Environment Agency

nuclear sector plan

2007 Environmental Performance Report

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foreword

The nuclear sector was one of the first for which the Environment Agency published a sector plan. This is a collaborative effort between the Environment Agency and the sector. In recognition of our joint effort, where 'we' is used in this document it applies to the Environment Agency and the industry collectively. Logos of organisations participating in this initiative are given below.

This is the second annual report on the environmental performance of the nuclear sector. It highlights where the industry has performed well and identifies areas for improvement.

Major changes are underway in the nuclear industry. To support these, the Environment Agency believes that the industry, NDA and Government need to make more strategic plans to establish and maintain a sustainable infrastructure for the UK's nuclear industry.

Government and the Nuclear Decommissioning Authority (NDA) are mapping out an approach to dispose of higher activity radioactive waste in a geological facility. The NDA is reorganising the civil nuclear industry and seeking to drive innovative approaches to site decommissioning and clean up. Meanwhile, the Environment Agency and the Health and Safety Executive (HSE) are assessing new designs of nuclear power reactors that may be constructed in the UK. But there are still gaps and questions remaining and a need for an overview of the whole of the industry 's infrastructure needs both now and in the future.

Recognising these changes, we are reviewing the scope and objectives of the nuclear sector plan. We plan to publish a revised version in early 2009. This will build on the successes of the plan to date, and look ahead to forthcoming challenges.

Tricia Henton / Environment Agency

babcock · British Energy · Westinghouse · AWE · LLW Repository Ltd · BAE SYSTEMS · Ministry of Defence · Rolls-Royce · urenco · UKAEA · NDA · Sellafield Ltd · Magnox South · GE Healthcare · Magnox North

summary

This is the second report describing the environmental performance of the nuclear sector in England and Wales. It covers 2007 and measures performance against the objectives and performance indicators set out in the **nuclear sector plan**.

The Environment Agency and the nuclear industry jointly developed the sector plan, which covers statutory responsibilities and voluntary activities the industry has agreed to carry out. The Environment Agency is very pleased that the industry is supporting the sector plan and has agreed to use it to monitor and report on the environmental impact of its activities.

Overall, the environmental performance of the sector was again good during 2007, with improvements against previous performance in a number of areas. Of course, we will need to monitor performance over a number of years to identify trends. Here, we highlight how the sector performed against its eight main environmental objectives.

Use of natural resources continues to fall

➜ The nuclear sector used 14.6 million cubic metres of water in 2007, that's six per cent less than in 2006. It used 24,794 TJ (6.89TWh) of energy in 2007, eight per cent less than the previous year.

Progress in waste packaging continues

➜ One quarter of the intermediate level radioactive waste (ILW) currently 'in stock' at nuclear sites has been conditioned and packaged. Making real progress on packaging ILW is a major long-term challenge for the nuclear industry. In some cases, the Environment Agency has agreed with operators that final packaging can be delayed, although safe and secure storage arrangements will need to be agreed with all nuclear industry regulators. Almost 70 per cent of the non-radioactive waste produced by the nuclear sector in 2007 was recycled. Integrated waste strategies were in place at 80 per cent of nuclear sites.

Fall in discharges to air and water, partly linked to reduced reprocessing at Sellafield

➜ The industry is making good progress towards meeting the UK radioactive discharge strategy targets. Total radioactive discharges to water have been significantly lower than usual since 2005. However, this is largely because less fuel was reprocessed at Sellafield.

Overall radioactive discharges to air have decreased steadily since 2000, apart from a slight increase in 2006 associated with increased output at some Magnox power stations.

Radiation doses to 'critical groups' of adults and children living around nuclear sites remained well below the public dose limit of 1 mSv a year.

Contribution to reducing greenhouse gases

➜ The nuclear sector releases a relatively small amount of greenhouse gases into the environment. In 2007, the eight nuclear power stations in England and Wales generated 12 per cent of the UK's electricity (if the output from Scottish nuclear power stations is included, the total nuclear contribution was 16 per cent) and the nuclear sector released greenhouse gases equivalent to 0.55 million tonnes of carbon dioxide. In comparison, producing this amount of electricity using fossil fuels would release about 30 million tonnes of carbon dioxide emissions.

Image 3 courtesy of Springfields Fuels Ltd.

Working to restore sites and develop biodiversity action plans

➜ Nuclear operators reported that 73 per cent of nuclear sites have some areas of land affected by radioactive or non-radioactive contamination. All of these sites had some arrangements in place to investigate and, if necessary, to manage the contamination. Biodiversity action plans (BAPs) are a voluntary initiative being taken forward under this sector plan. 70 per cent of sites had implemented BAPs by the end of 2007.

