Environment Agency

nuclear sector plan

Nuclear sector plan 2009 performance report

Foreword

This is our fourth annual report on the environmental performance of the nuclear industry in England and Wales. It describes the performance of the industry measured against the objectives and indicators set out in the Nuclear Sector Plan.

We published the first nuclear sector plan in November 2005, and have worked closely with the industry to update it. A revised version of the plan was published in July 2009. It builds on the successes delivered so far and looks ahead to forthcoming challenges such as the need to minimise greenhouse gas emissions and adapt to climate change.

The plan sets out the main environmental issues facing the nuclear industry over the next few years, and the ways in which we can work together to address them. It encourages nuclear operators to continue to be responsible for environmental issues and to improve further their environmental performance beyond the minimum standards of regulation. It also commits us to continue our work to be a 'better regulator', focusing on significant issues and streamlining regulation as appropriate.

We are delighted that the nuclear industry continues to support the use and further development of the Nuclear Sector Plan. We want the industry to use it as a basis for regular dialogue between sites on what represents best practice and so to encourage greater sharing of lessons learned and innovative thinking that will support further improvements in environmental performance.

In recognition of the joint effort between ourselves and the nuclear industry, where 'we' is used in the body of this document it applies to the Environment Agency and the industry collectively. Logos of organisations participating in this initiative are shown below.

Ed Mitchell / Environment Agency

Summary

This report describes the environmental performance of the nuclear industry in England and Wales. It measures performance against the objectives and performance indicators set out in the revised Nuclear Sector Plan, published in July 2009. Overall, the environmental performance of the industry during 2009 was good, with improvements made in a number of areas. Here, we highlight how the industry performed against its eight main environmental objectives during the year, and since 2005 when we started reporting.

Our 'traffic light' indicates the status of each objective as follows:

 Good / improving performance since 2005

 Areas where performance needs to improve

 Poor / worsening performance since 2005

Reduce consumption of natural resources 
The industry continues to reduce its resource use. In 2009 it used 14 million cubic metres of water and 7 million megawatt hours of electricity, that's 13 and 9 per cent less (respectively) than in 2005.
Recognise the impact of climate change 
The nuclear industry generated 18 per cent of the UK's electricity, which if produced by fossil fuels, would have released around 29 million tonnes of CO_2. The industry reduced its own emissions of greenhouse gases to 0.59 million tonnes of CO_2 equivalent: a reduction of nearly 8 per cent compared to 2008.
Minimise discharges to air and water 
Discharges to air and water remain low and on target to meet UK Strategy commitments. Some slight increases in the discharges to water since 2008 reflect an increase in fuel reprocessing and two power stations being brought back into service. The overall trend, since 2005, shows reducing discharges to air and water.
Minimise and manage solid waste 
During 2009 the industry managed to avoid sending 67 per cent of its low level waste to the national repository. This is a significant achievement which helps protect the limited capacity of the repository. The industry continues to recycle the majority of its inert and non-hazardous waste. However, it needs to make progress in conditioning and packaging 'legacy waste'. Less than a quarter of intermediate level waste has been conditioned and packaged. This proportion has remained roughly the same since 2005.
Demonstrate sound environmental management and leadership 
Nuclear operators continue to deliver robust environmental management arrangements at their sites. During 2009 the industry supported an Environmental Leadership Conference to share best practice.
Manage land quality and biodiversity 
The industry has arrangements in place to manage land quality and biodiversity at most sites. Work has started to develop the regulators' common expectations for land quality management. Biodiversity Action Plans are being implemented at most nuclear sites.
Improve or maintain a very high level of regulatory compliance 
The nuclear industry continues to maintain a high standard of regulatory compliance with far fewer incidents than other regulated sectors. Only three enforcement actions were taken against the industry during 2009.
Achieve better regulation 
The Environment Agency made good progress against each of its improvement goals: producing new guidance, promoting the monitoring certification scheme, developing a new permitting regime and working to make risk-based regulation clearer.

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Introduction

This report presents the latest information on environmental performance for the nuclear industry in England and Wales. It describes the progress of the Environment Agency and the nuclear industry towards meeting the objectives set out in issue 2 of the Nuclear Sector Plan published in 2009:

1. Minimise the amount of natural resources used
2. Recognise the impact of climate change
3. Minimise discharges to air and water
4. Minimise and manage solid waste
5. Demonstrate sound environmental management and leadership
6. Manage land quality and biodiversity
7. Improve or maintain a very high level of regulatory compliance
8. Achieve better regulation

Unlike previous reports, this report describes the performance of the nuclear industry in more strategic terms – building on the information collected in previous reports rather than focusing solely on in-year performance.

Performance of the nuclear industry

The nuclear sector is diverse. It includes a wide range of operations and products: electricity generation, decommissioning and clean-up of redundant facilities, waste disposal, research and development and defence.

Together with the support and encouragement of the Environment Agency, the nuclear industry has committed to and successfully delivered year-on-year improvements in its environmental performance whilst also continuing to make significant achievements and contributions to the UK economy. For example, during 2009:

- Nuclear energy supplied approximately 18 per cent of the UK's electricity, supported by two nuclear power stations being returned from an extended period of maintenance.

- Significant engineering projects took place, including completion of the first Astute class submarine for the Royal Navy, powered by a 'fuelled for life' nuclear reactor.

- The first UK strategy for nuclear low level waste (LLW), focusing on providing sustainable solutions for waste management, was published for consultation.

- New routes for the treatment and disposal of low level radioactive waste were established, including the opening of a new metal recycling facility.

The **Studsvik Metal Recycling Facility** (MRF) which opened in 2009 at Lillyhall, Cumbria treats & recycles low level metallic wastes from nuclear sites in England and Wales. Using the MRF helps ensure that **low level waste** sent to the Low Level Waste Repository **is minimised.**

Highlights in the environmental performance of the nuclear industry in 2009 include:

- A significant contribution towards helping the UK meet its climate change targets. Electricity generated by nuclear power saved 29 million tonnes of CO_2 (equivalent) from burning fossil fuels. The industry also reduced its own emissions of greenhouse gases by 8 per cent compared to 2008.

- The industry managed to avoid sending 67 per cent of its low level radioactive waste to the national repository through recycling or using disposal routes other than LLWR. This is a significant achievement which helps protect the limited capacity of the repository, making better use of alternative, suitable disposal routes.

- The industry continued to reduce its resource use, using 13 per cent less water and 9 per cent less electricity than in 2005. Similarly, volumes of inert and non-hazardous waste continue to reduce from the peak levels reported in 2006, while the majority of this volume is recycled.

- The nuclear industry continues to deliver a high standard of regulatory compliance with far fewer incidents than in other regulated sectors.

Areas for improvement

While the overall performance of the nuclear industry is good, more needs to be done to improve the efficient use of resources, to reduce greenhouse gas emissions and to improve the understanding and management of contaminated land on nuclear sites. The industry recognises this and is already committed to improving performance in these areas and to sharing best practice.

A key area in which performance needs to improve is in the conditioning and packaging of 'legacy' intermediate level radioactive waste. Waste needs to be placed in a form suitable for disposal, or for safe and secure storage. It is not an easy issue to tackle, requiring the development of suitable plant and processes as well as regulatory approvals, but progress in this area is vital to minimise the environmental risk at nuclear sites. Since our first report was produced, the proportion of legacy waste that has been conditioned and packaged has increased in roughly the same proportion as waste arising as a result of decommissioning activities. This means the overall situation remains effectively static. The nuclear industry does need to improve this and is working with the regulators to consider how best this can be achieved.

More information

In the following chapters we describe the performance of the nuclear industry against each of the specific objectives. Information on the performance of individual companies within the nuclear industry can be found by following the links to their websites provided at the end of this report.

Significant challenges ahead

The formation of the new coalition government, and the review of government funding, presents a challenge to the nuclear industry as it does for all organisations. The challenge is for the nuclear industry and regulators alike to innovate and adopt a more pragmatic approach in addressing their responsibilities and so to minimise any possible impact on the pace and ability of the industry to deliver decommissioning and clean-up across legacy sites, as well as delivering other key nuclear projects such as a Geological Disposal Facility.

The need for timely decommissioning and clean-up of legacy nuclear sites is a key priority for the Environment Agency, Government and the nuclear industry. We want

to see the hazards and risks posed at these sites reduced as soon as possible, and recognise that this may mean delays at other, less hazardous sites. We want to avoid any delays adding to the overall burden of environmental risk, and to ensure that, once funds are available, decommissioning and clean-up can progress rapidly.

Climate change remains a priority issue that must be tackled. As with other industries, the nuclear industry will be participating in the Carbon Reduction Commitment (CRC) Energy Efficiency Scheme. This scheme aims to improve energy efficiency in large organisations. We hope that the work already underway as part of this Nuclear Sector Plan, will help the nuclear industry become more energy efficient.

Alongside other energy choices, plans for more nuclear power stations can help the UK to meet its climate change targets. We look to the industry to provide innovative solutions in delivering any new build, driving further improvement within the sector and attracting investment and new talent. We expect any new nuclear build to deliver the highest standards of environmental performance and, more generally, to support the ambition of the nuclear industry to find sustainable solutions for the efficient management and disposal of radioactive wastes.

