very rare events. There has been no transport incident in the movement of ANSTO's materials with significant radiological consequences. Elsewhere in the world, the safety record of the transport of radioactive material has also been excellent. Over several decades of transport of tens of millions of radioactive material packages each year around the world, there has never been an in-transit accident with serious human health, economic or environmental consequences attributable to the radioactive nature of the goods.

6. The waste to be transported from Lucas Heights to the National Radioactive Waste Repository will consist of inert solids within multiple levels of containment. This will include encasement in concrete as necessary, placement in steel drums, and packing securely inside 6 metre long steel shipping containers. There will be no liquid waste involved and therefore no possibility of leakage. The total activity of a truckload of approximately 80 drums of LLW would be less than 60 GBq. Even if an accident occurred, there would be no significant radiological consequences. Any major effect to third parties would arise primarily from the physical impact of vehicles, such as can occur in any road accident.

7. The road transport of hazardous materials such as petrol, other flammable liquids, flammable gases and toxic chemicals is a common event throughout New South Wales and Australia. When vehicles carrying such (non-radioactive) goods are involved in accidents, a wide area can be affected. Occasionally, lives are lost as a direct result of the hazardous nature of the load. Nevertheless, society accepts the risks concerned as a normal part of daily life. Experience demonstrates that the risks associated with the transport of radioactive waste are much lower than the risks associated with the transport of many other hazardous materials classified as dangerous goods.

ANSTO's activities involving the movement of radioactive materials

8. As Australia's national nuclear research and development organisation, ANSTO is the major source of Australia's nuclear expertise. It is a knowledge-based organisation that specialises in the delivery of specific scientific products and services to government, industry, academia and other research organisations.

9. ANSTO's responsibilities include the operation of Australia's national nuclear facilities. Two of these facilities, the HIFAR nuclear research reactor located at Lucas Heights and the National Medical Cyclotron (NMC) located in Camperdown, produce radioisotopes for use in medicine, industry and research. HIFAR has been operating since 1958. The Government agreed to its replacement in 1997, and the replacement research reactor, which is now being constructed, is expected to be commissioned in 2005-06. It will have a greater production capacity for radioisotopes.

Radioisotope Production

10. ANSTO's predecessor, the Australian Atomic Energy Commission, commenced production of radioisotopes for use in nuclear medicine in the 1960s. Since then, there has been a continuing growth in the use of nuclear medicine in Australia for diagnosis, therapy and palliation of pain. ANSTO is the main supplier of radioisotopes for use in nuclear medicine in Australia.

11. Radiopharmaceuticals division of ANSTO, trading as ANSTO Radiopharmaceuticals and Industrials (ARI), is Australia's sole manufacturer of radioisotope products. The radioactive products are supplied as radiopharmaceuticals[1], radiochemicals and sealed radiation sources for use in nuclear medicine as diagnostic and therapeutic aids, and for use in industry and research. ANSTO estimates that, in 2001-02, some 475,000 Australians were treated using nuclear medicine. ARI's annual turnover is greater than $20 million (2002-03), and is predicted to increase at a rate of between seven and ten per cent per annum for the next several years. Most of ARI's products must be produced under the *Australian Code of Good Manufacturing Practice for Medicinal Products* and standards from regulatory bodies such as the US Federal Drug Administration.

Transportation of ARI Products

12. On average, ANSTO Radiopharmaceuticals and Industrials sends about 2,500 packages per month of radioisotopes for medical and industrial uses to destinations around Australia and overseas[2]. The transport of those packages is in accordance with the Australian *Code of Practice for the Transportation of Radioactive Materials 2001*, which is based on strict, internationally accepted guidelines[3].

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[1] A radiopharmaceutical is a biologically active chemical compound that incorporates a carefully selected radioisotope and is suitable for medical usage. Each radiopharmaceutical is designed to target a selected organ, such as heart, lungs, brain or bones. Radiopharmaceuticals can be ingested by inhalation, or as solids or liquids through the mouth, or by injection. The radiation then provides information to assist diagnosis, or has therapeutic or palliative impacts.

[2] From 1 May 2002 to 30 April 2003, ARI dispatched 28,465 packages.