Links between the industry and stakeholders working well

➜ All nuclear sites hold some form of regular liaison meeting with local stakeholders. 75 per cent of operators published their own environmental report in 2007.

Recognising the importance of product stewardship

➜ There are some examples of good practice in the nuclear sector of operators managing the health, safety and environmental impact of their products, and of their purchased good and services. The Environment Agency and the industry will promote good practice more widely and will look at this further when we review the sector plan.

No serious incidents or breaches of permits, but three enforcement actions

➜ There were fewer lower category pollution incidents but more lower category breaches of permit recorded in the sector in 2007. The Environment Agency took enforcement action on three occasions against two companies this year.

Nuclear performs well against other sectors

The environmental performance of the nuclear sector was good in relation to other industry sectors in a number of key areas. The Environment Agency's 'Spotlight on Business' report provided favourable comparisons on waste recycling (most non-radioactive waste produced in the nuclear sector is reused or recycled) and on serious breaches of permits and pollution incidents (there were none in the nuclear sector). Also, the sector is using fewer resources, greenhouse gas emissions are small and discharges of pollutants to the environment are generally falling.

Areas for improvement

Although the overall environmental performance of the nuclear sector was good in 2007, and shows some improvements compared to 2006, there are certain areas where there needs to be greater focus to improve performance further, in particular:

- making better use of resources at some sites, particularly those that can improve infrastructure and management systems;
- progressing packaging and conditioning of intermediate level radioactive waste in a form suitable for disposal, or for safe and secure storage;
- sharing best practice on recycling conventional waste within the nuclear sector and learning from other sectors;
- continuing to make good progress in reducing significant discharges, working towards meeting all of the UK strategy targets for radioactive discharges to water;
- making progress in improving waste management and using the 'waste hierarchy', as set out in 'integrated waste strategies' (IWS) for individual sites. A national waste strategy should be developed that builds on this work;
- the Environment Agency will look to improve the robustness and transparency of how it employs its regulatory resources.

Moving forward

We are now reviewing the nuclear sector plan to build on the successes of the current version, and to look ahead to the challenges that face an industry undergoing major change.

Feedback

We would welcome your views on the content or format of the report. If you have any queries or wish to make any comments, please contact David Bennett – **david.bennett@environment-agency.gov.uk.**

Table – Changes in environmental performance, 2007 compared to previous year

To provide an overview, the main changes in performance in 2007 compared with 2006 are summarised below. Where a significant event has influenced the change in performance, comment is made. More detail is provided in the main body of the report.

Key:

- Performance is better than last year
- Performance is worse than last year
- No change in performance compared to last year, or change is trivial, or due to changed basis for reporting
- Comparison either not possible or not meaningful

Indicator	Overall change	Comments
Objective 1: reduce consumption of natural resources		
1.1 Water use	6 per cent less water used	
1.2 Energy use	8 per cent less energy used	
Objective 2: minimise and manage solid wastes		
2.1 ILW packaging	8 per cent more waste packaged by volume, but increased stocks mean that the proportion of waste packaged only increased from 24 per cent to 25 per cent	Harwell and Winfrith completed packaging of some waste for the first time in 2007. Sellafield, Trawsfynydd and Windscale continued to make progress
2.2 Reuse/recycling of non-radioactive waste	Proportion of waste recycled increased from 66 per cent to 69 per cent	More inert waste was recycled, but less non-hazardous and hazardous waste was recycled
Objective 3: reduce discharges to air and water		
3.2 Liquid alpha discharges	50 per cent less activity discharged	Mainly due to reduced discharges from Springfields and Sellafield
3.3 Liquid beta/gamma discharges	42 per cent less activity discharged	Mainly due to reduced discharges from Springfields since the uranium ore processing operations were shut down in 2006
3.4 Liquid tritium discharges	24 per cent less activity discharged	Mainly due to reduced discharges from Sellafield, which are partly because less fuel was reprocessed
3.5 Liquid Tc-99 discharges from reprocessing	12 per cent less activity discharged	
3.6a Gaseous alpha discharges	51 per cent more activity discharged	Due to fluctuations in emissions from stored radium waste at GE Healthcare's Grove Centre
3.6b Gaseous beta/ gamma discharges	47 per cent less activity discharged	Mainly due to reduced discharges from Sellafield, but also to Dungeness A and Sizewell A shutting down
3.6c Gaseous tritium discharges	12 per cent less activity discharged	Mainly due to reduced discharges from Sellafield
3.7 Critical group doses	Doses due to liquid discharges were very similar to 2006. Doses due to gaseous discharges reduced	Highest doses due to liquid discharges are dominated by past discharges from Sellafield. Fall in doses from gaseous discharges was due to closure of Sizewell A and Dungeness A power stations
3.8 Nitrate/nitrite discharges	29 per cent less discharged	Discharges from Springfields and Sellafield both fell
Objective 4: reduce greenhouse gas emissions		
4.1 Greenhouse gas emissions	5 per cent more CO_2 emitted	