Feedback

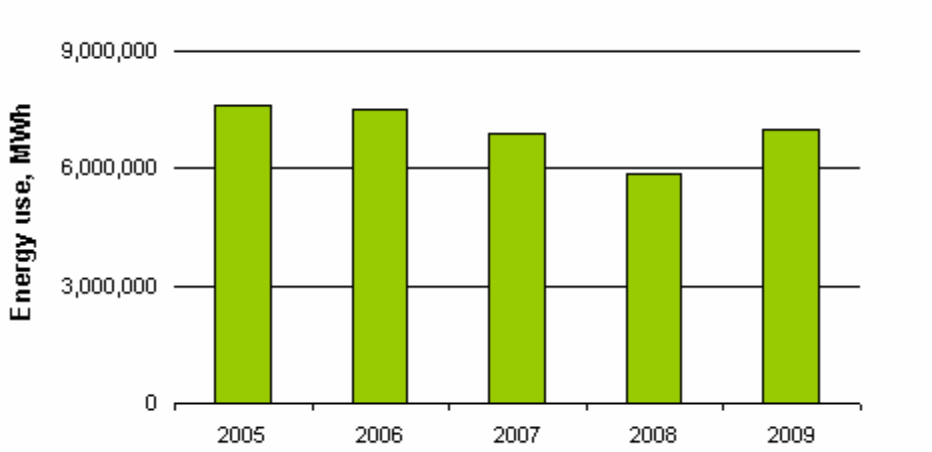
We'd welcome your views on the content or the format of the report. If you have any queries or wish to make any comments, please contact lisa.m.jones@environment-agency.gov.uk

Minimise the amount of natural resources used

Energy use

The industry continues to be a net generator rather than user of energy. In 2009, it generated over 47 TWh, using only 15 per cent of this. This increase in the amount of energy contributed to the UK grid (and in the overall energy use of the sector) is due to two nuclear power stations (Hartlepool and Heysham 1) being returned to service after an extended period of maintenance.

Total energy use



The amount of energy the industry uses depends upon the activities taking place at the sites. For many of the power stations this is a relatively fixed amount reflecting the equipment needed to operate and monitor the reactors. At other sites the energy use can reflect the amounts of decommissioning and clean-up undertaken.

Operators are looking to improve their understanding of how they use energy (and ways of minimising it), by raising awareness about energy use, encouraging energy efficiency and investing in new, more efficient facilities.

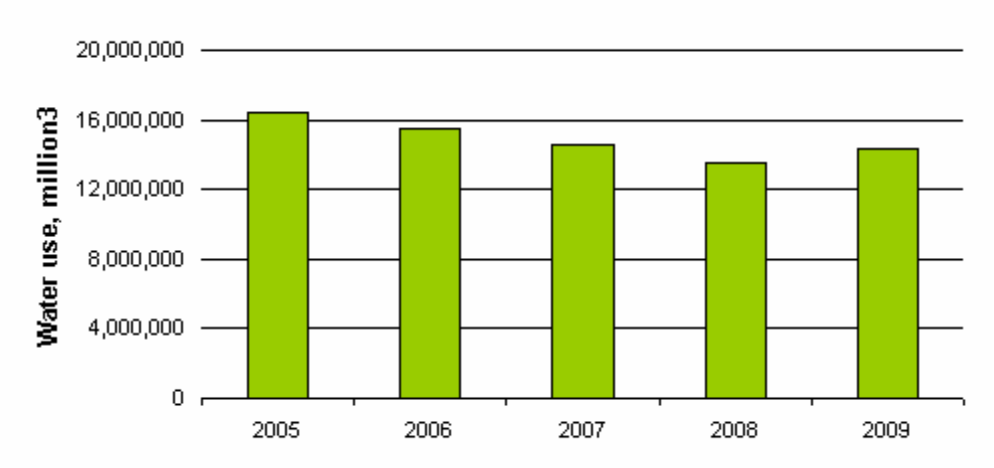
Water use

The nuclear industry has reduced its water use by 13 per cent over the last 5 years. The amount used in 2009 (14 million cubic meters (m^3)) was a slight increase on 2008, and reflects the two power stations being returned to service after an extended period of maintenance. Overall the amount of water used by the nuclear industry is low compared to other sectors, such as:

- Manufacture of chemicals, chemical products and man-made fibres - 604 million m^3
- Construction - 168 million m^3
- Research and development - 16 million m^3 [1]

[1] *A review of water use in industry and commerce – a summary report 2009. EN952. Envirowise*

Total water use



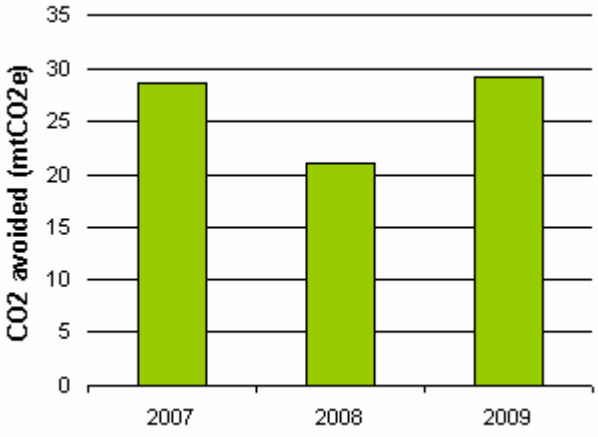
While this comparison largely reflects the small size of the nuclear industry it does show that the overall impact of the nuclear sector, compared to others, is small. Nonetheless, the nuclear industry is working to improve its water efficiency. Good progress is being made towards this – several sites are employing their own initiatives to reduce water use. For example, water use audits at Sizewell B, and water metering at Heysham 1.

Recognise the impact of climate change

As with other sectors the nuclear industry contributes to climate change and is also susceptible to its impacts.

Contributing to climate change

Carbon dioxide avoided

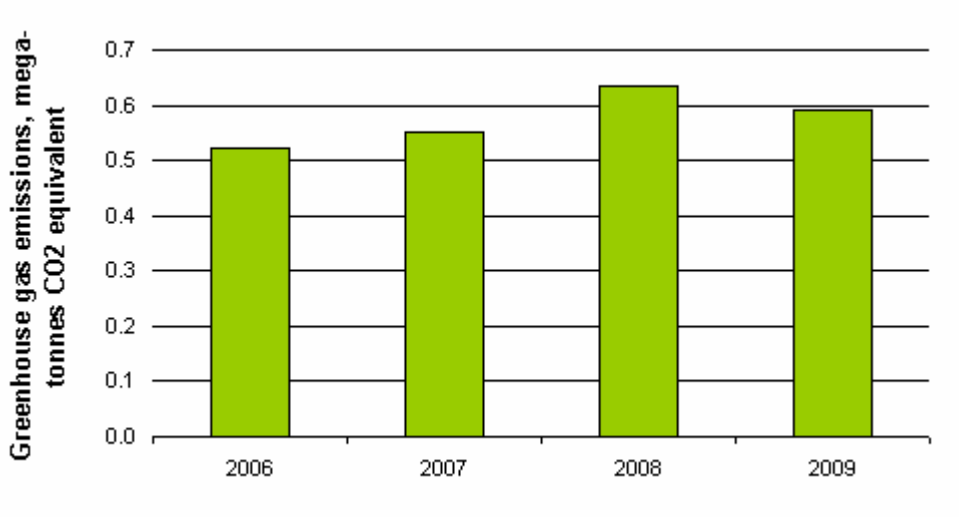


The nuclear industry provides electricity to the UK grid and, in doing so, contributes far less carbon dioxide (CO_2) by comparison with other forms of electricity generation. During 2009 nuclear electricity generation saved approximately 29 million tonnes of CO_2 (equivalent) from burning fossil fuels. This is a significant saving – equivalent to the household emissions from 29 UK cities.[2]

Understanding the overall contribution that the nuclear industry can make to climate change is complicated, but the industry is working to clarify this. For example, British Energy, part of EDF Energy, has produced an environmental product declaration for Sizewell B that describes the environmental impacts of the entire fuel cycle, including nuclear waste, spent fuel, CO_2, SO_2 and NO_x emissions.

[2] *Sustainable Energy Initiative: action & results 2006-08 http://www.ebrd.com/downloads/research/brochures/sei.pdf*

Total greenhouse gas emissions



Note: data from 2005 have not been included because they were unreliable

The total emissions of greenhouse gases fell in 2009 compared with 2008, although they were higher than those recorded in 2006 and 2007. The reasons for this are not yet fully understood. There is only limited information on the contribution to greenhouse gas emissions currently made by the nuclear industry. The industry is working to improve its performance in this area.

Adapting to climate change

Given the nature of hazards and risks associated with nuclear sites, and the long timeline of activities at sites, it is important that the industry considers how best to manage its own operations to adapt to the impacts of climate change. This includes planning for and adapting to increased risks of flooding and coastal erosion.