[3] International Atomic Energy Agency, Regulations for the Safe Transport of Radioactive Material (1996) TS-R-1, which serve as a basis for the UN Model Regulations on the Transport of Dangerous Goods.

13. Shipments are sent to all states and territories (capitals and country areas) in Australia. More than 99% of ARI shipments are dispatched from Lucas Heights, with the balance being shipped from the NMC. Delivery distances range from a few km (Liverpool) to thousands of kilometres. Cities and towns within NSW and outside Sydney to which ARI products are regularly shipped include Albury, Coffs Harbour, Dubbo, Griffith, Lismore, Maitland, Newcastle, Nowra, Orange, Port Macquarie, Tamworth, Taree, Wagga Wagga, Wollongong and Wyong.

14. All deliveries start and finish using road transport, as even those that travel by air need to be transported by road from Lucas Heights or Camperdown to Mascot, and from the destination airport to the hospital or medical clinic. Approximately 60 - 70% travel by air (freighter and passenger aircraft), including to a number of country NSW destinations. No sea or rail transport is used for these products. ARI endeavours to have all domestic deliveries in place by 9.00 a.m. each day. Therefore although many interstate shipments are carried by air, occasional shipments to Melbourne travel by road. The furthest regular overnight road deliveries are to Newcastle. Accidents or incidents involving ARI packages are very rare (1 - 2 incidents per 30,000 packages) and there have been no transport accidents that have resulted in any health impacts or contamination.

15. Under the terms of its licence, ANSTO has in place emergency arrangements for all its shipments of radioactive material, including any shipments of waste.

Other activities involving the movement of radioactive materials within NSW

16. Radioactive materials are used for a wide variety of beneficial purposes in Australia and around the world. Licenced radioactive sources within NSW are used in medicine, industry, agriculture, the environment and elsewhere[4]. Many of those sources – particularly those used in industrial radiography (e.g. checking the integrity of oil pipelines or aircraft engines) - are mobile, being moved around the state as required. An individual industrial radiography source is typically much more active than an entire truckload of low-level waste. The use and transport of such sources in NSW by persons other than Commonwealth agencies is regulated by the NSW Environment Protection Authority. In particular, their transport is governed by the Radiation Control Regulation (1993). The EPA has estimated that there are currently 540 mobile radiation gauges using radioactive sources presently in use in New South Wales[5].

17. As radioactivity is present in varying amounts in the earth's crust, there are many naturally occurring radioactive materials (NORM) that are found in mineral deposits, including mineral sands. In some cases, their level of radioactivity is such that their transport is subject to national and international standards relating to the transport of radioactive material.

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[4] For more detail, see Proposed Radiation Control Regulation 2003 Regulatory Impact Statement, Environment Protection Authority of NSW, http://www.epa.nsw.gov.au/radiation/ radregris03.pdf.

[5] Proposed Radiation Control Regulation 2003 Regulatory Impact Statement, Environment Protection Authority of NSW, http://www.epa.nsw.gov.au/radiation/radregris03.pdf, p 56.

The International Context

18. The transport of radioactive material around the world has an excellent safety record. The recent IAEA International Conference on the Safety of Transport of Radioactive Material[6] concluded:

> "The application of the regulatory requirements in a safety-conscious work environment by the 'transport industry' – consignors, carriers and consignees – has resulted in an outstanding safety record for the transport of radioactive material. In fact, over several decades of transport, there has never been an in-transit accident with serious human health, economic or environmental consequences attributable to the radioactive nature of the goods."[7]

19. Australia's total holdings of LLW and short-lived intermediate level waste (SLILW) designated for disposal in the national repository amount to approximately 3,700 m^3. By comparison, the French government has disposed of a total of 651,000 m^3 of similar wastes in near-surface repositories - 527,000 m^3 in the now closed Manche repository in Brittany and 124,000 m^3 in the operating repository at Aube, Champagne[8]. Australia's total holdings of LLW and SLILW are a small fraction of the annual arisings of LLW and SLILW in countries such as Britain or France (about 25,000 cubic metres). The operation of those facilities has had no impact upon surrounding areas, and the transport of waste to them has not caused any significant exposures to people or the environment.

