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MANAGEMENT OF WASTE ASSOCIATED WITH THE DECOMMISSIONING OF THE JASON RESEARCH REACTOR AND THE NUCLEAR LABORATORIES AT THE ROYAL NAVAL COLLEGE GREENWICH

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In 1996 the UK Government announced that the Royal Naval College, Greenwich would pass to non-defence use by the millennium. As a consequence of this decision, the decommissioning of the JASON 10 kW Argonaut research reactor and the relocation of the Department of Nuclear Science and Technology (DNST) were approved by the Ministry of Defence. The decommissioning of the reactor commenced in November 1997 while DNST remained operational until October 1998. The DNST was responsible for education and training in support of the UK Naval Nuclear Propulsion Programme and operated academic laboratories for atomic and nuclear physics, health physics, instrument calibration and radiochemistry. Therefore, besides the nuclear reactor, open and sealed sources (alpha, beta and gamma), intense x-ray (sealed tube) and gamma-ray (^{60}Co and ^{137} Cs) sources and small ^{241}Am/Be neutron sources had been used in the Department for over 35 years. Decommissioning of all facilities was therefore a relatively complex task and the management of waste streams was challenging. All facilities were successfully decommissioned for unrestricted site release by December 1999 and this paper will describe the methodology used for preparation, storage, characterisation and disposal of all waste streams.

The most significant waste management task during this decommissioning programme was that associated with the JASON reactor and the overall contract strategy for the project is given in Table 1. It should be noted that the JASON reactor fuel was not designated as nuclear waste, the fuel removal and storage were covered under separate contracts and therefore no high level waste was generated. With respect to other waste streams, a combination of Monte Carlo modelling and selective sampling and analysis of the reactor materials was used to estimate the quantities of waste as follows:

- LLW – 76 tonnes packed in 4 half height ISO containers.
- LLW – 6 Tonnes packed in 200litre drums in 1 full height ISO container.
- ILW – 60 kg packed in approved shielded containers.
- FRW – 121 tonnes packed in 6 disposal skips.

These estimates will be compared to the actual waste inventories as reported in the projects Post Decommissioning Report.

TABLE 1: IMPLEMENTATION CONTRACTS

DESCRIPTION
1. **Prime and Reactor Dismantling Contract – NNC Ltd** Preparation of documentation required for safety approval of the decommissioning work. Detailed design, construction and commissioning of the waste processing facility, including modifications to DNST for entry of the fuel flask. Operations to decommission the reactor, including packaging, sentencing and transport to disposal site of all wastes, including laboratories. Decommission and remove the waste processing facility. Restoration of the DNST Building and affected areas of the site.
2. **Fuel Removal Contract – AEA Technology** Preparation of documentation required for safety approval of the fuel operations. Hire of fuel flask. Design modifications, modify, commission and gain approval for use of the flask with JASON fuel. Design, manufacture and commission equipment for transferring the fuel flask into the DNST Deliver flask to site, commission system, load the fuel in conjunction with the JASON operators, transport to disposal storage site and return to home site.
3. **Fuel Disposal Contract – BNFL** Receipt of flask, unload fuel and (a) short term storage or (b) long term storage. (Note: UKAEA Dounreay not available for JASON fuel).
4. **ILW Disposal Contract – Safeguard International** Collection, unload and long term storage or disposal of ILW.
5. **LLW Disposal Contract – BNFL** Receipt of transport containers, unload, process and disposal of LLW.

With respect to the overall waste management strategy, a Post Operational Clean Out (POCO) phase preceded decommissioning. This allowed all approved discharges and transfers to occur under the facility operational safety case, including the disposal of laboratory sources and the reactor start-up source (185 GBq ^{241}Am/Be) by Safeguards International. The reactor fuel was then transported off-site under a fuel removal safety case. In addition, the reactor control plates, drive motors and in-core nuclear detectors were removed, designated as ILW, packaged and transported under the decommissioning safety case so that all major radioactive hazards were removed from the facility prior to construction of the main waste handling and transfer facilities. All ILW was sent for storage at the UK's national facility at UKAEA Harwell.

Waste categorisation, size reduction and initial packaging was carried out in the reactor hall and items were transferred by trolley to an airlock/storage area. Waste was segregated according to type, monitored and transported across the airlock/storage boundary for further interim storage or direct loading of ISO containers. The assay of waste, size reduction, packaging, radiological monitoring and final, removal of waste to designated ILW, LLW or FLW facilities will be described. In addition, the special case of low level tritium waste in the facility, its assay and removal will be discussed. Finally, the results and conclusions of the Post Decommissioning Report will be compared to the proposed waste management scheme in the Preliminary Safety Report and any significant lessons learned will be addressed.