



**Sellafield, Windscale and LLWR at Drigg**

**WEST CUMBRIA SITES STAKEHOLDER GROUP**

**QUARTERLY REPORT FOR 1 APRIL TO 30 JUNE 2008**

### **FOREWORD**

This report is issued to the West Cumbria Sites Stakeholder Group (WCSSG) to provide a summary of the regulatory activities of the Environment Agency relating to the above nuclear licensed sites.

Environment Agency nuclear regulators attend meetings of the WCSSG, and some of its sub-committees, and will be happy to respond to questions raised there. Alternatively please contact us at our Penrith office:

Team Leader (Sellafield), Nuclear Regulation Group (North), Environment Agency, Ghyll Mount, Gillan Way, Penrith, Cumbria, CA11 9BP. Email: [nrg.north@environment-agency.gov.uk](mailto:nrg.north@environment-agency.gov.uk). Tel: 01768 215705.

We wish to improve this report over time and would be happy to hear your views on its format and content.

## **EXECUTIVE SUMMARY**

This provides a brief summary of some of the highlights of environmental performance and key challenges at the West Cumbria sites during the period 1 April-30 June 2008. The figures in brackets indicate where to find more detail in the report.

### **Authorisations and permits**

- We issued a variation to the Sellafield RSA93 authorisation on 1 April 2008, which incorporates the transfer of Windscale from UKAEA to Sellafield Ltd. (2.1, 2.2)

### **Compliance assessment and enforcement**

- Radioactive discharges to air and water were all well below the authorised site limits in the year to the end of March 2008. (3.1)
- We estimate that the annual radiation dose to the most exposed group of the public as a result of current discharges to sea from Sellafield is around 17 microsieverts. This is about 3.5% of the legal constraint on radiation dose to the public from a single site. (3.1)
- We inspected three fuel storage facilities and groundwater protection arrangements at Magnox reprocessing. (3.3)
- About 50 radioactive particles have been found on the beaches of West Cumbria since April. (3.2)
- Following a period of slight elevation levels of iodine-129 in local milk returned to normal. (3.2)
- We issued four warning letters to Sellafield this quarter. (3.4)

### **Progress against our strategic objectives**

- Improved sampling arrangements have been agreed for the Calder Hall asbestos removal project. (4.1)
- As part of our process of comparing methods across different sites we visited Aldermaston to look at its management of liquid effluent. (4.5, 4.2)
- Sellafield's planning for the Magnox reprocessing shutdown in September incorporates learning on minimising aqueous effluent and solid wastes. (4.7)
- Good progress has been made in developing a strategy for managing spent oxide fuels. (4.7)
- The new parent body organisation has taken over at the LLWR and some significant changes are being proposed. (4.9)
- Construction of Vault 9 at the LLWR is expected to start in July 2008. There are a number of outstanding requirements which will need to be addressed before we consider disposal in this vault. (4.10)
- We published the first environmental performance report against the Nuclear Sector Plan in April. (4.11)

## 1 INTRODUCTION

This report presents a summary of our work at Sellafield, Windscale, Calder Hall and the Low-Level Waste Repository (LLWR) near Drigg over the three months to the end of June 2008.

The report covers progress against our regulatory strategy which steers our work at nuclear sites. Our strategy sets out, among other things:

- our long term objectives;
- our expectations of the operator;
- how our strategy connects with the wider Environment Agency vision and goals.

The contents of this issue are:

[Authorisations and permits](#)

[Compliance assessment and enforcement](#)

[Strategic objectives](#)

[Annex 1 – Our role](#)

[Annex 2 – Glossary](#)

### **Our role**

Our role is to ensure the protection of the public and the environment from the radiation exposure that may result from the disposal of radioactive waste. We also aim to prevent pollution, to protect and enhance the environment, and to contribute to the sustainable development of the UK.

The operation and clean up of nuclear sites generates radioactive and non-radioactive wastes. To ensure that the impact of those wastes on people and the environment is as small as it can be, now and in the future, we supplement direct regulation with partnership working. If you want to know more about our role in regulating nuclear sites see Annex 1 or our website at the link below:

<http://www.environment-agency.gov.uk/business/444304/945835>

## 2 AUTHORISATIONS AND PERMITS

The West Cumbria sites hold various environmental authorisations and permits. We aim to issue, regularly review and revise these as necessary to ensure that they are up to date, flexible and fit for purpose.

### **2.1 Sellafield Ltd**

#### *Radioactive Substances Act (RSA93)*

Disposal of radioactive waste (including the disposal of solid wastes and the disposal, or discharge, of gaseous and liquid effluents) are only permitted subject to strict limits and conditions under an RSA93 authorisation.

We issued a variation to the Sellafield RSA93 authorisation on 1 April 2008. This incorporated the transfer of Windscale from UKAEA to Sellafield Ltd. Sellafield Ltd and UKAEA recognised the clear plan we developed for the transfer of the authorisation as good practice.

Sellafield Ltd have submitted a request to vary their Environment Agency Requirements (EAR) document to add a previously unregistered point for a minor discharge to air from the on-site laboratory facility.

#### *Pollution Prevention & Control (PPC)*

The prevention and control of non-radioactive pollutants, and other environmental impacts, at the Sellafield site has been regulated under the PPC regime. On 6 April 2008 the PPC regime merged with Waste Management Licensing to form a single system under the Environmental Permitting (England and Wales) Regulations 2007.

Sellafield Ltd has applied for a variation to their Environmental Permit (formerly PPC permit), to replace the temporary chimney stacks at the Fellside Combined Heat and Power plant. A revised height is being considered for the replacement stacks. Independent studies supporting the application have considered a range of stack heights and concluded that heights of around 45m would provide sufficient dispersion and dilution. This is lower than the previous stack heights of 55m, however, the shorter design provides a number of advantages, namely: fewer flanges that could provide potential sites for corrosion; easier to inspect; lower weight loading on the main structure and they are easier to fabricate and install.

## **2.2 LLWR**

Following a recent variation to allow disposal of the last Outokumpu slag pot to LLWR, contractual matters with the consignors have still not been resolved. Outokumpu is considering its position and this could lead to further delays in disposal and the available space in Vault 8 becoming inaccessible.

## **3 COMPLIANCE ASSESSMENT AND ENFORCEMENT**

Compliance assessment is an important part of our regulatory strategy. We continue to assess compliance with the limits and conditions of the permits and authorisations we have issued. This section provides highlights of our assessment and site inspection activities over the reporting period.