20. As for long-lived intermediate level waste, the Commonwealth Department of Education, Science and Training has indicated that Australia's total holdings of this category of waste amount to approximately 500 m^3.[9] By comparison, France produces 930 m^3 of this class of waste every year, together with another 155 m^3 of high-level waste (which Australia does not produce at all)[10]. Again, the storage and transport of that material has not caused any significant exposures to people or the environment.

Low Level Waste Transport on NSW Roads - Considerations

21. Australia has accumulated around 3700 cubic metres of LLW and Short-lived Intermediate Level Waste (SLILW) from research, medical use, and industrial use of radioactive materials[11]. More than half this material is drummed contaminated soil

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[6] 7-11 July 2003, Vienna; see http://www.iaea.org/worldatom.

[7] Summary and findings of the Conference President, page 2.

[8] Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, First National Report on the Implementation by France of the Obligations of the Convention, English version - Original report in French, March 2003, pp 31-32.

[9] http://www.radioactivewaste.gov.au/store/index.htm.

[10] Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, First National Report on the Implementation by France of the Obligations of the Convention, English version - Original report in French, March 2003, p 33.

[11] http://www.radioactivewaste.gov.au/australia/amounts.htm, which also notes that ANSTO currently holds approximately 1080 m^3 of this type of material.

from Fishermans Bend, Victoria which is now in storage at Woomera near the designated site for the repository, having been transported there safely. ANSTO holds approximately 30% of Australia's holdings of LLW and SLILW. ANSTO understands that LLW and SLILW are also in storage at a number of medical centres, universities and other sites in New South Wales, and that there is a quantity of contaminated soil in storage at Hunters Hill.

22. The draft EIS for the National Repository Project estimated the total number of truck movements to deliver all existing waste to the repository to be just 171 (and not all these movements would involve NSW). Contrast this with the regular transport of thousands of ARI packages, radioactive industrial sources, fertilisers, mineral sands, even some consumer goods that may only include small amounts of radioactivity per unit but are trucked in bulk, and the relative insignificance of trucking solid LLW becomes clear. A comparison of potential doses to the average member of the public from radiation from LLW and from various other sources of radiation is given in Table 1.

23. When comparing the potential consequences of an accident involving a truck containing dry, solid, securely packed LLW, with those of an accident involving a truck containing other hazardous goods regularly on our roads (such as petrol, other flammable liquids and gases, or toxic chemicals), it should be clear which accident would pose the greater risk to life and property. Any consequence of an accident involving a truck carrying solid LLW would *only involve any actual impact* and would have no significant radiological consequences. However, a truck carrying other hazardous goods could leak, explode or spill such substances over a wide area.

24. This is not intended to minimise the potential radioactive dose one could receive from LLW, but it is important in consideration of this issue, that the risk is put into perspective with other risks the community regularly takes. LLW can pose a risk, but it is smaller, of minimal consequence and more unlikely than the other risks referred to in the previous paragraph.

TABLE 1: Putting the Level of Radiation from Low Level Waste into Perspective

Radiation Source	**Dose**[12]
Standing 2 metres away from a truck containing LLW or SLILW	<0.1 mSv per hour
Return flight Sydney-Los Angeles-Sydney	0.1 mSv

[12] The unit Sv (sievert) is the SI unit and has been approved by the International Commission on Radiation Units and measurements (ICRU) and used by the International Commission on Radiological Protection. The sievert is a unit of dose, calculated using a weighting factor to account for the risk of producing damage in biological systems by different types of radiation. Therefore one can directly compare dose rates in sieverts. 2mSv = 2mSv, regardless of the source of the radiation.

One chest x-ray	<1 mSv each
Annual dose to the general public in Sydney from natural radiation background sources (see Annex I for more information on background radiation) (Katoomba's background is 0.2 mSv higher than Sydney's, due to altitude)	About 2.0 mSv per year
One CT scan	5-10 mSv each scan
Annual dose from living in a granite building	8 mSv over one year
Limit for exposure to member of the public from non-medical and non-natural sources (ICRP recommendations)	1 mSv per year
Limit on occupational exposure	20 mSv per year, averaged over 5 years