Indicator	Overall change	Comments
Objective 5: develop site restoration and biodiversity plans		
5.1 Part 2A contaminated land	One nuclear site is formally 'determined' as contaminated	Aldermaston is taking voluntary action to clean up an area contaminated by chemical solvents.
5.2 Contaminated land management arrangements	All sites affected by radioactive or chemical contamination have some management arrangements in place	
5.3 Biodiversity action plans (BAPs)	70 per cent of sites have implemented BAPs	BAPs are not appropriate for most of the other sites
Objective 6: improve transparency, understanding and involvement		
6.1 Local stakeholder meetings	All sites hold some form of regular stakeholder meeting	
6.2 Environmental reporting	Fewer operators published environmental reports, down from 83 per cent to 75 per cent	Reporting under the nuclear sector plan has improved overall reporting One defence site which produced a report in 2006 did not do so in 2007
Objective 7: promote product stewardship		
7.1 & 7.2 Indicators being developed		
Objective 8: work to risk-based regulatory and environmental management systems		
8.1 Multi-media authorisations	10 new authorisations issued	
8.2 Pollution incidents	No serious incidents, and fewer lower category incidents recorded	
8.3 Breaches of permits	No serious breaches, but more lower category breaches recorded	
8.4 Enforcement actions	3 enforcement notices were issued to 2 companies in 2007	
8.5 PPC permits	11 new permits or variations issued. Average time to determine permits was ~15 months.	No PPC permits were issued last year
8.6 RSA93 authorisations	21 new RSA authorisations or variations issued. Average determination time was –11 months	More authorisations issued, but average time to determine authorisations was longer

contents

Introduction

The nuclear sector

The 'nuclear sector' refers to sites which are licensed by the Nuclear Installations Inspectorate (NII) under the Nuclear Installations Act (1965), or sites that would be licensed if the Act applied to the Ministry of Defence. There are 33 nuclear licensed sites in England and Wales. Other sites (including hospitals and universities) also produce radioactive waste, but not in such significant amounts.

The nuclear sector is diverse. Nuclear sites cover a wide range of operations and products that can be broken down into seven sub-sectors. Since the Nuclear Decommissioning Authority (NDA) was set up in 2005, there has been some restructuring of the civil nuclear industry. The sub-sectors, companies and sites are listed below, as they reported in 2007, together with any new site licence company (SLC) names.

Sub-sector	Company	Sites	New SLC name
Electricity generation	Magnox Electric Ltd (MEL)	Dungeness A [a] Hinkley Point A [a] Sizewell A [a] Bradwell [a] Berkeley [a]	Magnox South Ltd
		Wylfa Trawsfynydd [a] Oldbury	Magnox North Ltd
	British Energy Generation LTD (BEGL)	Dungeness B Heysham 2 Hartlepool Hinkley Point B Heysham 1 Sizewell B	
Fuel reprocessing	Sellafield Ltd (SL)	Sellafield	
Fuel fabrication and enrichment	Sellafield Ltd (SL)	Capenhurst [a]	
	Urenco (Capenhurst) Ltd	Capenhurst	Urenco UK Ltd
	Springfields Fuels Ltd	Springfields	
Research	United Kingdom Atomic Energy Authority (UKAEA)	Harwell [a] Winfrith [a]	Research Sites Restoration Ltd (RSRL)
		Windscale [a]	Windscale became part of Sellafield Ltd, Sellafield site in April 2008
	Imperial College	Ascot [b]	
Defence	Ministry of Defence (MoD)	HMNB Devonport [c] Devonport Royal Dockyard [c] BAE Barrow [c] RRMPOL Derby [c]	
	Atomic Weapons Establishment (AWE)	Aldermaston Burghfield	
Medical and bioscience research and products	GE Healthcare (GEH)	Amersham (Grove Centre) Cardiff (Maynard Centre) Harwell (Building 443.26) [b] Harwell (Building 10.23) [b]	
Waste management	LLW Repository Ltd	LLWR near Drigg	

a) Decommissioning sites
b) Small sites with minimal impacts, not reporting under the nuclear sector plan
c) MoD provides a consolidated return for these sites, which support the nuclear submarine propulsion programme

2007 performance

The nuclear sector plan includes eight environmental objectives. These are:

1 Reduce consumption of natural resources

2 Minimise and manage solid waste

3 Reduce discharges to air and water

4 Reduce greenhouse gas emissions

5 Develop site restoration and biodiversity action plans

6 Improve transparency, understanding and involvement between the Environment Agency, industry and other interested organisations

7 Promote product stewardship and wider supply chain benefits

8 Work to risk-based regulatory and environmental management systems

Each objective has a number of associated performance indicators.