During 2009, operators reviewed the latest Shoreline Management and Catchment Flood Management Plans relevant to each of their sites.

Several operators are now doing further work to ensure they continue to understand and minimise the risk of flooding. In particular, the Low Level Waste Repository has carried out a significant review of coastal studies, including modelling the potential impacts, and prepared an environmental safety case for the repository.

Improving drainage on site

Sellafield have completed cleaning a site drainage system over 50 years old consisting of 12 kilometres of pipework below ground. A total of 15 tonnes of sediment was removed from the drainage system. Now an annual cleaning regime for gullies and catch-pits has been initiated, in addition to a maintenance plan which has been developed to address any identified defects.

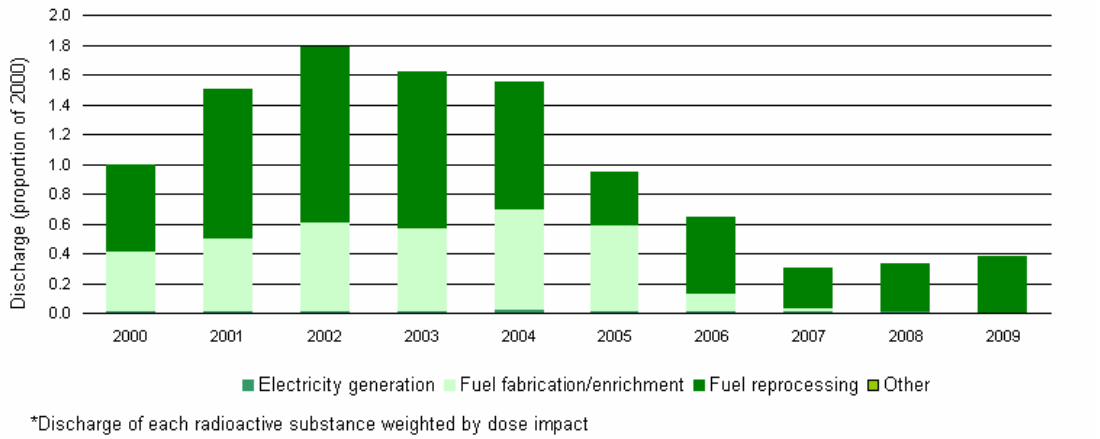
Minimise discharges to air and water

Nuclides emitting alpha, beta/gamma and tritium are the principal radioactive discharges to air and water from the nuclear industry. The discharges are permitted by the Environment Agency which requires the nuclear operators to implement Best Available Techniques to minimise any such releases to the environment. (A fuller description of radioactivity and the discharges from the nuclear industry can be found in the UK Strategy for Radioactive Discharges).

Discharges to water

Radioactive discharges to water remain low and on target to meet the commitments set out in the UK Strategy for Radioactive Discharges. This is a success story for the nuclear industry which, over the last 30 years, has achieved significant reductions in its discharges to water. The UK Strategy published in 2002 set a number of targets for further reductions, to be achieved by 2020. More recently the revised Strategy, published in 2009, set further targets for 2030. Already the radioactive discharges from the nuclear industry are in line with, or reducing faster than, the projections given in the original strategy. However, a key event that will contribute significantly to ensuring the UK Strategy targets are achieved will be the completion of the Magnox Operating Plan (MOP)[3] and this will remain a focus of considerable work within the nuclear industry for some while yet.

Trends in radioactive discharges to water

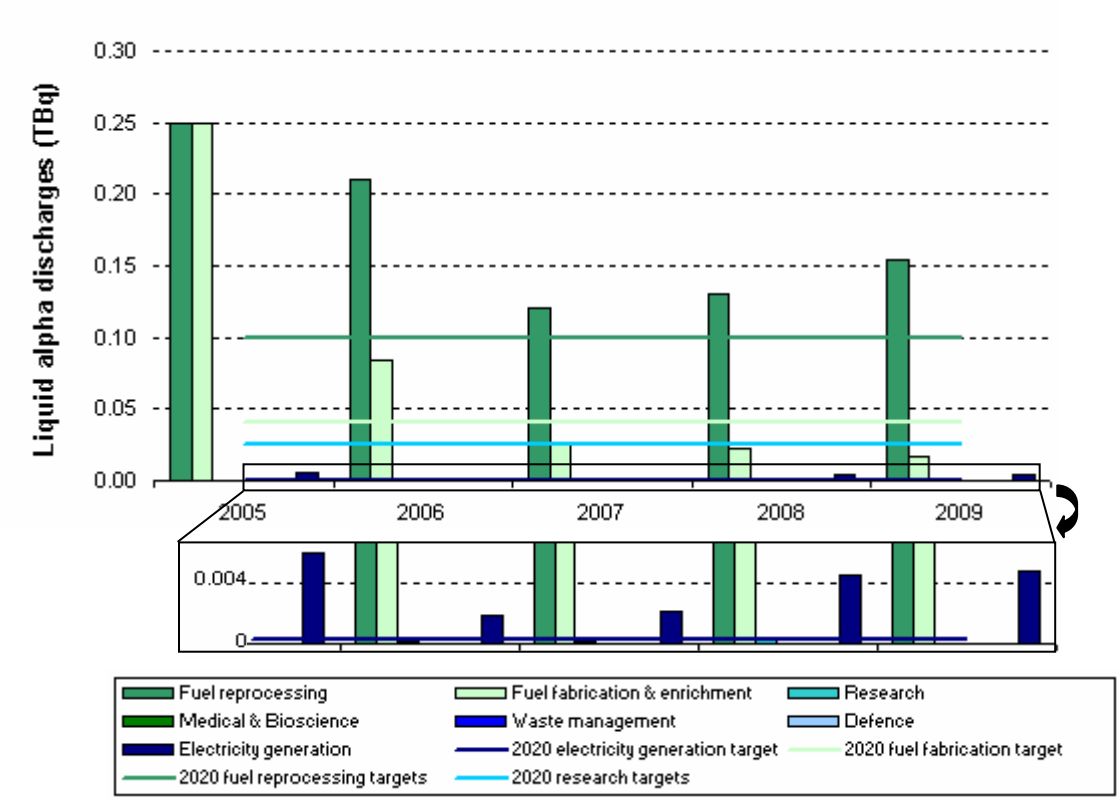


Notes: i) this graph assumes that all discharges are released into the same environment. The total discharge of each radionuclide from each sub-sector is multiplied by a specific "dose per unit release" factor which takes into account the different toxicities of different radionuclides and the likely concentration in the environment. The total is then compared to the 2000 total to show the trend in this indicator over time. The graph is therefore comparative and does not have any units: also it does not equate to actual impact. ii) the "other" category includes the medical and bioscience, defence, research and waste management sub-sectors.

Small increases in certain discharges have occurred largely as a result of an increase in fuel reprocessing which reflects progress being made in the management of spent fuels. This is a key activity that will enable the de-fuelling, and subsequent decommissioning and clean-up of legacy Magnox sites. Discharges also increased slightly because two power stations came back into use.

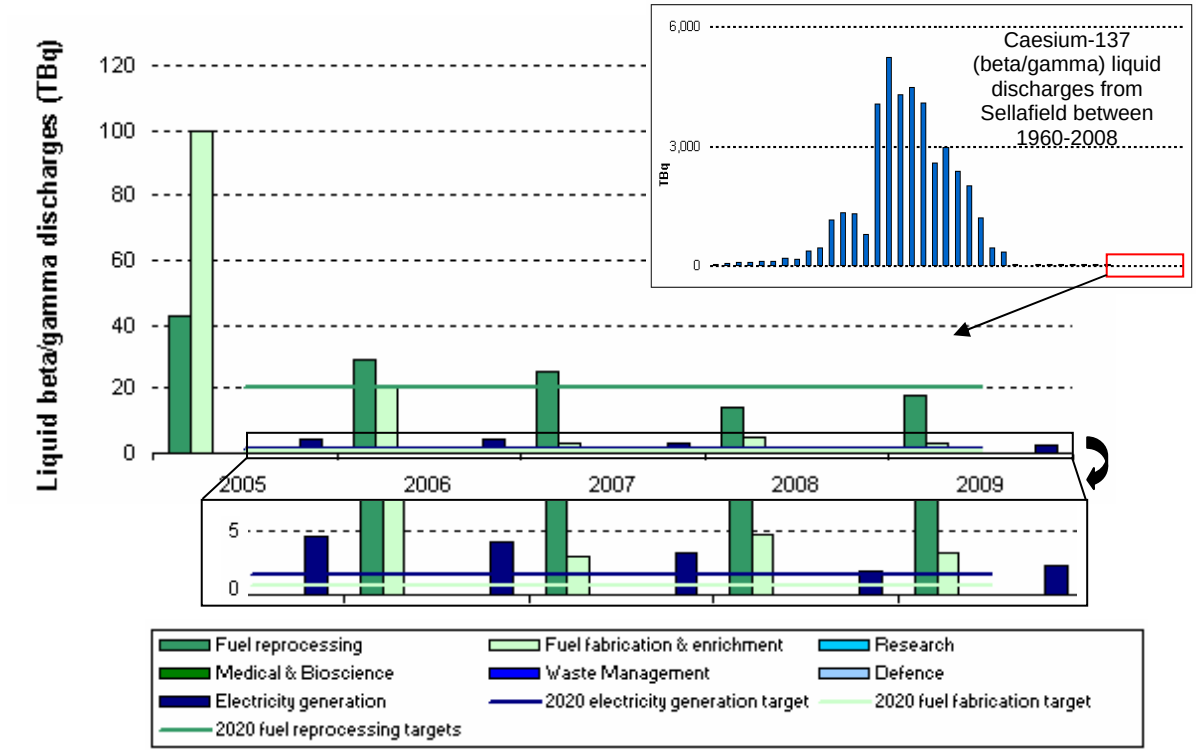
[3] The MOP defines the key deliverables of the whole Magnox fuel cycle covering fuel manufacture, electricity generation, fuelling and de-fuelling of reactors, and reprocessing of spent fuel.