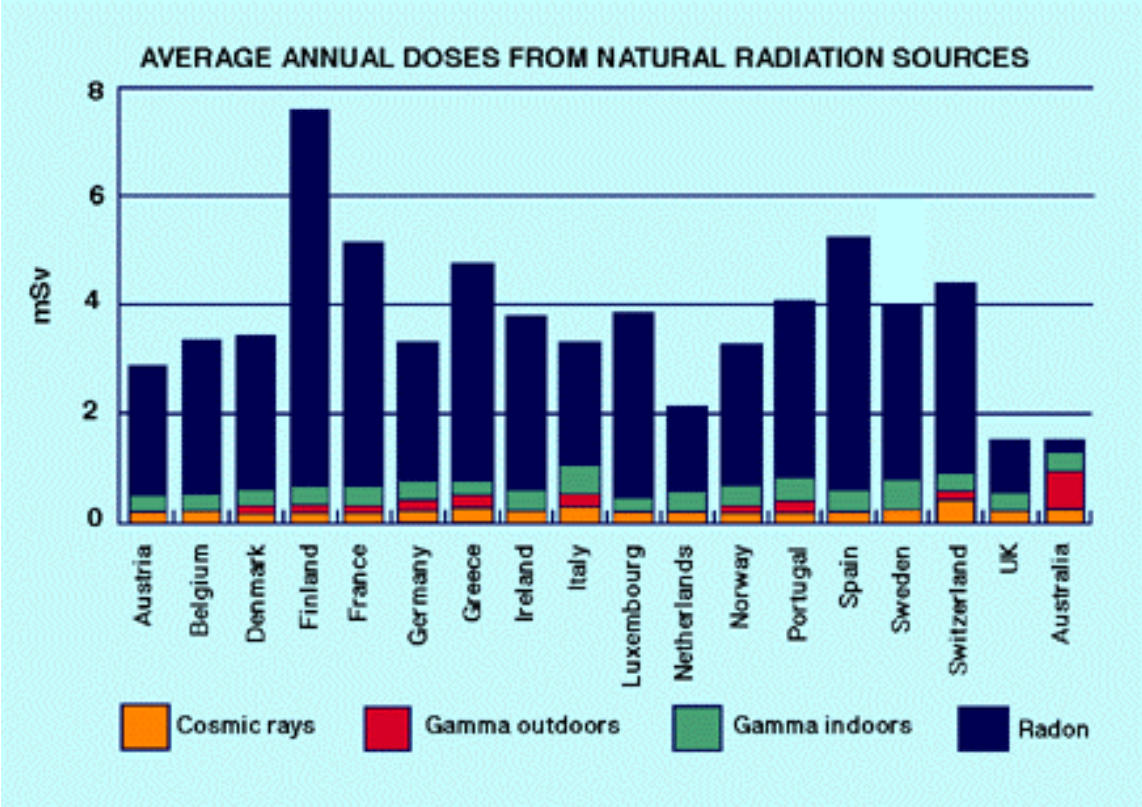
Conclusion

25. The transport of LLW to the national repository will be managed professionally using experienced carriers, regulated by an independent regulator and be conducted in accordance with the *Australian Code of Practice for the Transportation of Radioactive Materials 2001*.

26. Radioactive materials are transported safely on NSW roads every day. The risk to the public and to the environment from the transport of radioactive waste on NSW roads will be essentially the risk associated with any truck movement, and will be low. The radiological consequences of transportation will be miniscule, even in the unlikely event of an accident.

Annex I – Background radiation

1. Background radiation is that which is naturally and inevitably present in our environment. Levels of this can vary greatly. People living in granite areas or on mineralised sands receive more terrestrial radiation than others, while people living or working at high altitudes receive more cosmic radiation. A significant amount of natural exposure is due to radon, a gas which seeps from the earth's crust and is present in the air we breathe[13].



(Graphic from UIC web site)

2. Several places are known in Iran, India and Europe where natural background radiation gives an annual dose of more than 50 mSv and up to 260 mSv (at Ramsar in Iran). Lifetime doses from natural radiation range up to several thousand millisieverts[14]. Studies have not shown any correlation between high rates of background radiation and cancer rates; indeed, the opposite may be the case[15].

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[13] Uranium Information Centre http://www.uic.com.au/ral.htm

[14] Uranium Information Centre.

[15] http://cnts.wpi.edu/RSH/Data_Docs/1-2/6/2/1262list.html.