

RADIOACTIVE WASTE MANAGEMENT IN A COUNTRY WHICH HAS NO NUCLEAR POWER PROGRAMME

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Compared to countries with nuclear power, Australia generates a relatively small amount of radioactive waste from non-mining sources, but there is still enough radioactive waste to make its management a public issue. Radioactive waste in Australia is generated by research, industry, medical applications, research reactor operation and radiopharmaceutical production. In addition, the uranium mining and milling industry generates several million tonnes per year of tailings containing low levels of long lived radioactivity, which is managed at the mine sites.

ANSTO is located at Lucas Heights about 40 km southwest of Sydney. ANSTO has a 10 MW heavy water research reactor (HIFAR) and an associated radiopharmaceutical production facility. A contract has been signed for a multipurpose 20 MW research reactor which, amongst other uses, will provide for radiopharmaceutical production and neutron beam research.

Most of the radioactive waste that has been generated at Lucas Heights over more than 40 years is stored on-site. This inventory represents some 30% of the national inventory of low level and short lived intermediate level waste and some 40% of the long lived intermediate level waste.

In 1995, ANSTO issued its radioactive waste management policy which made a commitment to: (a) complying with all regulatory requirements; (b) ensuring that radiation dose rates were kept as low as reasonably achievable (the ALARA principle); (c) disposing of waste when appropriate disposal routes are available; and (d) being in accord with international best practice. An extensive audit was carried out of ANSTO's waste management facilities and practices. As the result of this audit, 24 recommendations were made and these became the basis for an integrated Waste Management Action Plan, a six-year project, which is scheduled for completion in 2002.

Solidification of the intermediate level liquid waste has been a major priority of the Waste Management Action Plan. This acidic waste is generated during the production of molybdenum-99 for radiopharmaceutical use. A hot cell process was developed involving concentration of the waste by evaporation, destruction of the ammonium ion by a novel process and crystallization of the waste as a uranium-rich salt. Routine processing of the liquid waste commenced in 1999 and to date about 1.9 m³ of liquid waste has been converted to a solid. The waste is stored in high-integrity stainless steel vessels with a design life of at least 50 years.

Another project is under way to convert this solid waste into a more durable waste form suitable for long term storage or disposal. Two waste forms were initially considered; Synroc (or a titanate-based variant of Synroc) or cement. Laboratory scale testing established the feasibility of producing Synroc with a high waste loading and its performance advantage over cement. Engineering scale development of a hot cell process is under way.

An important objective of ANSTO's waste management policy is minimization of radioactive waste generated and stored. This is being achieved by a number of strategies: for example, in one radioisotope production area a threefold reduction in waste volume has been achieved by separating non-radioactive waste from radioactive waste at the source.

Currently, wastewater from active drains at ANSTO is treated by a flocculation/centrifugation process and discharged to the sewer. Over the next few years, ANSTO is planning to upgrade its effluent treatment facilities using state-of-the-art technology. Pilot plant demonstration of a membrane-based process is scheduled over the next year after which a specification will be prepared for a full scale plant.

Planning is also under way for a new facility to treat and package ANSTO's radioactive waste in readiness for disposal. Construction of the new facility is planned to commence within six months. Equipment will be installed and will commence operation from 2001.

The Waste Management Action Plan also has a role in fostering research that can be applied to ANSTO's waste and with potential for wider application overseas. One example is our research into a novel family of inorganic ion exchangers, which are capable of extracting caesium-137 and strontium-90 from highly acidic liquors. This technology is being tested on ANSTO's molybdenum-99 waste but has wider application to acidic process and waste liquors.

The mining of uranium and mineral sands in Australia produces waste containing elevated levels of naturally occurring radionuclides. The two uranium mines now operating produce about 10 million tonnes of uranium mill tailings a year and most of these tailings are disposed of in near surface facilities at the mine sites. The Ranger mine disposed of tailings into a mined-out pit and Olympic Dam sends some tailings underground and the rest to a surface tailing storage facility. Although uranium mill tailings are controlled by different regulations, the requirements for their disposal are consistent with disposal criteria for near-surface disposal of radioactive wastes.

Low level radioactive waste disposal occurs at the Mt. Walton East Intractable Waste Disposal Facility but only for waste originating within the state of Western Australia. To provide a national facility, the Australian Government in 1992 established a project to select a site and establish a national near-surface repository for the disposal of low level and short lived intermediate level radioactive waste. A methodology using a Geographic Information System (GIS) was developed for selecting a suitable site. On the basis of this methodology and public comment, eight broad regions in Australia were identified as likely to contain suitable sites. The central north region in South Australia was selected for further investigation from eight identified regions. In August 2000, the

Australian Government selected three preferred sites for further characterization and assessment.

Under the Australian classification system, the long lived intermediate level waste unsuitable for near-surface disposal is known as Category S waste. The Category S waste includes numerous radium sources, waste from the production of molybdenum-99 and intermediate level residues resulting from the overseas reprocessing of research reactor spent fuel. The Government has established a process for identifying a site for a national storage facility for this Category S waste.

Australia has no nuclear power, but the management of its nuclear waste involves most of the same issues that must be considered in countries with nuclear power. These include public consultation at all stages, an open approach, high level scientific and engineering input and political decisions by Government. The Australian approach to the management of radioactive waste depends on establishing compliance with international recommendations and practice.