Annual liquid alpha discharges



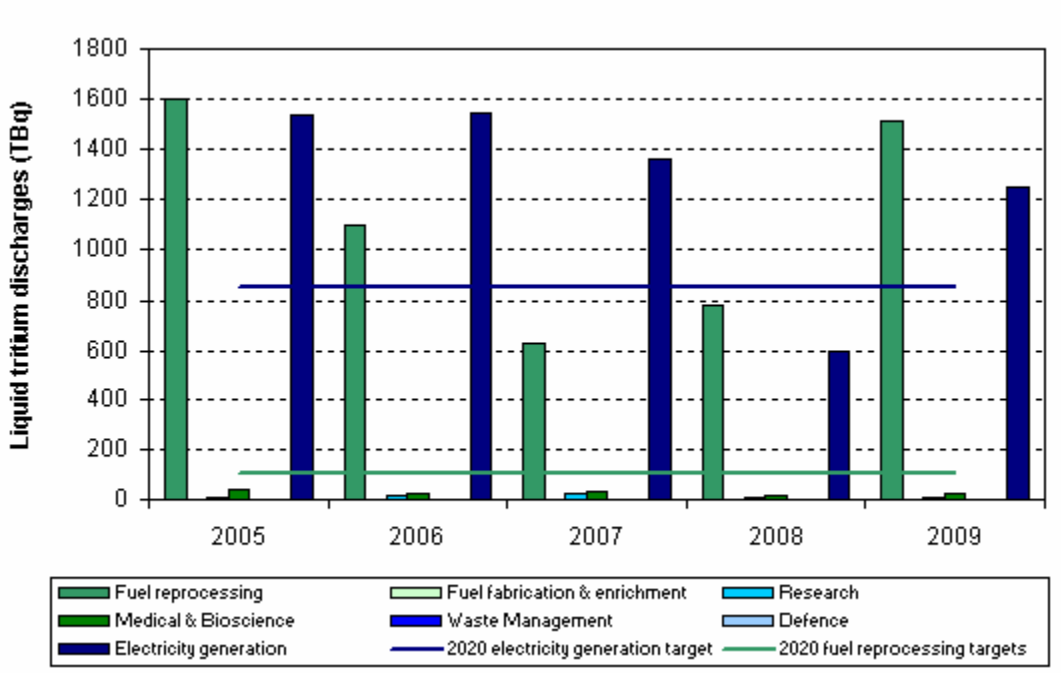
Note: There are no targets in the current UK radioactive discharge strategy for liquid alpha discharges from the defence, medical & bioscience or waste management sub-sectors.

Annual liquid beta/gamma discharges (excluding tritium)



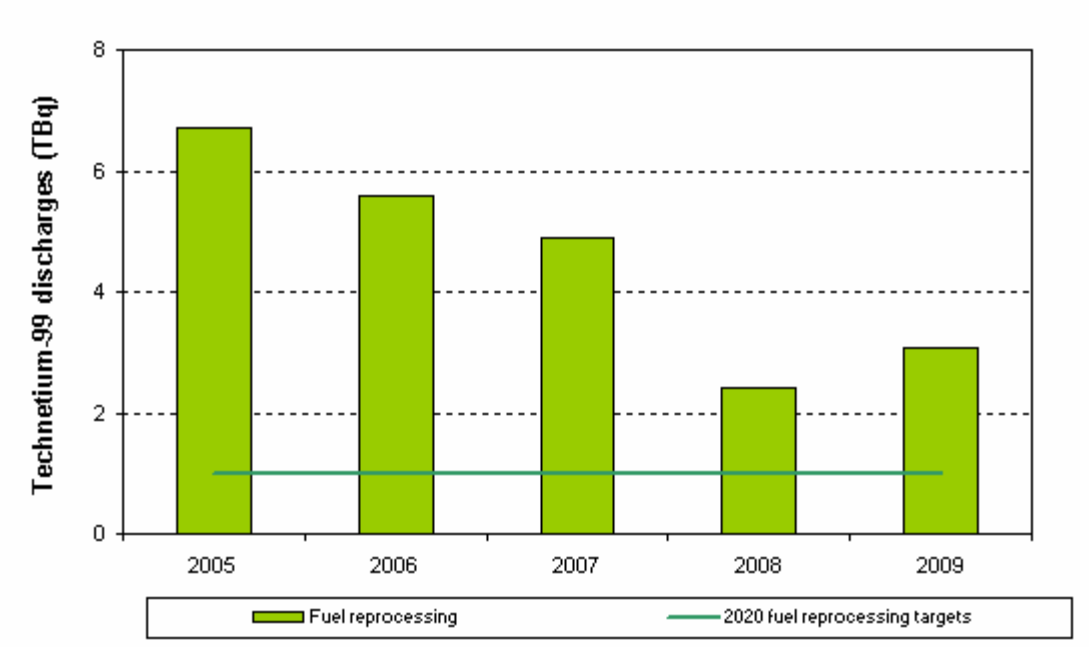
Note: there are no targets in the UK radioactive discharge strategy for liquid beta/gamma discharges from the research, medical & bioscience or waste management sub-sectors. The 2020 target for the defence sub-sector is 0.002 TBq/yr, and the discharges measured for this sub-sector have already achieved this target.

Annual liquid tritium discharges



Note: There are no targets in the UK radioactive discharge strategy for liquid tritium discharges from the fuel fabrication and enrichment, defence, research, medical and bioscience or waste management sub-sectors.

Annual technetium-99 discharges to water from reprocessing



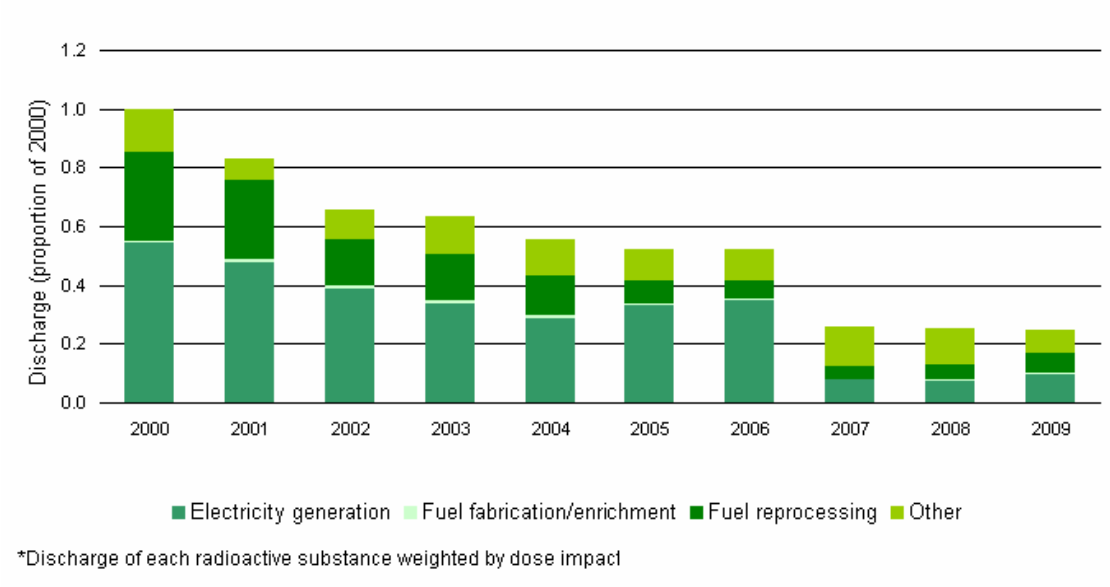
Note: The UK radioactive discharge strategy has technetium targets solely for the fuel reprocessing sub-sector.

