

FACTSHEET:

Wastes from research activities

Overview

A wide range of research activities have been undertaken in the UK, which have led to the production of radioactive wastes. Research activities have benefited the nuclear, defence, medical and industrial sectors.

Research into commercial nuclear fission

In the early days of the nuclear industry in the 1940s until the 1980s, there was a large Government funded research programme into nuclear fission reactor technology.

Many different reactor designs and fuel types were investigated. That research programme led to the successful development of the early Magnox reactors and the later Advanced Gas Cooled Reactors (AGR) that have been built and operated commercially in the UK.

Experimental fission reactors

During the research programme, 19 test and prototype fission reactors, both large and small, were operated at the research sites of Harwell, Winfrith, Windscale and Dounreay. These include the Graphite Low Energy Experimental Pile (GLEEP) reactor at Harwell, which was built in 1946 and was the very first nuclear reactor in Europe.

These experimental reactors were supported by an array of laboratories and facilities for material testing, and for fuel manufacture, analysis and reprocessing.

During their operation, a wide range of irradiated fuel materials were produced, together with many different types of solid and liquid wastes.

These experimental reactors and associated facilities have now all shut down and are being decommissioned, or have already been decommissioned.

The Dounreay fast reactors

The Dounreay site in the north of Scotland was home to research on fast breeder reactor technology.

These fast reactors differ from conventional thermal reactors in a number of ways. Most importantly they use high energy fast neutrons that interact with uranium to produce much more fissile material than they use. They effectively 'breed' new fuel as they operate. For this reason they are sometimes called 'breeder' reactors.

Two fast reactors were operated at Dounreay. The Dounreay Fast Reactor (DFR) which is housed in the famous 'golf ball' spherical dome and the Prototype Fast Reactor (PFR) that trialled full-scale power operations.

Fast reactor research has stopped in the UK, and both the DFR and PFR are now closed and are being decommissioned.

Due to their novel design and operations, a much more diverse range of solid and liquid wastes come from DFR and PFR than from commercial Magnox or AGR reactors.



Image: Fast reactor at Dounreay

Research into nuclear fusion

In the UK, research into nuclear fusion is being conducted at the Joint European Torus (JET) facility at Culham, which is currently the largest facility of its kind in the world.

A fusion reactor does not use conventional nuclear fuel. Instead energy is generated through the fusion of radioactive hydrogen isotopes (deuterium and tritium). Radioactive wastes produced during operation and future decommissioning of JET will be contaminated by tritium.

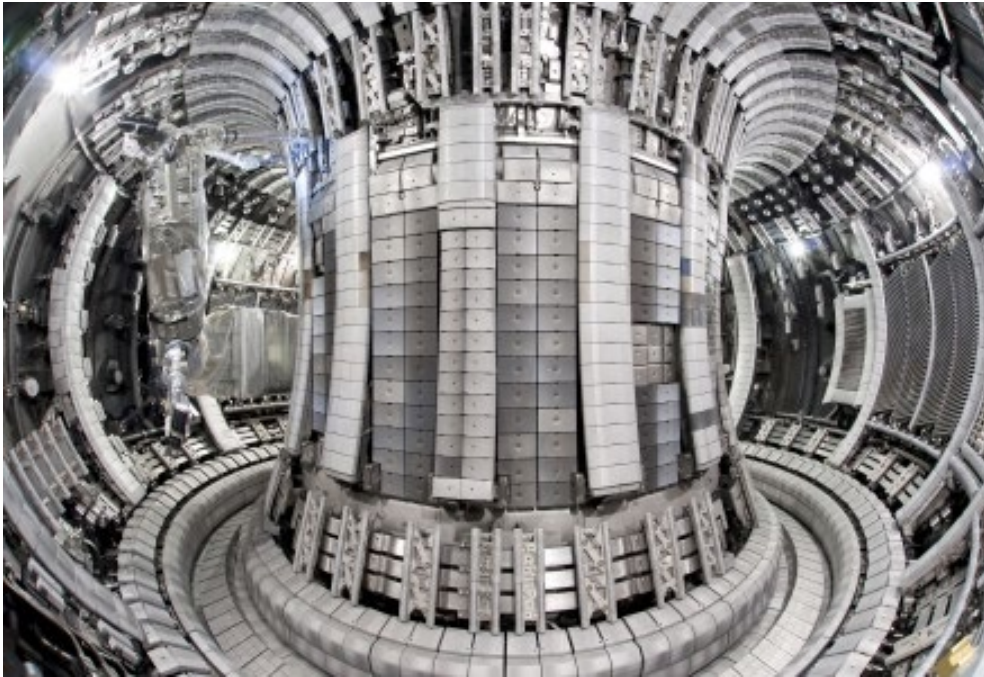


Image: The inside of the JET fusion facility. Source: www.ccf.ac.uk/images.aspx

Other civilian nuclear research

Academic and industrial research and development work takes place in many universities and research establishments across the UK.

The scope of research is very wide, and includes work to address challenges across the nuclear, industrial and medical sectors. Examples include research into new radiotherapy treatments and work to test novel techniques for encapsulating liquid radioactive wastes.

Radioactive wastes produced by research activities

Many different radioactive waste types have been produced during operation of the experimental nuclear power reactors and their associated research facilities.

Many of these wastes are unique and are not found at other nuclear sites. Examples include:

- novel irradiated fuels, and high active liquid and solid wastes from their testing and reprocessing
- sodium metal coolants used in the Dounreay fast reactors and contaminated coolant circuits
- mixed wastes that are due to be recovered from old disposals in a deep rock shaft at Dounreay

A wide range of different radioactive wastes are produced from other research activities, although the quantity of waste generated by these activities is relatively small.