More details of discharge and environmental monitoring data can be found in our annual Radioactivity in Food and Environment (RIFE) report. RIFE is published jointly with the Food Standards Agency, Scottish Environment Protection Agency (SEPA) and the Environment and Heritage Service of Northern Ireland. The latest RIFE report (2006) can be found at:

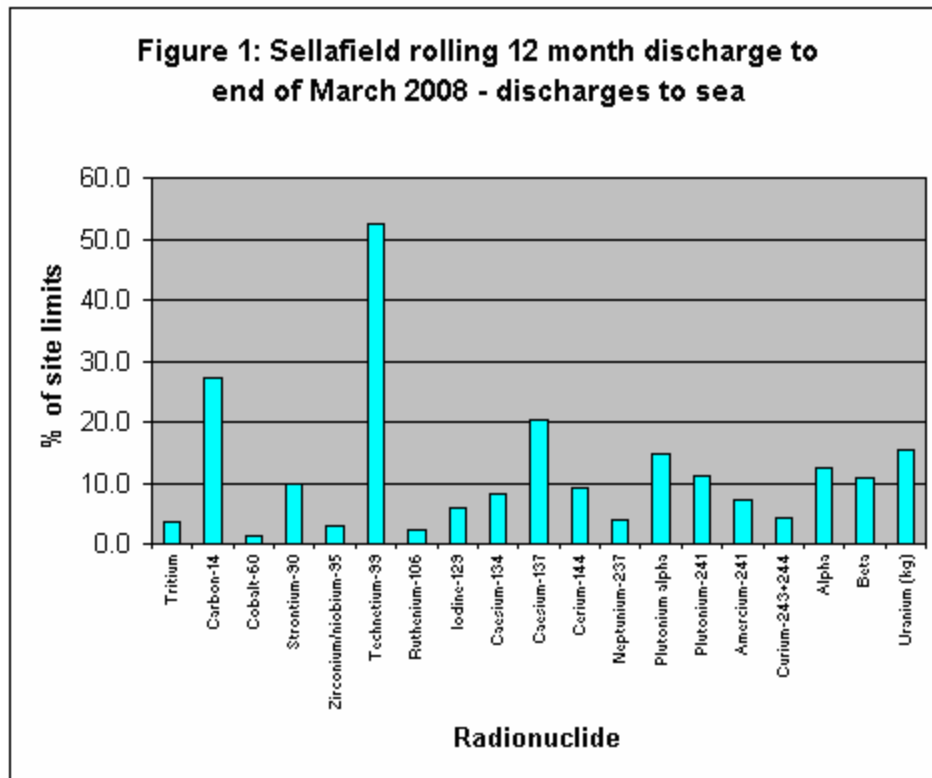
[RIFE report for 2006](#)

### 3.1 Disposals

There were no breaches of the authorised site limits on disposals to land, sea or air during the reporting period at any of the West Cumbria sites.

#### *Discharges to sea*

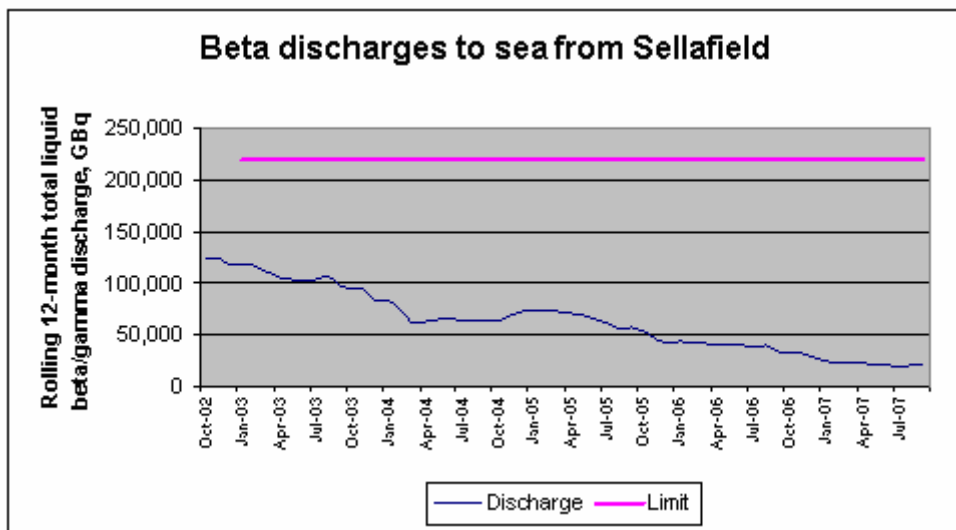
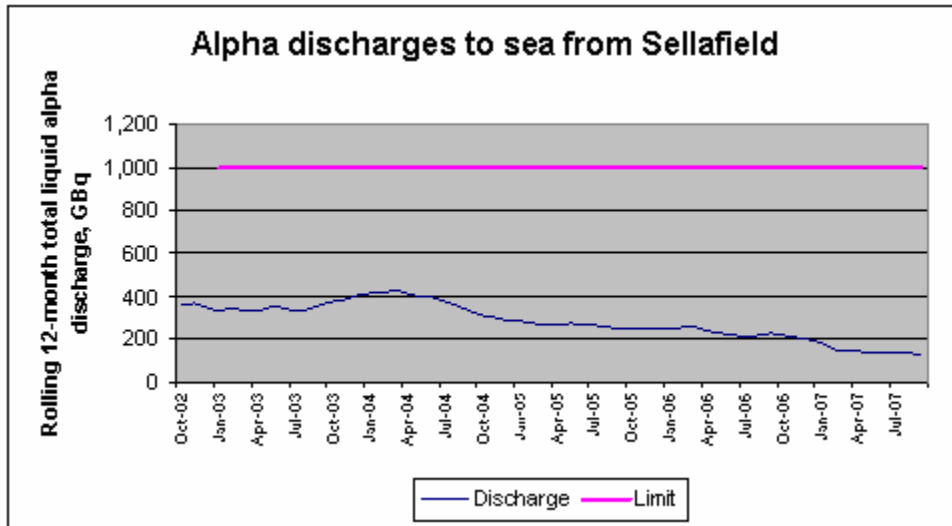
Radioactive discharges to sea from Sellafield for the 12 months to the end of March 2008 were all well below the authorised limits – see Figure 1 below. Note that for certain radionuclides the site limits for calendar years relate to the amount of spent fuel reprocessed ('throughput related limits').