Discharges to air

The total radioactive discharges to air from the nuclear industry continue to fall. The overall trend in discharges since 2000 has shown a significant reduction in discharges to air. A step-change reduction in discharges took place in 2007 which reflected the planned shut-down of Magnox power stations at Dungeness A and

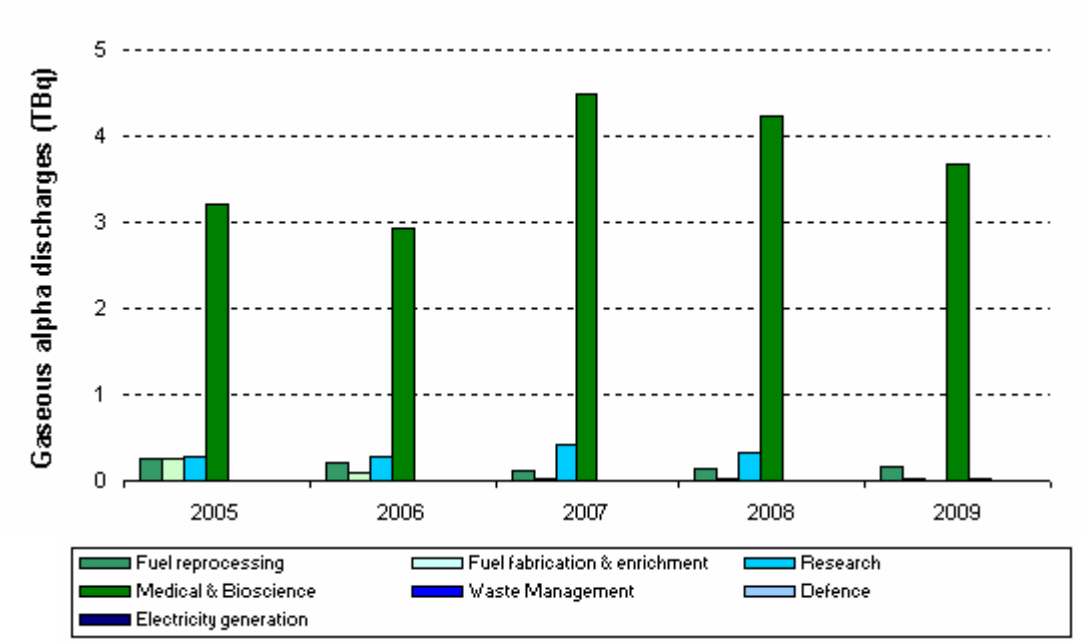
Sizewell A. More recently the downward trend has continued primarily because some commercial operations within the medical and bioscience sector stopped.

Total assessed radioactive discharges to air



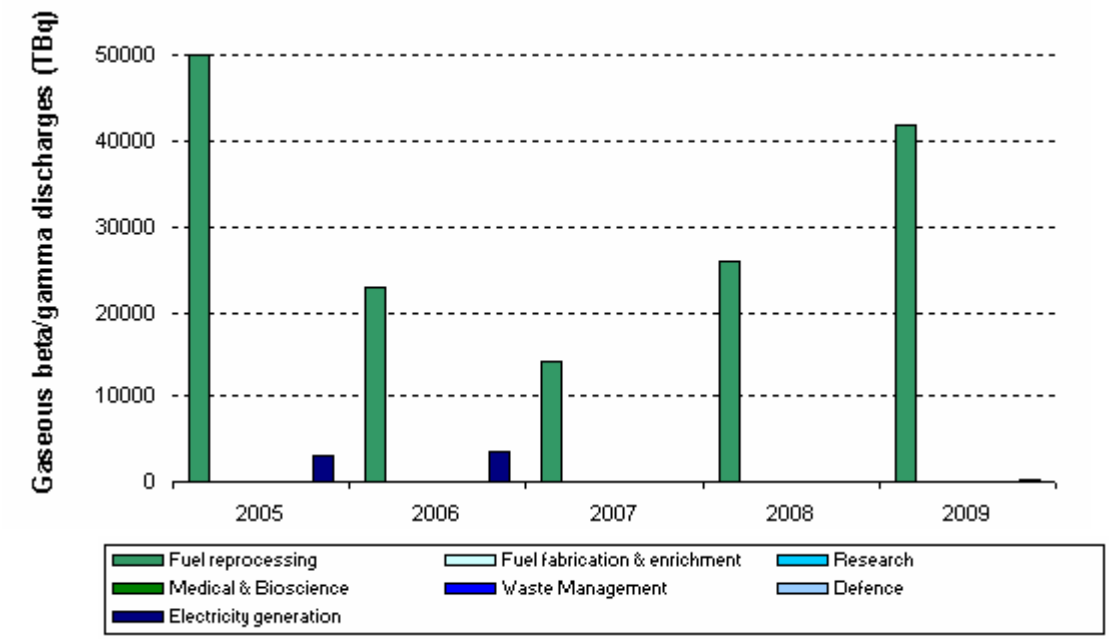
Notes: i) this graph assumes that all discharges are released into the same environment. The total discharge of each radionuclide from each sub-sector is multiplied by a specific "dose per unit release" factor which takes into account the different toxicities of different radionuclides and the likely concentration in the environment. The total is then compared to the 2000 total to show the trend in this indicator over time. The graph is therefore comparative and does not have any units, also it does not equate to actual impact. ii) the "other" category includes the medical and bioscience, defence, research and waste management sub-sectors.

Annual alpha discharges to air



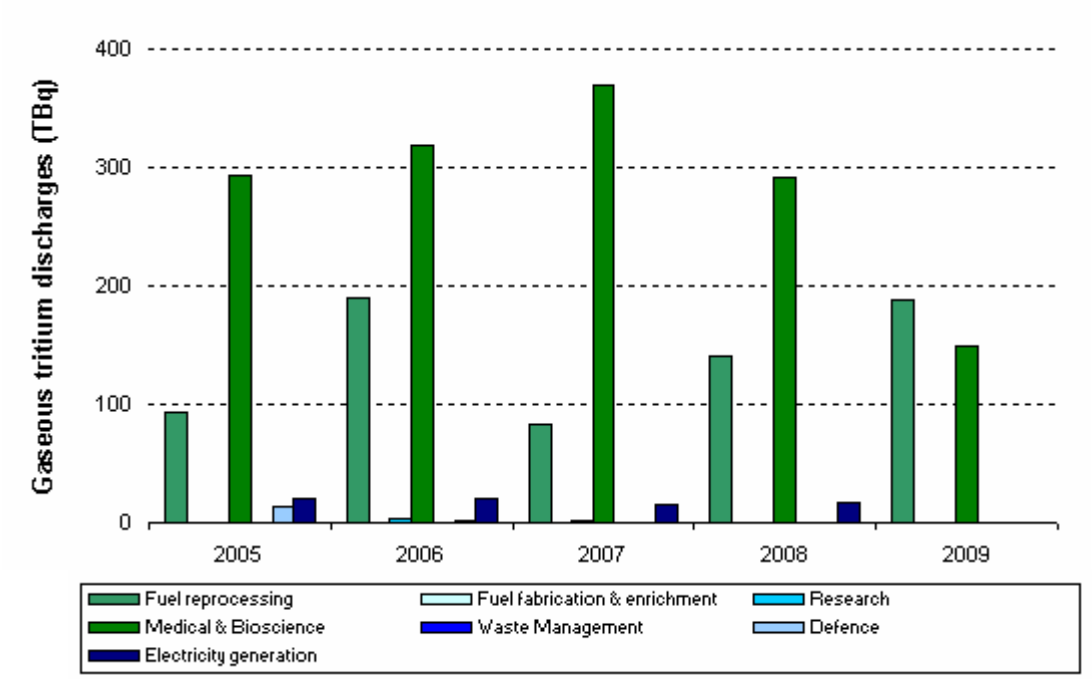
The gaseous alpha discharges continue to be dominated by those from the medical and bioscience sub-sector, associated with the radiopharmaceutical industry, relating to historic radium stored on the sites (rather than current operations).

Annual beta / gamma discharges to air (excluding tritium)



Since 2007 the annual beta / gamma discharges (excluding tritium) have increased steadily. This reflects the increased rates of fuel reprocessing taking place at Sellafield following a period in which a number of the reprocessing plants were unavailable.

Annual tritium discharges to air



The significant reduction in tritium discharges from the medical and bioscience sub-sector reflects the cessation of commercial operations at one plant, in readiness for decommissioning and clean-up. Increasing tritium discharges from the fuel reprocessing sub-sector reflect the increased rate of reprocessing taking place at Sellafield.

Radiation doses due to radioactive discharges

Levels of radiation affecting people who live close to nuclear sites remain well within the legal limit of 1mSv per person.

The levels are determined by monitoring food and the environment around nuclear sites. The results are published annually in the Radioactivity in Food and the Environment (RIFE) report. The Environment Agency uses this data, together with information on the habits of people who live near the sites, to assess radiation levels affecting people as a result of discharges.

Radiation levels change from year to year and are mostly caused by variations in the form and concentrations of radioactivity. However in some years, levels are affected by changes in people's habits, in particular the food they eat. The assessed radiation levels for members of the public most exposed to radiation near all nuclear sites in the UK are known as "the dose to representative person".

The largest contribution to this from liquid and gaseous discharges in 2009 continues to be the effects of current and past discharges from Sellafield. This largely reflects the accumulation of radionuclides in seafood and the environment from discharges made in the 1960s and 1970s.

