

# RADIOACTIVE MATERIALS AT DOUNREAY



Decommissioning and demolishing a redundant nuclear site like Dounreay produces large quantities of radioactive material.

Most of it will remain at the site. But a small amount is being removed, because it belongs to other people or because it could be used again to make electricity. This leaflet explains why.



Cleaning out and demolishing all the redundant facilities over the next decade or so will produce approximately 300,000 tonnes of nuclear fuel and radioactive waste.

## How much radioactive material is there at Dounreay?

There's two types – nuclear fuel and radioactive waste.

Nuclear fuel can be used again but radioactive waste cannot.

Cleaning out and flattening the site will yield about 300,000 tonnes of radioactive material.

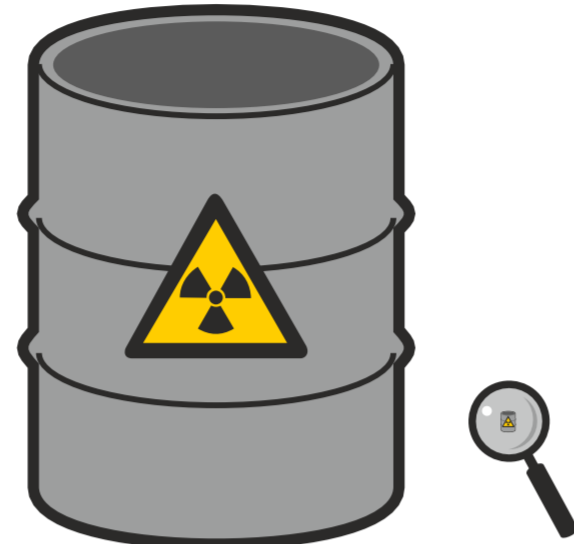
## Why is there so much more waste than fuel?

The fuel amounts to about 110 tonnes. The rest is waste.

Waste includes all the everyday industrial equipment, materials and buildings that have been contaminated by coming into contact with nuclear materials.

## What is the difference between fuel and waste?

Fuel consists of uranium or plutonium that could be used in a nuclear power plant to generate electricity or isotopes for medical and industrial use. Some of the fuel at Dounreay is "spent" and needs to be reprocessed before it could be used again. Typically, about three per cent of "spent fuel" is waste that cannot be used again and is removed through reprocessing.



Of the 300,000 tonnes of radioactive material that decommissioning will yield, less than 1 per cent is expected to leave Dounreay.

## What about security?

All radioactive materials attract a level of security protection, which varies according to the type of material it is. The security regime for transporting nuclear fuel and radioactive waste is rigorous and independently regulated.

## What is happening to the radioactive waste?

The radioactive waste is being treated and packaged at Dounreay in a way that will make it safe for long-term storage or disposal at the site. A small amount may need specialist treatment elsewhere.

Approximately 600 tonnes belongs to former overseas reprocessing customers who are obliged to take back their waste. The exact amount to be returned will depend on how many ask for their waste to be sent back in a different form from another site owned by the Nuclear Decommissioning Authority.

Some of this waste belonged to the operators of a Belgian reactor. It was removed from the site between 2012 and 2014 and returned to Belgium by sea in a series of shipments.



Armed officers of the Civil Nuclear Constabulary are responsible for the protection of civil nuclear materials in the UK.

## What is happening to the nuclear fuel?

A small amount belonged to foreign operators and was returned to them after the decision to close down the site. The rest belongs to the Nuclear Decommissioning Authority, a non-departmental public body of the UK Government.

The NDA sought the views of stakeholders on the options for its fuel, before concluding it should be transferred to Sellafield, where most of the UK's nuclear fuel is already stored.

Dounreay Site Restoration Ltd is implementing this decision.

DSRL began removing the fuel in 2012. The first batches to be transported were "breeder" elements from the experimental fast reactor known as DFR and these were taken by road and rail to Sellafield. These will be followed by fuel known as the "exotics" – irradiated and unirradiated plutonium and uranium.

In total, some 200 or so shipments are planned to remove all the fuel and this will take several years to complete.



Much of the waste is low in radioactivity and can be buried safely in a series of engineered vaults being developed at the site.



Radioactive materials leaving Dounreay need to travel at least part of their journey by road to reach their destination.

## Who decides what stays and what goes?

The NDA decides within the policy framework of the UK. Nuclear fuel is reserved to Westminster under Energy, so policy is set by the UK Government. Radioactive waste is devolved to Holyrood under Environment, so policy is set by the Scottish Government.