The total alpha and total beta discharges to sea from Sellafield have been declining for some time and have been below the UK discharge strategy targets for the fuel reprocessing sub-sector for 2020 for over a year. This trend is attributed to the recent low fuel reprocessing rates and to our drive to ensure that best practicable means (BPM) are used to minimise radioactive discharges from the site. Several factors may result in discharges rising in the future, including increased reprocessing rates, prolonged storage of Magnox and oxide fuel in fuel ponds, and clean-up of the site.

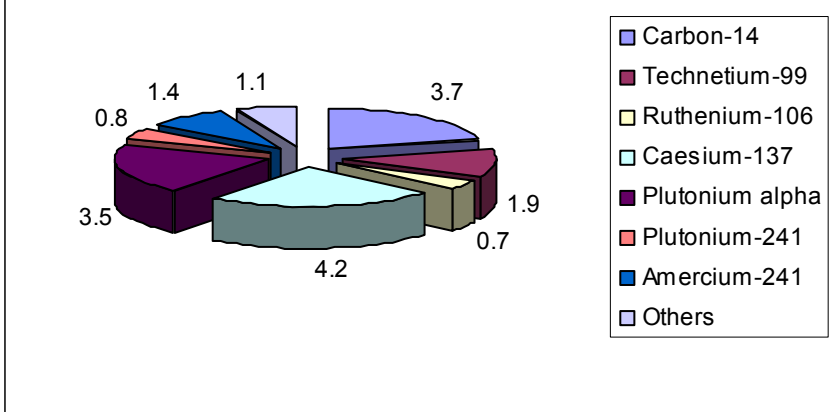
It will be a challenge to consolidate these achievements, and to pursue greater reductions over the longer term through the application of BPM/BAT as suggested by the proposed strategic targets for 2020 and 2030 in the Defra UK discharge strategy consultation document:

<http://www.defra.gov.uk/corporate/consult/rad-discharges-ukstrategy/index.htm>



Our assessment of the predicted annual radiation dose to the most exposed group of the public from current discharges of radionuclides subject to numerical limits is given in Figure 2. The total dose was about 17 microsieverts, which is about 3.5% of the constraint on dose from discharges from a single site (500 microsieverts per year) and less than 1% of the average dose from natural background radiation.

**Figure 2: Annual dose (microsieverts) to most exposed group from Sellafield 12 month discharges to sea to end March 2008**

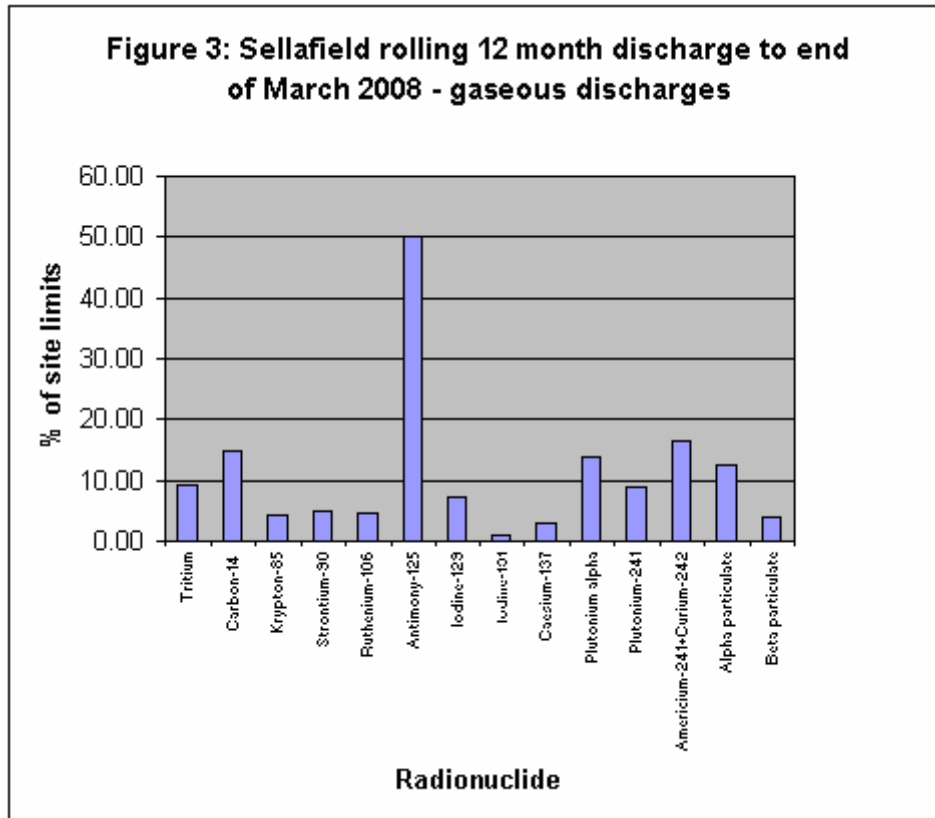


Note that the above dose assessment does not include the radiation dose from radioactivity already in the environment from discharges made in the past. The dose assessments presented in the RIFE reports (see page 4) are based upon measurements of radioactivity and radiation in the environment and therefore will include a contribution from radioactive discharges made in the past. The latest assessment of annual radiation dose to the most exposed group from sea discharges is 230 microsieverts via seafood consumption and external radiation.

The latest RIFE also states that the seafood consumer group receives an additional dose from the presence in local seafood, of enhanced levels of natural radionuclides resulting from past discharges from the former phosphate processing plant at Whitehaven. The discharge, which has now ceased, contained natural radionuclides, for example uranium isotopes and their decay products such as polonium-210 and lead-210, which were present in the materials used in the process. It is estimated that the dose from this source was 240 microsieverts in 2006 giving a total dose of 470 microsieverts. This dose is less than the dose limit for the public of 1,000 microsieverts per year.

*Discharges to air*

Figure 3 gives the rolling 12 month discharges to air to the end of March 2008 as a percentage of the site limits.



The radiation doses to individuals from aerial discharges are generally lower than those from sea discharges. The latest assessment in RIFE for 2006 indicates that the dose to the most exposed group was 29 microsieverts from aerial discharges via consumption of local terrestrial foods, inhalation and exposure to external radiation.

### 3.2 Environmental monitoring

#### *Beach monitoring programme*

For more details see our website at:

[Beach monitoring and Sellafield particles](#)

In summary, approximately 80 hectares of beach has been monitored at St Bees, Seascale, Braystones, Drigg and Sellafield since April. Around 50 radioactive particles have been found, the majority (42) on Sellafield beach, where find-rates have been comparable with those encountered during last year's surveys.