Representative person doses due to current and past discharges from Sellafield[4]

2009	Liquid discharges (mSv)	Gaseous discharges (mSv)	UK Limit (mSv)
	0.20[a]	**0.029[b]**	**1**

[a] largest dose as a result of liquid discharges was at Sellafield from fish and shellfish consumption and external intertidal areas (excluding naturally occurring radionuclides)

[b] largest dose as a result of gaseous discharges at Sellafield from terrestrial foods, external and inhalation

As in 2008, the second highest radiation level resulting from the exposure to discharges was recorded in people living on houseboats in the Ribble Estuary. In 2009, their level was 0.13 mSv, the same as in 2008.

Levels measured in the most exposed groups were less than 0.5 per cent of the legal limit , as a result of:

- gaseous discharges from 14 nuclear sites (compared to 12 sites in 2008), and
- liquid discharges from 9 nuclear sites (compared to 7 sites in 2008).

Minimise and manage solid waste

The nuclear industry generates a range of solid wastes, both radioactive and non-radioactive, as a result of activities at its sites. Operators are required to minimise the production of all wastes. Most of the waste is non-radioactive and comes from construction and demolition projects. Radioactive wastes are disposed in accordance with permits granted by the Environment Agency.

Managing solid radioactive waste is a key challenge for the nuclear industry, reflecting the limited availability of disposal sites within England and Wales. Considerable effort has been made over the last few years to minimise waste

[4] RIFE 15 - Radioactivity in Food and the Environment, 2009

production and to make use of a wider range of alternative options for waste management and disposal.

Many operators have now adopted Integrated Waste Strategies and good progress is being made in ensuring these exist for each nuclear site. Already this work has started to improve understanding of the range of wastes that exist and the commercial opportunities available for new waste treatment technologies and disposal opportunities. An example of this, and a highlight for the sector during 2009, was the opening of the Metals Recycling Facility, providing the first dedicated UK facility for the treatment and recycling of metallic radioactive waste.

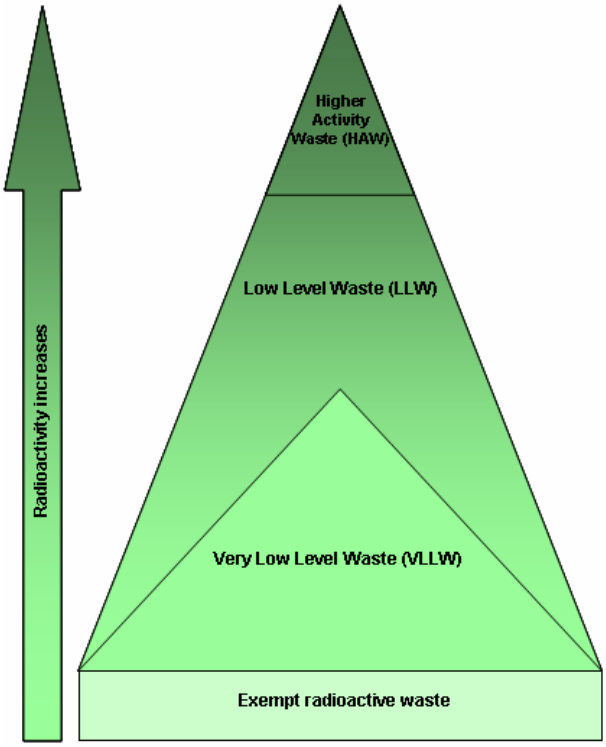
Radioactive wastes

Solid radioactive waste is divided into three categories according to the amount of radioactivity it contains and the heat it produces:

High level waste (HLW) is waste in which the temperature may rise significantly as a result of its radioactivity. Because of the heat it produces, high level waste requires special storage or disposal.

Intermediate level waste (ILW) has lower levels of radioactivity than high level waste and does not generate sufficient heat for this to impact on the design of storage or disposal facilities.

Low level waste (LLW) has a much lower potential hazard than other categories. LLW makes up more than 90 per cent of the UK's radioactive waste legacy by volume but contains less than 0.1 percent of the total radioactivity.



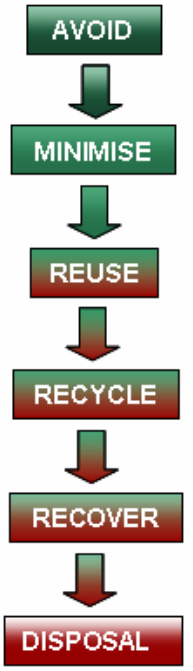
Further details on types of radioactive waste in the UK can be found in the UK National Radioactive Waste Inventory. A description of the Government's programme to find and implement practicable solutions to the management of higher activity waste can be found at 'Managing Radioactive Waste Safely'.

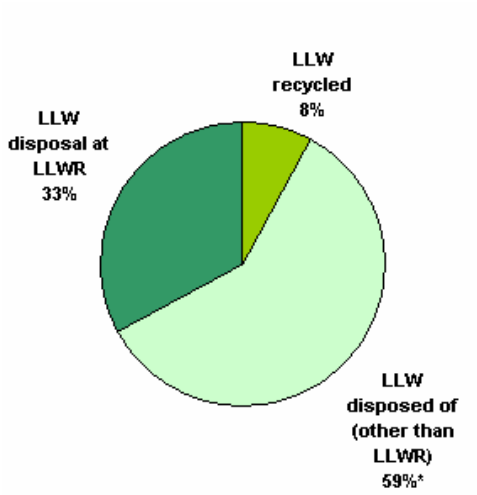
During 2009, the nuclear industry generated 19,070 m^3 of low level waste and managed to avoid sending 67 per cent of this to the Low Level Waste Repository (LLWR). This is a significant achievement, helping to ensure that the limited capacity within the national repository is protected for that waste which *does* require the level of protection it offers.

The LLWR is engineered specifically to provide suitable containment for higher activity low level waste. Historically all of the low level waste would have been disposed to the repository. However, alternative disposal routes are available for lower activity low level waste, eg landfill and incineration, and the repository has only a limited capacity. To protect the remaining capacity of the repository the nuclear industry is not only continuing to minimise the amount of waste it produces, but also

seeking to make best use of the alternative, suitable disposal routes that exist for the lower activity low level waste.

Low Level Waste recycled





*Industry is making better use of best available techniques to identify other suitable means of disposing of waste, such as incineration or landfill.

The Environment Agency and the nuclear industry are committed to understanding more about the various types of waste that make up low level waste, to help drive further improvements in its management, and in protecting the limited capacity of the Low Level Waste Repository for future generations. In particular we are keen to encourage better use of the waste hierarchy where possible, and increase the amount of low level waste recycled or reused.

A key development during 2009 was the consultation, launched by the Nuclear Decommissioning Authority (NDA), on a draft strategy for the management of solid low level radioactive waste from the whole of the UK nuclear industry. This was produced by the NDA in conjunction with a UK wide consultative group – the Low Level Waste Strategy Group, bringing together NDA, nuclear industry operators, regulators, local and national Governments.

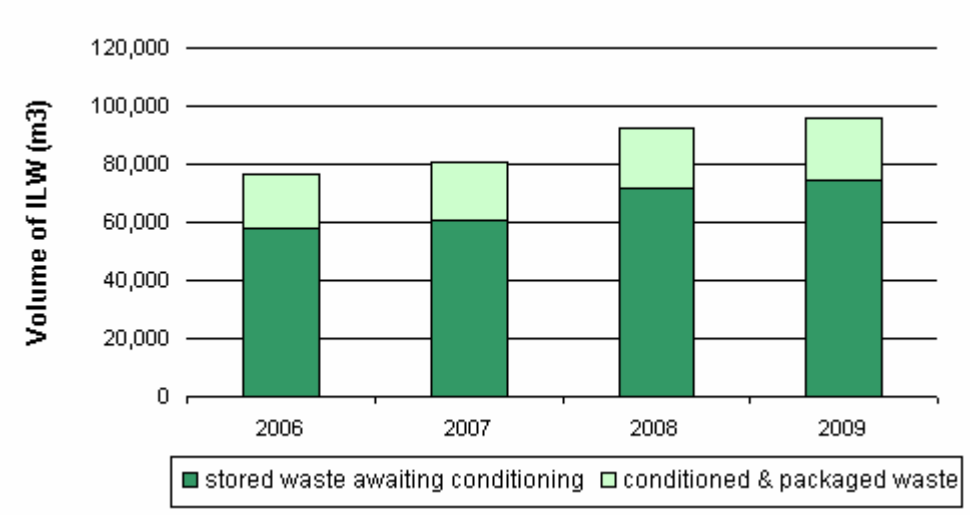
An area of waste management that needs further improvement is the conditioning and packaging of 'legacy intermediate level waste' within the nuclear industry. These are wastes that, while safely managed at the sites, are not yet in a final form which can safely be disposed. Volumes of 'raw' intermediate level wastes are increasing as sites undergo decommissioning, and further progress is being made to condition and package these – most notably at Winfrith.

