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RADIOACTIVE WASTE MANAGEMENT AT ANSTO – MANAGING CURRENT AND HISTORIC WASTES

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The Australian Nuclear Science and Technology Organisation (ANSTO) site at Lucas Heights has operated as a nuclear site for over 40 years and most of the waste generated is still stored at the site. The 10 MW heavy water research reactor (HIFAR) has operated at Lucas Heights for over 40 years with associated radioisotope and radiopharmaceutical production facilities. HIFAR is scheduled to shut down in 2005 and a contract has been signed for a multipurpose 20 MW research reactor which, amongst other uses, will provide continued radiopharmaceutical production and neutron beam research. In addition to these activities, a wide range of nuclear science and technology R&D is carried out at the site.

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.

The recommendations arising from this audit became the basis for an integrated five year Waste Management Action Plan, which began in 1996. The Plan dealt with legacy issues that had arisen from the accumulation of the radioactive waste at Lucas Heights. It involved construction and operation of improved storage facilities for low-level radioactive waste, better monitoring of existing storage facilities for spent research reactor fuel and intermediate level liquid wastes, and conversion of liquid and solid wastes into more stable forms suitable for prolonged storage.

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 solidification of the waste as a uranium-rich salt. Routine processing of the liquid waste commenced in 1999 and to date over 2 m^3 of liquid waste has been converted to a solid. The solidified waste is stored in high-integrity stainless steel vessels with a design life of at least 50 years.

Another project under way will convert this solid waste into a more durable waste form suitable for long term storage or disposal. Two waste forms were initially considered; a titanate-based variant of synroc and cement. Laboratory scale testing established the feasibility of producing the titanate based ceramic with a high waste loading (~44 wt % U) and the superior performance of this matrix over cement. Engineering scale development of a hot cell process for production of the ceramic waste form is under way.

Much of the historic waste was characterised when it was generated by external dose with little information recorded about the radionuclide content. In 1996, a radioactive waste scanning system was installed to determine the radionuclide content of drums of historic waste. A data base system is being developed to integrate the characterisation, treatment and location information on the radioactive waste at ANSTO including the results from the drum scanning measurements. .

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. A substantial reduction in radioactive gas emissions during the production of molybdenum-99 has also been achieved by changes in waste processing operations and procedures.

As well as focussing on historical waste issues a number of initiatives within ANSTO aimed at improving current processes and waste systems are being carried out. Currently, waste water from active drains at ANSTO is treated by a flocculation/centrifugation process and discharged to the sewer. Over the next few years, ANSTO plans to upgrade its effluent treatment facilities using state-of-the-art technology. Pilot plant demonstration of a membrane-based process is in progress 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 in the national repository for low level and short lived intermediate level waste.