Further laboratory analysis was carried out of those particles found in 2007/08 which are associated predominantly with beta radioactivity. The radiation dose rates measured on contact with the larger of these particles were up to 33 millisieverts per hour. Work to improve the assessment of hazard and risk from the potential for the inadvertent ingestion of particles also continued during the quarter.

Advice from the Health Protection Agency on access and use of beaches remains unchanged i.e. no special precautions are necessary.

In order to obtain a picture of the extent of any offshore contamination we have required Sellafield to begin monitoring of the local seabed. Discussions on the best way to achieve this have been held. The aim is to begin monitoring by the end of this financial year.

Work to investigate the feasibility of improving the capability of the beach monitoring equipment to detect different types of radionuclides continued.

More details are also available via the Sellafield website:

<http://www.sellafieldsites.com/page/what-we-do/case-studies/beach-monitoring>

#### *Esk Estuary monitoring*

The results for samples taken from the Esk estuary during a joint visit with Cumbrians Opposed to a Radioactive Environment (CORE) in March, were consistent with those measured for samples routinely taken from the estuary.

#### *Iodine in milk near Sellafield*

The elevated levels of iodine-129 in milk reported by Sellafield's statutory monitoring programme, in the few months leading up to March, were not seen in April (i.e. levels had returned to, or were lower, than the analytical 'Limit of Detection'). The elevated levels were extremely low and not significant in terms of radiation dose to people. It is thought that the slight elevation in levels may relate to seasonal effects since similar results have been seen in winter before. No such elevation was reported by the independent monitoring programme managed by the Food Standards Agency.

It has been concluded that these results were not unusual and within the fluctuation seen in results over the long term.

### **3.3 Site inspection and assessment**

Site inspections and assessment by our nuclear regulators are essential for effective regulation of nuclear sites. The main aim of our site inspection and assessment is to provide assurance that an operator is complying with the relevant limits and conditions of its authorisations issued under the Radioactive Substances Act 1993 (RSA 93), the Environmental Protection Act 1990 (EPA 90) and other relevant legislation and policy. The following provides highlights of our site inspection and assessment activities over the reporting period.

#### *Groundwater protection*

We carried out a team inspection at the Magnox Reprocessing Plant in May, focussing on groundwater protection. This looked at bunds, process pipework, pipe trenches and entry points to the effluent system. The inspection raised a number of issues including the definition of standards for this type of infrastructure, and general housekeeping. We found a number of situations where steam condensate discharges directly to ground. We are keen to see such discharges stopped because the condensates may increase the migration of any contamination in the ground.

### *Site Ion Exchange Plant (SIXEP)*

Last year, discharges of caesium-137 from SIXEP were elevated following an ion-exchange bed change. This was found to be as a result of the spent ion-exchange bed not being discharged fully. We reviewed the situation with Sellafield Ltd in November 2007 and conducted a follow-up inspection this May to ensure that appropriate improvements have been made on plant. We were generally pleased with the improvements and the increased staff awareness of this issue.

A trial using pre-washed clinoptilolite in the ion-exchange bed started in May. It is hoped that this will further improve the degree of radionuclide removal, particularly for strontium-90.

### *Fuel storage facilities*

We inspected three fuel storage facilities at Sellafield:

- We carried out a joint inspection with NII in May to assess arrangements for checking the integrity of the THORP Receipt & Storage pond. We were made aware of two independent reports which confirmed that the integrity of the pond remains good.
- An inspection of the piles fuel storage pond in May identified outstanding improvements to the leak detection system, continued slippage in the local effluent treatment plant programme and the possible impact of algae on the sand bed filters. We have asked the plant managers to ensure that all environmental issues raised are tracked until they are finally resolved.
- In June we inspected the first generation Magnox storage pond. Progress has been made in terms of managing the environmental risk associated with this facility. Sellafield Ltd is working on a systematic environmental assessment for the pond, which will form the basis for developing an environmental safety case for clean-up and decommissioning.

### *Records management at LLWR*

We completed a two-day inspection of records at the LLWR in May. Handling of records was generally good, although we identified four actions which we have asked LLWR to address.

- Although all records relevant to the RSA93 Authorisation appeared to be in place they were not all recognised formally as environmental records within their procedures. We have asked LLWR to review the scope of their records before the end of August.
- The RSA93 Authorisation requires all records of compliance with the authorisation to be retained indefinitely unless agreed otherwise with the Environment Agency. No such agreements are in place, yet certain compliance records were identified with shorter retention periods. We have asked LLWR to review retention periods and propose any agreements for shorter retention periods they may wish to adopt, before the end of August.
- We identified certain minor anomalies and omissions in documented procedures which we have asked LLWR to correct before the end of August.
- We have asked LLWR to update us on record storage locations for our agreement before the end of July.

### 3.4 Enforcement

We expect full voluntary compliance with legal requirements and authorisations. However, we will not hesitate to use our enforcement powers, if necessary, to secure compliance, or to ensure that preventative or remedial action is taken to protect the environment. The need for enforcement may stem from an unauthorised 'incident' or from a breach of the conditions of an authorisation or permit. This section contains a summary of enforcement activity during the quarter and any follow-up of previous action.

#### *Sellafield*

We issued four warning letters in May, relating to the following events and issues:

- Inadequacy of bunding and working arrangements and documents relating to the management of liquid effluent flow into the Replacement Holding Tanks during outage of the Segregated Effluent Treatment Plant. This was associated with a spillage of liquid effluent from a holding tank in March.
- Inadequate maintenance of flow measuring equipment in a borehole used to pump groundwater from an area close to the High Activity Storage Tanks.
- Failure to renew an existing temporary registration for a minor aerial discharge outlet from a demolition project.
- Failure to register a minor aerial discharge outlet at the laboratory facility.

We received a response to the enforcement notice that we issued to Sellafield Ltd in April which focussed on improvements to the means used to exclude solids from aqueous waste. We are discussing the response and the improvements programme with Sellafield Ltd. We also met with the NDA in May to discuss potential improvements to the final filtration system on the sea pipelines.

### 3.5 Events and incidents

This section contains a report of events and incidents of relevance from an environmental perspective.

#### *Sea Line 3 final filtration*

On 2 May, the mesh of one of the 'Vee Bee' filters on sea line 3 was found to be damaged. We will follow this up as part of our ongoing investigation into previous instances of filter damage.