However, the overall rate of progress within the industry has remained static over the last five years. Since 2005 the proportion of the total volume of intermediate level waste that has been conditioned and packaged remains at under 25 per cent. This reflects the lack of real progress in addressing the large volumes of legacy wastes stored at Sellafield. It is not an easy issue to tackle but progress in this area is still needed to prove the technique and obtain regulatory approvals and to minimise the environmental risk at nuclear sites.

Elsewhere, Magnox South is actively looking at alternative solutions that could offer significant benefits for the prompt and cost-effective packaging of these wastes, but considerable work is still needed to 'prove' the technique.

Both the nuclear industry and the Environment Agency are keen to accelerate the rate of conditioning and packaging of these wastes and this will continue to be a focus of much of our work.

Total volume of raw and conditioned/packaged ILW produced [5]



Non-radioactive wastes

The bulk of the waste generated by the nuclear industry is non-radioactive. Non-radioactive waste is divided into three categories according to its hazardous nature and other characteristics.

Hazardous waste is waste which is harmful to human health or the environment and cannot be disposed of by conventional methods. Examples include paints, solvents, oil and pesticides.

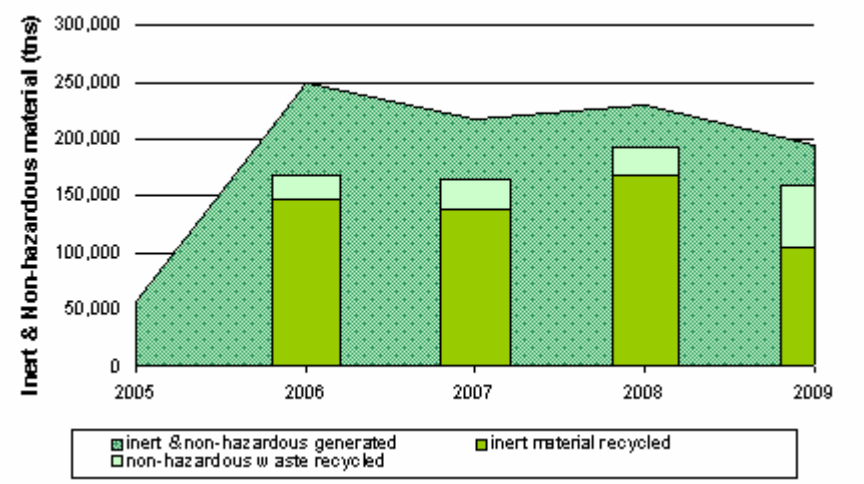
Inert waste is waste that has no hazardous properties and which does not undergo any significant physical, chemical or biological transformations. Examples of inert waste include concrete and sand.

Non-hazardous waste is waste that, while it doesn't have any hazardous properties, is not inert and could cause problems if not dealt with properly due to the fact it may biodegrade. Examples of non-hazardous waste include paper, cardboard and plastic.

Since 2005 there has been considerable variation in the amount of inert and non-hazardous waste produced by the nuclear industry. Nearly five times as much waste was generated in 2006 compared to 2005, but since that time quantities have been reducing. The amount generated largely reflects construction and demolition activities at the sites, with the significant increase in 2006 due to an increased focus on decommissioning activity across civil nuclear sites following the setting up of the Nuclear Decommissioning Authority.

[5] *Data based on the 2007 UK radioactive waste inventory*

Volumes of inert and non-hazardous waste generated and recycled



Note: there is no data for the amount of inert & non-hazardous waste recycled in 2005, only the amount generated.

Since 2006 the nuclear industry has been recording the amount of waste that is recycled, and continues to demonstrate a very high level of recycling of both inert and non-hazardous wastes.

Sites apply the waste hierarchy and segregate wastes carefully to allow recycling to take place. For example during 2009, Dungeness B established a new waste compound for the segregation of waste. Sellafield Limited (at Capenhurst) also improved waste segregation during 2009, addressing waste streams such as batteries, fluorescent tubes and metals. Much of the inert waste that is created is re-used on the sites of origin. For example, at Trawsfynydd, inert waste is used for back-fill and landscaping.

Demonstrate sound environmental management and leadership

Nuclear operators continue to have robust environmental management arrangements at their sites. Not only is this a requirement of their environmental permits, but many nuclear operators have chosen to adopt systems that go 'beyond compliance' in helping to achieve far greater improvements in environmental performance. Most have an environmental management system that has been independently certified to the international standard (ISO14001) while others have chosen alternative, equally robust arrangements.

The industry is committed to working together and sharing its views on good environmental performance, and is making good progress towards the goals set out in the nuclear sector plan. These include publishing and implementing a Corporate Social Responsibility statement, incorporating sustainable procurement, as well as developing proactive local stakeholder engagement programmes.

Delivering Environmental Leadership
During October 2009 the Environment Agency, Scottish Environment Protection Agency and NDA together hosted an Environmental Leadership Conference which involved senior representatives from across the UK nuclear industry. The conference explored expectations for environmental leadership, sharing, with input from representatives of the non-nuclear sector, thoughts on the different approaches to environmental leadership that exist.

Manage land quality and biodiversity

Good progress is being made to manage land quality and biodiversity. Many nuclear operators are already working to identify and manage land affected by chemical or radioactive contamination, and the industry has committed to develop Land Quality Management Plans, where appropriate. In support of this, and to help operators understand the regulatory requirements, the Environment Agency, Scottish Environment Protection Agency (SEPA) and Nuclear Installations Inspectorate (NII) are working to develop some 'common expectations'.

Good progress was made in 2009, and a paper on this was presented at the International Conference on Environmental Remediation and Radioactive Waste Management (ICEM09) in October 2009.

Most nuclear sites have and continue to implement biodiversity action plans (BAPs).

In 2009 **Springfields Fuels Limited** was recommended for certification to the Wildlife Trust's Biodiversity Benchmark. The certification demonstrates that Springfields satisfied the scheme's rigorous criteria for managing the site carefully to protect and enhance the habitat for native plants and animals within the constraints of its business.

Springfields was the first nuclear site in the UK to put a Biodiversity Action Plan in place to manage the site's environmental areas. The site contains two Biological Heritage Sites, including a nature trail which is visited by hundreds of school children and provides a safe haven for the protected species of great crested newt and slowworms.

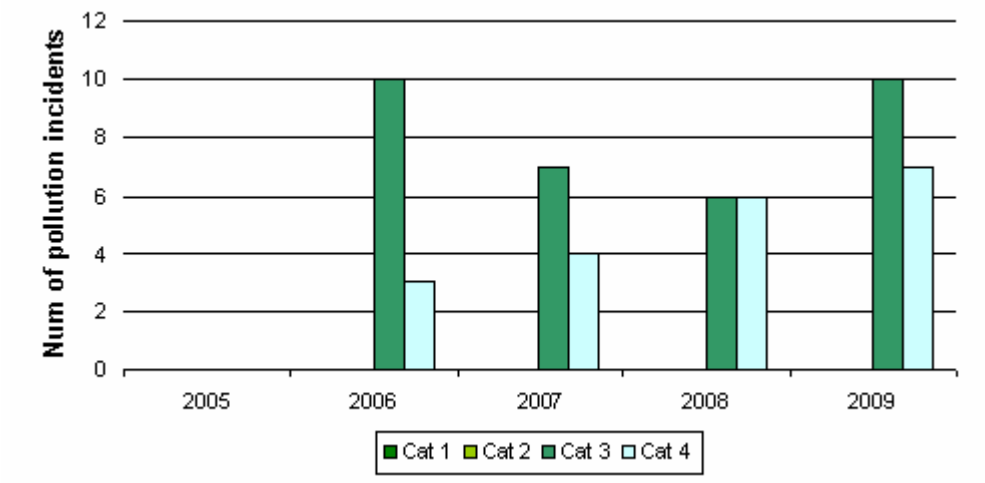
(Deepdale Wood Biological Heritage Site at Springfields)

Improve or maintain a very high level of regulatory compliance

The nuclear industry continues to deliver a high standard of regulatory compliance. It is a heavily regulated industry, reflecting the significant hazards and risks associated with activities on its sites. The Environment Agency works closely with the industry and other nuclear regulators (such as the Nuclear Installations Inspectorate) to ensure compliance and support improvements in performance. As a result, non-compliances are rare and when they do happen, both the Environment Agency and the industry are committed to responding promptly to understand how these occurred and how any future recurrence can be avoided.

Over the last five years there have been some incidents at nuclear sites which have either had an impact or the potential to impact on the environment, or to breach a permit. None of the incidents at nuclear sites have had major or significant impacts on the environment (as categorised in the Environment Agency's Compliance Incident Classification Scheme).