Customers with historic contracts can also affect what happens to their material.

## Could it all stay at Dounreay?

Almost all the radioactive waste will remain at Dounreay, in accordance with Scottish Government policy, but Dounreay no longer has the facilities to recycle nuclear fuel and new facilities would be needed to keep it stored safely and securely in the longer term.



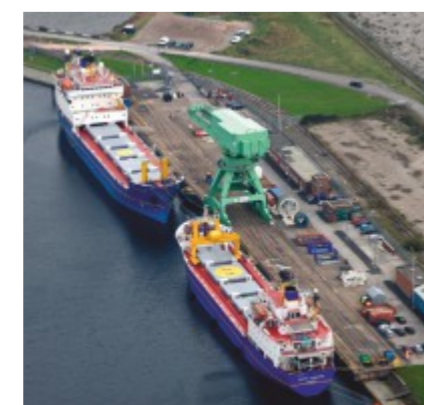
## How will it be transported?

Nuclear materials can be transported by road, rail, sea and air, depending on the type of material and the container being used to transport it. The standards for nuclear transport are set by the UN's International Atomic Energy Agency and adopted in legislation here by the Department for Transport at the UK Government.

Transport and security plans are subject to robust and independent regulation.



Robust containers known as flasks shield the more hazardous waste and fuels when it is transported



## Will the public be informed?

The only information we cannot disclose is detail which might compromise the safety and security of any particular movement, such as precise routes, timings, quantities and security arrangements.

## Is it safe?

Yes. The containers are designed to remain intact in all credible accident scenarios.



Radioactive material is moved routinely between nuclear sites on Britain's railways by Direct Rail Services, a part of the Nuclear Decommissioning Authority

## How is an accident dealt with?

The emergency services throughout the UK are trained to respond to all sorts of incidents involving a variety of hazardous cargo. Exercises are held regularly to test their response to radioactive cargo.

The nuclear industry formed the RADSAFE network to provide the emergency services in the UK with access to immediate technical support in the event of an incident with a radioactive cargo. The containers are designed not to be breached in the event of an accident involving its transporter.

## What other transports are needed?

Radioactive particles will be transported to the site from the seabed and local beaches for so long as the particle recovery and monitoring programme continues.

Some equipment needed to decommission particular facilities contains radioactive sources for calibration purposes. We send radioactive sources for calibration and recertification for quality control purposes. Some equipment purchased for the management of radioactive waste contains natural or depleted uranium.

Some lightly radioactive materials may be removed for recycling or specialist decontamination elsewhere (e.g. lead bricks, mercury and sodium).

In addition, we need to send some samples such as soil, concrete and graphite to specialist labs for characterisation and independent verification.



Moving nuclear material by sea is carried out by International Nuclear Services, a subsidiary of the NDA, using specially designed and modified ships.

## For more information

**Dounreay Site Restoration Ltd** – the contractor closing down the site  
[www.dounreay.com](http://www.dounreay.com)

**Nuclear Decommissioning Authority** – government body responsible for the site  
[www.nda.gov.uk](http://www.nda.gov.uk)

**Health Protection Agency Centre for Radiation, Chemical and Environmental Hazards** – public body that advises on all aspects of radiological protection  
[www.hpa.org.uk/radiation](http://www.hpa.org.uk/radiation)

**Direct Rail Services** – subsidiary of NDA providing transport services to the nuclear industry  
[www.directrailservices.com](http://www.directrailservices.com)

**International Nuclear Services** – a subsidiary of the NDA and the world's leading shipper of nuclear materials  
[www.innuserv.com](http://www.innuserv.com)

**RADSAFE** – industry body offering expert support in the event of a transport accident  
[www.radsafe.org.uk](http://www.radsafe.org.uk)

**Office for Nuclear Regulation** – regulates the protection of people and society from the hazards of the nuclear industry  
[www.onr.org.uk](http://www.onr.org.uk)

**Scottish Environment Protection Agency** – public body responsible for regulating the keeping and use of radioactive substances and the accumulation and disposal of radioactive wastes  
[www.sepa.org.uk](http://www.sepa.org.uk)

**World Nuclear Transport Institute** – international body dedicated to the safe, efficient and reliable transport of nuclear materials.  
[www.wnti.co.uk](http://www.wnti.co.uk)

**Civil Nuclear Constabulary** – Armed police force responsible for the protection of nuclear materials in the UK.  
[www.gov.uk/cnc](http://www.gov.uk/cnc)





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