#### *Iodine-129 gaseous discharges*

Sellafield Ltd reported that there was an elevated discharge of iodine-129 to air on 3-4 June 2008 from the stack which serves the Magnox reprocessing plant. Action was taken immediately to stop the discharge and discharges have returned to normal levels. The elevated discharge has been measured as being small fractions of the RSA93 weekly and annual discharge limits (6% and 1%, respectively), and the impact has been assessed as extremely low (the dose to the most exposed members of the public would be less than 0.001% of the dose limit). However, the elevated discharge did exceed the plant investigation level (set internally by Sellafield Ltd) and consequently Sellafield Ltd is now investigating this event. We will monitor the Sellafield Ltd investigation and

consider whether there are any authorisation compliance issues associated with the event. There is no evidence to suggest that this event is linked to the elevated iodine in local milk (see section 3.2) since it occurred after those levels had returned to normal.

## **4 STRATEGIC OBJECTIVES**

In addition to the areas covered in sections 2 and 3, we carry out a wide range of other work aimed at achieving the objectives set out in our strategy. This section provides a summary of progress against these other objectives.

### **4.1 Reduction of environmental risk and avoidance of further legacies**

#### *Fuel Handling Plant (FHP) ponds*

We reviewed Sellafield Ltd's updated pond water remediation strategy for the Fuel Handling Plant in May. The on-going strategy is to maintain 'as designed' storage conditions, prioritise the removal of corroded fuel, and to minimise the release of radioactivity by cleaning and decontaminating skips and containers promptly and effectively.

#### *Calder Hall asbestos removal*

Sellafield Ltd have proposed that over 1,000 tonnes of asbestos from the heat exchangers could be sent to hazardous landfill as waste exempt from authorisation under the Radioactive Substances Act. To strengthen the case for this we have suggested further sampling of *in situ* material and waste contained within ISO containers. We received a revised proposal from the project team in May which incorporates these suggestions.

#### *Calder Hall cooling tower demolition*

The report on high volume air sampling undertaken during demolition concluded there were no significant environmental effects arising from the dust cloud.

### **4.2 Integrated waste strategy and its improvement**

#### *Effluent management at Sellafield*

We visited the Atomic Weapons Establishment (AWE) at Aldermaston (another complex nuclear site) to look at recent improvements to its liquid effluent management systems and to compare with those in use at Sellafield (see 4.5). We have discussed the outcome from our Aldermaston visit and the future discharge challenges at Sellafield with Sellafield's Aqueous and Gaseous Waste Steering Group.

#### *Low level waste(LLW) strategy*

We met with Sellafield Ltd to discuss progress on their best practicable environmental options work for the treatment of LLW that will contribute to their developing LLW strategy. They are developing this in parallel with the development of a national LLW strategy. We are supportive of this work and are supporting the development of guidance on associated issues such as waste dilution and averaging volumes for the purposes of characterisation.

#### *Studsvik LLW processing facility*

We held a routine progress meeting with Studsvik and NII in April. The company has now let a contract for the construction and installation works at the Lillyhall site. The facility is expected to start operating towards the end of 2008. We discussed authorisation of the transfer of LLW to the Lillyhall site for active commissioning of the facility.

### **4.3 Disposable waste forms**

#### *Legacy ponds & silos (LP&S) wastes*

We have nearly completed our review of the report on characterisation of high activity sludge, and plan to share the final draft with Sellafield Ltd.

#### *Magnox Encapsulation Plant (MEP)*

To date, 16 MEP drums have been retrieved from Encapsulated Product Store 1 (EPS1) for inspection. Small bulges have been found on three of these drums. The cause of the bulges is currently unknown. Two theories are that they may be due to heavy items falling into the drum during manufacture, or to expansive corrosion of the uranium content. Research is being carried out on the potential impacts of drum distortion.

### **4.4 Infrastructure and asset care**

#### *High Level Waste Plants (HLWP)*

We met with Sellafield Ltd and NII to discuss progress against the recommendations from our joint asset care inspection at HLWP in November 2006. While there has been progress in some areas there remains more work to do and we have requested that Sellafield Ltd submit a revised implementation programme for the outstanding work.

#### *Wet Inlet Facility (WIF) chiller bund*

We inspected the condition of the WIF chillers and their associated bund in May. Engineering improvements are being made, so that different discharge routes can be used for uncontaminated rainwater and water from the pond purge or pond recirculation. The arrangements appear satisfactory and the general asset care of this bund and its chiller equipment has improved since we raised concerns during the inspection of ponds in 2006.

### **4.5 Development of guidance on Best Available Techniques (BAT)**

#### *Aqueous effluent management at Aldermaston*

We undertook a benchmarking visit to AWE Aldermaston with staff from Sellafield Ltd in April. We were updated on the construction of the new Liquid Effluent Treatment Plant (LETP), and visited the North Ponds water management facility. These new developments have removed the need for use of the discharge pipeline and eliminated discharges to the River Thames. AWE recognise that this work has delivered significant business benefits, including a reduced need for effluent treatment, reduced reliance on, and maintenance of ageing infrastructure, enabling early decommissioning, reduced solid waste arisings and discharges, and improved standing with stakeholders.

We are considering the developments at Aldermaston in the development of long term strategy for liquid effluent at Sellafield.

#### **4.6 NDA issues and national waste strategy**

##### *Sellafield lifetime plan (LTP08)*

We want to see old nuclear industry sites cleaned-up as soon as possible. Delays to site clean-up/decommissioning could result in increased environmental detriment in terms of increased discharges and additional solid waste arisings. There may also be increased environmental risks.

Discussions between NDA, Sellafield Ltd and the regulators related to Lifetime Plan 08 and funding shortfalls continued. We have provided advice to SL on the process for justifying (from an environmental perspective) any significant changes to the Lifetime plan.

#### **4.7 Integrated fuel and nuclear materials management**

##### *Magnox Operating Plan (MOP)*

About 218 te of Magnox fuel had been reprocessed by the end of June 2008 against a financial year target 2008/9 of 540te. This is marginally ahead of programme for the year. No corroded fuel has been processed so far this year, because of problems in cleaning wash baskets. However, stocks of wetted fuel have reduced to less than 1,000 tonnes as de-fuelling at the power stations continues to be delayed. One skip of Studsvik fuel was processed in May.