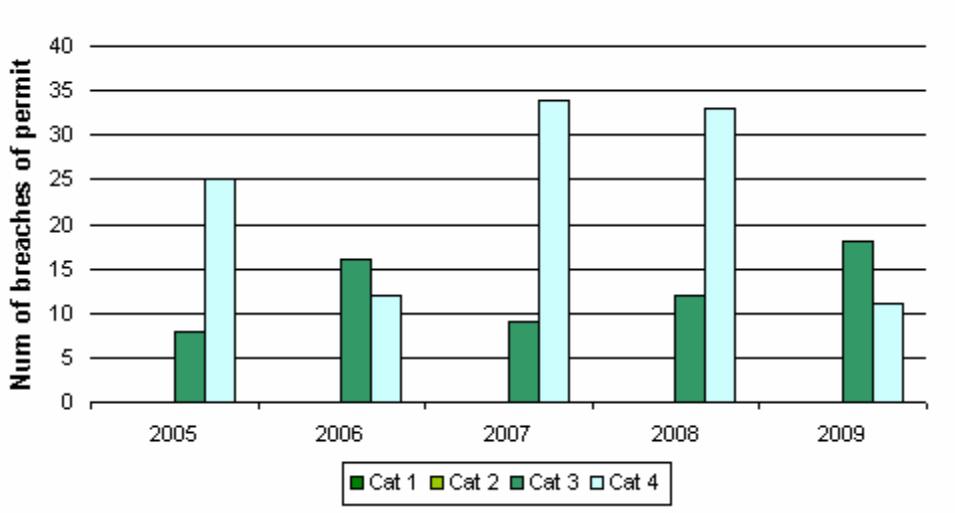
Number of pollution incidents



Note: The Environment Agency classifies incidents (in the CICS scheme) from Category 1 to Category 4, where Category 1 is the most serious. Incidents are classified based on their actual impact. For example, a Category 1 incident has a major impact on the environment, while a Category 3 incident has a minor impact.

There was an increase in the number of minor incidents during 2009. The reason for this is not entirely clear, but it appears to reflect an increasing awareness of environmental compliance issues within the industry and an improvement in the reporting of incidents, however minor. We believe that this is a reflection of good practice and an open reporting culture, but as an industry, we will need to monitor this carefully to ensure it is not an indication of any other reduction in performance.

Number of breaches of permit



Note: The Environment Agency classifies breaches (in the CCS scheme) from Category 1 to Category 4, where Category 1 is the most serious. Breaches are classified on their potential impact. For example, a Category 1 breach of permit has or could have a significant impact on the environment. A Category 4 breach has no potential to have an effect on the environment.

Comparison with other sectors

The nuclear sector had fewer serious pollution incidents or serious breaches or permits than any other regulated sector in 2009.

Sector	Number of serious pollution incidents in 2009[a]	Number of serious breaches of permit in 2009[a]	Number of permits[b]	Incidents per permit	Breaches per permit
Nuclear	0	0	38[c]	0	0
Water	77	68	35,500	0.002	0.002
Chemicals	7	6	418	0.02	0.01
Energy	5	0	245	0.02	0
Waste	139	668	498	0.3	1.34
Metals	2	2	203	0.01	0.01
Mineral products[d]	4	1	46	0.09	0.02
Farming	103	22	943	0.11	0.02
Food and drink	16	0			
Other[e]	30	22			

(a) "Serious" pollution incidents are those classified as Category 1 or Category 2 in the Environment Agency's Common Incident Classification Scheme (CICS). "Serious" breaches of permits are those classified as Category 1 or Category 2 in the Environment Agency's Compliance Classification Scheme (CCS).
(b) The food and drink sector reported as part of the "other" sector last year, and the number of permits in each part of that category is not known.
(c) RSA93 permits only. Many nuclear sites also have EPR (PPC) permits, and some also have water abstraction licences and water discharge consents.
(d) The "mineral products" sector includes cement and lime industries, glass ceramic and brick manufacturers, but not mineral extraction.
(e) The "other" sector includes construction, paper and pulp, textiles, and retail/wholesale.

During 2009 the Environment Agency took three enforcement actions against nuclear operators for previous environmental incidents that had occurred:

- against Sellafield Ltd twice, relating to the unsatisfactory managements of bunds and sumps, and to an unauthorised discharge to the ground, and;
- against Magnox Electric Ltd once, relating to the unauthorised discharge of radioactive waste from a drain line.

Achieve better regulation

The Environment Agency has made good progress against each of its improvement goals:

- Together with the nuclear industry, the Environment Agency developed a regulatory package for the environmental permitting regime for nuclear sites. (Phase 2 of the Environmental Permitting Regulations subsequently came into force in April 2010.) Details on environmental permitting at nuclear sites are available on the Environment Agency website.

- Risk-based regulation is becoming clearer. During 2009 the Environment Agency provided individual sites with compliance action plans setting out annual objectives for each site and the estimated costs of regulation, and held regular meetings with sites to review and discuss environmental performance.

- Adoption of the monitoring certification scheme (MCERTS) is being promoted. The Environment Agency has continued to work with nuclear operators through the Radiological Monitoring Standards Working Group. This supports, amongst other things, the development of schemes for certification of monitoring. Implementation of MCERTs for liquid effluent flow began at nuclear sites during 2009 with provisional inspections. Many sites met the performance standard expected and most should be able to proceed with certification. Work also started to establish MCERTs for the radio-analysis of waters which will be finalised in 2011.

- The Department for Energy and Climate Change led review of Radioactive Substances Act Exemption Orders has been supported by input from the Environment Agency alongside other regulators and nuclear operators. During 2009 the Environment Agency supported several workshops with industry and contributed to the drafting of government and regulatory guidance.

- Work with other regulators to develop new, clear and consistent guidance This includes joint guidance with the Nuclear Installations Inspectorate (NII) on management systems, and the provision of up-to-date application guidance on site-specific applications for new nuclear build. The Environment Agency is continuing to work closely with the NII to consider what further joint guidance may be needed for new nuclear build, and, with NII and SEPA, to support guidance on the implementation of the new exemption order regime.

Summary

Overall environmental performance of the nuclear industry in 2009, and since reporting against the Nuclear Sector Plan started, has been good. The industry has demonstrated continued commitment to and progress against most of the objectives and performance indicators and an enthusiasm for working together to share best practice.

The nuclear industry is one of the most compliant sectors in England and Wales and yet is committed to achieving further improvements in environmental performance that go 'beyond compliance'. It recognises that such performance is expected of an industry tasked with managing some of the most significant hazards and risks presented in the UK.

In working with the nuclear industry, the Environment Agency remains committed to supporting the industry in achieving these high standards of performance, in ways that minimise the regulatory burden and secure the best outcomes for the environment.

There are aspects of performance that do need improvement and the industry is already working to address many of these areas, for example:

- to improve the efficient use of resources
- to better understand and minimise greenhouse gas emissions, and
- to develop land quality management plans.

In particular there is a need to make real progress in the conditioning and packaging of legacy wastes. This will continue to be a focus of our working together in the next few years.

Glossary

Environmental Safety Case
A collection of scientific facts, evidence and statements about the environmental safety of the Low Level Waste Repository. The safety case must include information on environmental performance now and in the future.[6]

Integrated Waste Strategy
An Integrated Waste Strategy is a strategy which describes:

- how a site optimises its approach to waste management in an integrated way
- the waste streams and discharges expected from current and future operations,
- actions required to improve the site's approach to waste management.

The waste includes all radioactive and non-radioactive wastes (including those in solid, liquid or gaseous form) arising from the site's past, present and future operations, and any other waste transferred from other sites for management or disposal.

Land quality management plans
Plans for the control, monitoring and remediation of radioactive and non-radioactive contamination in the ground or groundwater at a site.

Low Level Waste Repository
The UK's national low level radioactive waste facility, located close to the West Cumbrian coastline in the north-west of England.

Monitoring Certification Scheme (MCERTS)
MCERTS is a scheme established by the Environment Agency. It provides a framework that businesses can use to demonstrate that their emission monitoring arrangements meet the quality requirements of their permits. A range of schemes exist, including for air monitoring, soil analysis, water monitoring and for environmental data management software.

Radioactive Substances Act Exemption Orders
These orders provide exemptions from the need to register some low activity radioactive sources, or to authorise the accumulation and disposal of some radioactive wastes. They are a mechanism for providing some degree of control, without excessive bureaucracy, over minor uses of radioactive substances where there is a clear benefit from its use, whilst ensuring continued protection of the environment and the public.

Radioactive waste inventory
The radioactive waste inventory is a public record of information on radioactive waste present in the UK. It describes the sources, quantities and properties of radioactive waste that exist at a particular point in time. The latest available inventory relates to that waste which existed at 1 April 2007 and that was forecast to arise in the future.

Waste hierarchy
The waste hierarchy is a useful framework which sets out the order in which options for waste management should be considered, based on environmental impact.

[6] http://www.llwrsite.com/environmental-safety-case

Links to participating organisations

http://www.awe.co.uk

http://www.babcock.co.uk

http://www.baesystems.com

http://www.british-energy.com

http://www.gehealthcare.com/uken

http://www.llwrsite.com/llw-strategy

http://www.magnoxnorthsites.com

http://www.magnoxsouthsites.com

http://www.nda.gov.uk

http://www.research-sites.com

http://www.rolls-royce.com

http://www.sellafieldsites.com

http://www.studsvik.com

http://www.urenco.com

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