

Reactor decommissioning: Universities Research Reactor



Universities reactor site, before. >



World winning solutions



Universities reactor site, after. >



Key project data

Dimensions	Reactor size approximately: 9m x 8m x 5m.
Reactor contents	500 t reactor components, mixed intermediate-level waste, low-level waste (LLW) and free release material.
Timescales	Dec '92 Defuelling complete May '95 Finished decommissioning. Oct '95 Finished demolition. July '96 Final delicensing of site.
Project value	c. £3M.
Radiological characteristics	Dose rates up to 300mSv/hr. Collective actual dose = 62mSv. predicted dose = 77mSv. Highest individual dose = 8.5mSv, annual allowable limit 10mSv.

This project demonstrated BNFL's ability to marshal a diverse set of skills, develop innovative solutions and integrate them into a single package to completely meet the client's requirements. The successful outcome, a site decommissioned and delicensed by the NII, is one of the first such examples in the UK.

The universities research reactor (URR) was located on a site owned by the Universities of Manchester and Liverpool at Risley, Cheshire. It was used for post-graduate training and research into many fields including:

- nuclear engineering
- radio-chemistry
- neutron and solid state physics.

- The Argonaut type water moderated and water cooled reactor, originally designed for continuous operation at 100kW, was commissioned in 1964 with the operating power increased to 300kW in 1966.

- The reactor was shutdown in 1991 and BNFL were contracted to decommission the reactor and dispose of all the waste.

- BNFL have won further contracts to decommission research reactors for ICI, and the Scottish Universities have subsequently placed contracts with BNFL to decommission research reactors.



Project objective

The Universities objective was fourfold:

- to transfer the fuel from the site for reprocessing;
- to decommission the reactor;
- to demolish and remove all buildings;
- revocation of the site license.

Project methodology

Shortly after final shutdown of the reactor operations, the fuel was removed from the core and placed in the dry storage pit. Utilising a temporary pond arrangement and shielded transfer system, the fuel was successfully loaded and dispatched for reprocessing.

A Pre-decommissioning Safety Report examined the proposed decommissioning operations and split the programme into 4 phases and 41 discrete tasks with the emphasis on safety management aspects. The phases consisted of Preparatory Work, Preliminary Tasks, Reactor Dismantling and Completion Tasks.

Although it did not originally intend to do so, the University decided to demolish and remove all buildings from the site. Following completion of the demolition, final radiological surveys of the site were conducted and a request to end the Licensee's Period of Responsibility was sent to the NII. This was granted (delicensing the site) on 26 July 1996.

Project challenges

- Development of specialist equipment to facilitate safe and cost-effective dismantling of the reactor.
- Demonstrate removal of radioactive material from the site to justify greenfield status.
- Remote handling to minimise operator dose uptake.
- Optimising waste management by size reduction, efficient packing and waste minimisation.

Project successes

- Mitigation of high dose by extensive training using 'mock up' facilities prior to carrying out potentially high dose operations.
- Delicensing of research reactor land, subsequently sold for commercial use.
- Application of conventional technology to dismantle reactor equipment and to ensure dose minimisation.

1 UK Waste categories:

- High-level wastes (heat generating): Fission product concentrates.
- Intermediate-level wastes: Fuel cladding, Low and medium active liquids, Slurries, Sludges, Floes, Low alpha technical wastes, High alpha technical wastes.
- Low-level wastes: <12GBq/t beta gamma, <4GBq/t alpha.

▼ Shielding removal from the universities reactor.



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