NDA is continuing to explore potential options as contingencies for reprocessing spent Magnox fuel. These include reprocessing Magnox fuel through Thorp, or vacuum-drying the fuel and storing it.

Sellafield Ltd has accepted our expectations for the Magnox reprocessing shutdown programmed for September 2008. The shutdown is an opportunity to improve arrangements to prevent solid matter from entering the aqueous waste from the plant and to implement standards relating to the operational life of air extract (HEPA) filters. Important inspection, maintenance and asset improvements will also be undertaken. We are pleased to see that learning from the previous shutdown will be applied, for example, through the use of dry decontamination techniques to minimise aqueous effluents and improved arrangements for sorting and segregating solid waste.

##### *Oxide fuels strategy*

An initial version of an Oxide Fuel Strategy was tabled at the third meeting of the Oxide Operating Strategy Regulatory Forum. To inform the ongoing development of the next version a number of issues around THORP and the HA evaporators need to be clarified and these form the subjects of a separate study, undertaken by Sellafield Ltd.

We met with Sellafield Ltd and NII in April to discuss progress on the AGR Interim Storage Strategy (AGRIS). The removal of multi-element bottles (MEBs) from the main pond at THORP remains slower than expected. Sellafield Ltd are researching the use of nitrate to dose the pond to passivate corrosion of sensitised stainless steel

cladding. They believe this could be delivered relatively quickly, and would reduce the pressure to remove redundant MEBs. We have indicated that we would expect the impact of nitrate on other pond materials to be fully assessed and proven benign.

The ion exchange skip placed in the THORP main pond to remove caesium-137 appears to be working well, with a noticeable reduction of radioactivity in pond water.

#### **4.8 Contaminated land and groundwater**

##### *End States and contaminated land workshop*

NDA provided an overview of the output from their end state consultation process and the status of contaminated land on their sites at a workshop in April. We agreed collectively that there would be value in developing a national position on contaminated land and groundwater management at nuclear licensed sites.

##### *Groundwater technical meeting*

We attended the first routine meeting, which aims to provide a forum to review interpretation of monitoring data, monitor actions and facilitate regulatory interaction. The regime for maintenance, design, rehabilitation and abandonment of boreholes was discussed, and we cited EA and USEPA guidance. Standards and procedures have been implemented to ensure consistency of sampling inside and outside the Separation Area.

##### *Site Protection and Monitoring Programme (SPMP)*

We met with Sellafield Ltd to discuss the design of their SPMP, which is required under the PPC permit (now known as the Environmental Permit) to establish the extent and nature of the reference data required to assess the current level of non-radioactive contamination on the site. Overall, the programme aligns with our expectations. However, due to the complexity of the site and the need to co-ordinate with existing land contamination projects, the reference data will not be available within 6 months of permit issue. We have agreed that data reporting should be co-ordinated with that required under the RSA93 authorisation.

##### *Research & development*

We discussed R&D with Sellafield Ltd's contaminated land team and asked whether research that is being done in this area is being fed into the lifetime and technology plans. They cited various examples, such as the leak detection information technologies, of research outputs being used. They also identified future R&D requirements including alternative sampling techniques, thermal treatment for ILW, in situ bio-remediation of groundwater plumes, and other treatment technologies.

#### **4.9 Organisational change**

##### *LLWR*

The share transfer for UKNWM Ltd to become the new parent body organisation (PBO) for the LLWR took place in April. We attended a joint transition steering group meeting in April, which reviewed the transition process to date and started to compile lessons learned.

Following share transfer we formally met with LLWR and the new PBO staff to begin discussions on key issues such as development of Vault 9 (due to start construction in July), the development of the Post-Closure Safety Case (PCSC) due in 2011 and their input to the NDA LLW Strategy development, including proposals to develop new disposal and treatment options to support increased segregation, sorting and treatment of LLW. We undertook to continue dialogue as these issues progressed.

The LLWR and NDA are now looking at the impact of funding issues as LLWR develop their LTP08 due for NDA approval in September 2008. We will be reviewing the development of the LTP during the summer, paying particular interest in any work that may be delayed due to funding restrictions.

#### *Sellafield PBO transition*

NDA received four tenders on 7 April. Announcement of the preferred bidder is expected in July, with the contract due to be awarded in October.

We continued to be involved in the transition process (working closely with NII, OCNS and DfT) both in an advisory and regulatory capacity. For example, we and NII met with Sellafield Ltd to discuss specifications for the senior executive team posts and the induction training being developed by Sellafield Ltd for the secondees that will be placed in the Site Licence Company by the new PBO.

### **4.10 Post Closure Safety Case (PCSC) and future options for LLWR at Drigg**

#### *PCSC-related developments*

We have had several constructive meetings over the period with LLWR to discuss progress with the environmental safety case programme. Progress is generally good and LLWR delivered Improvement Requirement 2 on time in May, along with other due requirements. This requirement represents a significant milestone leading up to a full environmental safety case, due in 2011. Specifically it required LLWR to address risk management and optimisation of the site's performance, in addition to providing us with information sufficient to allow us to review the sites capacity to take further waste. We have commenced review of this submission and once complete, will use the outcome to inform a review of the RSA93 authorisation.

#### *Vault 9*

We met with LLWR in May to discuss progress with provision of documentation to support Vault 9 design and build. The LLWR intend to start building around the end of July. Most of the documentation is now complete and from our review we saw no significant problems with the design for the purpose of storage of waste, nor potentially the future disposal of waste. However, we have identified a number of requirements that will need to be addressed before we would allow disposal in the vault, such as:

- Demonstration of acceptable performance and consistency with the Environmental Safety Case.
- Demonstration that the preferred design does not change as a result of Environmental Safety Case developments.
- Provision of a suitable Hydrogeological Risk Assessment (HRA) or equivalent work as part of the Environmental Safety Case.

- Justification of the philosophy and benefits of the proposed vertical drains as part of the overall containment system.
- Demonstration that the proposed vertical drains, cut-off wall and cap designs being developed as part of closure engineering will perform adequately and consistently with assumptions made within the Environmental Safety Case and can be constructed.

During Vault 9 construction we will undertake a series of inspections to provide confidence in the construction of key design components, such as the liner and leak detection layers.

#### **4.11 Wider communications**

##### *Nuclear sector plan – environmental performance in 2006*

The Environment Agency and the nuclear industry agreed eight key environmental objectives in 2005 as part of the Nuclear Sector Plan. We published the first environmental performance report (for 2006) against the plan in April.

Overall, the environmental performance of the sector was very good during 2006. However, we identified a number of areas on which it needs to focus its attention in order to further improve performance. The full report can be found on our website at: [Nuclear Sector Plan - 2006 Environmental Performance Report](#)

##### *Current consultations*

Defra are currently consulting on their statutory guidance to the Environment Agency, and on the revised UK radioactive discharge strategy. The consultation documents can be found on the internet:

<http://www.defra.gov.uk/corporate/consult/rad-discharges-eaguidance/index.htm>

<http://www.defra.gov.uk/corporate/consult/rad-discharges-ukstrategy/index.htm>

The statutory guidance makes reference to our Radioactive Substances Regulation Environmental Principles (REPs), which are also at the consultation stage. We are also consulting on our guidance on Best Available Techniques (BAT). These documents can be found at:

<http://www.environment-agency.gov.uk/yourenv/consultations/2066484/?version=1&lang=e>

The Government published a white paper on a framework for geological disposal in June. This can be found at:

<http://www.defra.gov.uk/environment/radioactivity/mrws/pdf/white-paper-final.pdf>

We are also consulting on revisions to our guidance on requirements for authorisation for solid radioactive wastes both for near surface and deep geological disposal:

[http://www.environment-agency.gov.uk/yourenv/consultations/current\\_consultations/?version=1&lang=e](http://www.environment-agency.gov.uk/yourenv/consultations/current_consultations/?version=1&lang=e)

## **ANNEX 1: THE ROLE OF THE ENVIRONMENT AGENCY AT NUCLEAR SITES**

We have two Nuclear Regulation Groups (NRGs), one group covering nuclear sites in the north and the other covering sites in the south. NRG (North) is based at our office at Penrith in Cumbria and includes a team of nuclear regulators who cover Sellafield, Windscale and the Low Level Waste Repository.

We collaborate with a number of other Environment Agency groups – in particular those which advise on policy, process, radiological monitoring and assessment and nuclear waste assessment. We also receive support from colleagues in other functions such as water quality, waste, contaminated land and ecology. Close working ensures an integrated approach to environmental protection.

We also work with a wide range of external stakeholders – local, national and international. In particular, we have close working arrangements and liaison with our colleagues in the Nuclear Installations Inspectorate (NII) of the Health and Safety Executive (HSE). We maintain good contacts with the Food Standards Agency (FSA), the Nuclear Decommissioning Authority (NDA), other regulatory bodies, local authorities and our sponsoring department, the Department for Environment, Food and Rural Affairs (Defra). We also have good links with our regulatory counterparts abroad, particularly in Norway, Ireland and France.

The NRGs work to ensure the protection of the public and the wider environment from radiation, to prevent pollution, to protect and enhance the environment and to contribute to the UK's aim of sustainable development. We achieve this through influence and education in addition to licensing/authorisation, compliance assessment and enforcement under legislation such as the:

- Environment Act 1995, which gives us our regulatory powers, etc
- Radioactive Substances Act 1993 (RSA 93), which deals with the disposal and discharges of radioactive waste from nuclear sites,
- Environmental Permitting (England and Wales) Regulations 2007, which covers non-radioactive pollution and non-radioactive waste management licensing, and
- Control of Major Accident Hazards (COMAH) Regulations.

We also have teams who deal specifically with water abstraction licensing, non-radioactive waste management licensing and liquid effluent discharges not covered under the above regulatory regimes but by 'consents' issued under the Water Resources Act 1991.

The Sellafield site is moving from an operational to a decommissioning and clean up phase. Decommissioning and clean-up will involve the facilities which are currently operating, as well as the legacy facilities which contain radioactive wastes from the early days of civil and military operations. It is important during this period of change that the strategic long-term aspects of the regulation of Sellafield are managed so as to prevent and minimise future environmental impacts and risks.

In summary, we are responsible for regulating and encouraging the prevention and minimisation of the current and future environmental impacts and risks from all activities at nuclear sites.

## **ANNEX 2: GLOSSARY**

Not all terms may have been used in this report

**Absorbed radiation dose:** Quantity of energy imparted by ionising radiation to unit mass of matter such as tissue. Unit gray, symbol Gy. 1Gy = 1 joule per kilogram.

**Activity:** The rate of radioactive decay. Measured in the standard international unit, Becquerels (Bq).

**Alpha particle/radiation:** A particle consisting of two protons and two neutrons. Emitted by some radionuclides.

**Authorisation:** Permission given by the Environment Agency under certain environmental legislation e.g. the Radioactive Substances Act 1993, subject to limits and conditions which must be met.

**Becquerel:** The standard international unit of radioactivity equal to one radioactive transformation (decay) per second.

- MBq equals 1 million transformations per second.
- GBq equals 1 billion transformations per second.
- TBq equals 1000 billion transformations per second.

**Best Available Techniques (BAT):** The use of the most effective process in preventing, minimising or rendering harmless polluting emissions taking into account availability.

**Best Practicable Environmental Option (BPEO):** A concept developed by the Royal Commission on Environmental Pollution, it implies that decisions on waste management have been based on an assessment of alternative options evaluated on the basis of factors such as the occupational and environmental impacts, the costs and social implications.

**Best Practicable Means (BPM):** Within a particular waste management option, the BPM is that level of management and engineering control that minimises, as far as practicable, the release of radioactivity to the environment whilst taking account of a wider range of factors, including cost-effectiveness, technological status, operational safety, and social and environmental factors.

**Beta activity:** Radionuclides that decay by emitting a beta particle.

**Beta particle/radiation:** An electron emitted by the nucleus of a radionuclide.

**CEAR:** see EAR

**COMAH:** Control of Major Accident Hazards Regulations

**CHPP:** Combined Heat & Power Plant

**Critical group:** A term used in radiation protection which refers to a small group of members of the public whose radiation exposure (or radiation dose) is reasonably uniform and is typical of people receiving the highest dose from a given source such

as a nuclear power station. If the radiation exposure of this group is within statutory limits, then it can be inferred that the exposure of all others will also be within limits.

**Dose:** A measure of the radiation received. Various forms of dose are commonly referred to, including equivalent dose, effective dose and absorbed dose (measured in Sieverts and Grays). In this document it is used primarily to mean the effective dose.

**Dose limit:** For the purposes of discharge authorisations under the Radioactive Substances Act 1993, the UK applies a legal limit of 1 milliSv/y (1,000 microSv/y) to members of the public from all man-made sources of radiation (other than from medical exposure).

**EAR:** Environment Agency Requirement – a supplement to an RSA93 authorisation which details an approval, agreement, specification or notification referred to in the authorisation. The set of EARs for a particular authorisation is known as the Compilation of Environment Agency Requirements (CEAR).

**Effective dose:** The quantity obtained by multiplying the equivalent dose to various tissues and organs by a weighting factor, appropriate to each, and summing the product. It allows the various equivalent doses in the body to be represented by a single number giving a broad indication of the health impact on an individual from an exposure to ionising radiation, regardless of the energy and type of radiation. This is the radiation dose quantity most often used and is often shortened simply to “dose”.

**Environment Act 1995 (EA 95):** The main piece of legislation giving the Environment Agency its powers, aims and objectives.

**Equivalent dose:** The quantity obtained by multiplying the absorbed dose by a factor to allow for the different effectiveness of various types of ionising radiations in causing harm to tissue.

**Exposure:** In the context of radiation, exposure refers to the radiation dose - see effective dose.

**Food Standards Agency (FSA):** The Food Standards Agency was formed in April 2000. It took over responsibility for food safety issues in the UK from MAFF.

**Fuel reprocessing:** The processing of spent uranium fuel from nuclear power stations to separate it into plutonium, uranium and waste fission products. The plutonium and uranium may be used again in new nuclear fuel.

**Gamma ray/radiation:** A discrete quantity of electromagnetic energy without mass or charge. Emitted by a radionuclide.

**Half-life:** The time required for the radioactivity of a radionuclide to decrease by radioactive decay to one half of its initial value.

**Integrated Pollution Control (IPC):** A statutory means of controlling pollution from major (non-nuclear) industry set up under the Environmental Protection Act 1990 (EPA 90). The main objectives are to prevent, minimise or render harmless polluting substances and to consider discharges from industrial processes, to all media, in the context of the effect on the environment as a whole.

**Intermediate Level Waste (ILW):** Waste with radioactivity levels exceeding the upper boundaries for low level waste but which does not require heat generation by the waste to be accounted for in the design of disposal or storage facilities.

**Isotope:** Any of two or more species of atoms of a chemical element with the same number of protons but different numbers of neutrons.

**Lifetime Plan (LTP):** The long-term plan covering the remaining lifetime of a nuclear site covered by the NDA.

**Low Level Waste (LLW):** Waste containing levels of radioactivity greater than those acceptable for disposal with normal refuse but not exceeding 4 GBq/tonne alpha-emitting radionuclides or 12 GBq/tonne beta-emitting radionuclides.

**LLWR:** Low Level Waste Repository near Drigg

**Magnox:** A magnesium/aluminium alloy that is used in the manufacture of the canister for uranium metal fuel that is used in a certain type of nuclear reactor.

**Magnox reprocessing:** The reprocessing of Magnox fuel. See fuel reprocessing.

**Medium Active Concentrate (MAC):** A liquid waste arising during fuel reprocessing. It is concentrated by evaporation for storage purposes. It is similar to highly active liquor but is less radioactive.

**Microsievert:** See Sievert.

**Most exposed group:** Those members of the public who share similar habits and receive the highest dose from radioactive discharges. It should be noted that unlike the critical group definition, this does not take account of direct radiation from the site and therefore the most exposed group may not always be the same as the critical group.

**Multi-media Authorisation:** Authorisation issued by the Environment Agency under the Radioactive Substances Act 1993 of a 'multi-media' or integrated type covering radioactive waste disposals to land, sea and air.

**Near Term Work Plan (NTWP):** The detailed work plan over a three-year period for a nuclear site covered by the NDA. See also Lifetime Plan.

**NII:** Nuclear Installations Inspectorate is the part of the Health & Safety Executive which has responsibility for enforcing legislation relating to nuclear safety under the Nuclear Installations Act 1965 (NII 65). The NII is also responsible for regulating the storage and accumulation of radioactive waste on nuclear sites while the Environment Agency is responsible for regulating the disposal of that waste.

**Non-radioactive waste:** Solid waste that contains no radioactivity of manmade origin and with sufficiently low levels of natural radioactivity for it to be excluded from the provisions of the Radioactive Substances Act.

**Nuclear Decommissioning Authority (NDA):** A public body to come into force on 1 April 2005 to oversee and manage the decommissioning and clean-up of the UK's civil nuclear legacy.

**PBO:** Parent Body Organisation. The company or group of companies that owns the shares in the Site Licence Company. The PBO has no direct operational responsibilities. However, for the SLC it owns, the PBO should provide the vision for the site, the key personnel to be seconded into the SLC to translate the vision into reality and provide the leadership and management support for the SLC to deliver the NDA contract.

**Pollution Prevention and Control Regulations 2000 (PPC):** The system of Integrated Pollution Prevention and Control applies an integrated environmental approach to the regulation of certain industrial activities. This means that the non-radioactive component of emissions to air, water, and land, plus a range of other environmental effects, must be considered together. The PPC regime replaced the Integrated Pollution Control regime (IPC).

**Radioactive Substances Act (RSA) 1960, 1993:** Statutory legislation to control the keeping and use of radioactive substances and the accumulation, discharge or disposal of radioactive waste.

**Radioactive waste:** Material that contains radioactivity above the appropriate levels specified in the Radioactive Substances Act 1993 and which meets the definition of waste given in the Act.

**Radionuclide:** A general term for an unstable nuclide that emits ionising radiation (e.g Cs-137).

**Sievert (Sv):** A measure of radiation dose received.

- millisievert (mSv): one thousandth of a sievert.
- microsievert or microSv ( $\mu$ Sv): one millionth of a sievert.

Often presented as a dose received over a period of time (dose rate) e.g. microSv per year

**Site Licence Company (SLC):** Responsible for the day to day operation of a nuclear licensed site under contract to the NDA. They hold the nuclear site licence and the majority of the environmental authorisations.

**SIXEP:** Site Ion Exchange Plant

**SL/Sellafield Limited:** The company that operates the Sellafield and Calder Hall sites i.e. the Site Licence Company and authorisation holder.

**Technetium-99 (Tc-99):** A radioactive element (half-life of 213,000 years) that is a product of nuclear fission. An emitter of low energy beta particles.

**Terabecquerel (TBq):** see Becquerel.

**THORP:** Thermal Oxide Reprocessing Plant

**UKAEA:** United Kingdom Atomic Energy Authority – the company that operates the Windscale site i.e. the Site Licence Company and authorisation holder.