This report details performance against the indicators in the nuclear sector plan for 2007. Please refer to the sector plan[2] for more detail on the background and indicators. This report compares nuclear with other sectors where data is available, and compares 2007 with 2006 performance if appropriate. We also consider where the sector needs to improve its environmental performance.

Thirty nuclear licensed sites took part in the 2007 reporting. Operators reported data against each performance indicator for each of their sites.

This report details performance against the indicators in the nuclear sector plan for 2007.

2 Available on the Environment Agency's website at www.environment-agency.gov.uk/sectorplans

Objective 1

Reduce consumption of natural resources

1.1 Water use (excluding cooling water)

Key messages

- The nuclear sector used a total of 14.6 million cubic metres of water in 2007 – six per cent less than in 2006.
- Fourteen sites (47 per cent) used less water in 2007, compared with 2006. Bradwell achieved the largest reduction (62 per cent) as a result of proactive leak detection and repair work and significant downsizing of the demineralised water treatment plant.
- Eleven sites (37 per cent) used more water than in 2006. In most cases, the increase was relatively minor (less than 20 per cent).

Figure 1.1a: **Total water use**

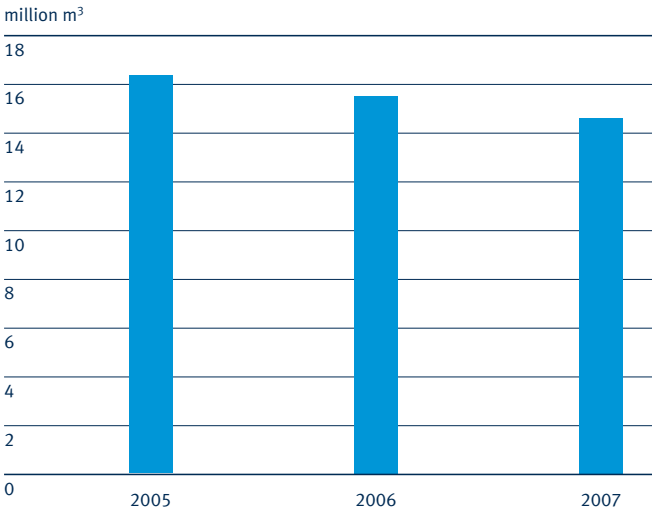
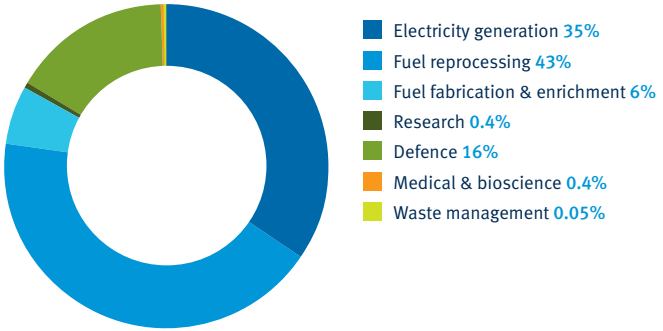


Figure 1.1b: **Water use by sub-sector, 2007**



1.2 Energy use

The nuclear sector uses energy in the fuel cycle and other industrial processes, in commercial and industrial buildings and for transport. The energy it uses may be in the form of electricity, gas, oil or diesel. However, the nuclear sector produces much more energy than it uses. In 2007, the eight nuclear power stations still operating in England and Wales produced a net total of 168,900 TJ (47 TWh) of electricity which was fed into the national grid – 12 per cent of the total electricity generated in the UK in 2007 (if the contribution from Scottish nuclear power stations is included, the total contribution of nuclear generation to UK electricity production was 16 per cent). This is 20 per cent less electricity than in 2006, because some British Energy power stations did not generate electricity for long periods and the Sizewell A and Dungeness A Magnox power stations reached the end of their operating lives.

Key messages

- The nuclear sector used 24,794 TJ (6.89 TWh) of energy in 2007 – eight per cent less than in 2006. Most of this decrease was due to the planned closure of Sizewell A and Dungeness A.
- Most of the energy consumed by the electricity generation sub-sector is used to circulate coolant around the reactors. British Energy was the major user, accounting for 57 per cent of the sector total, with Magnox Electric using 15 per cent.

Figure 1.1c: **Sites with highest water consumption, 2007**

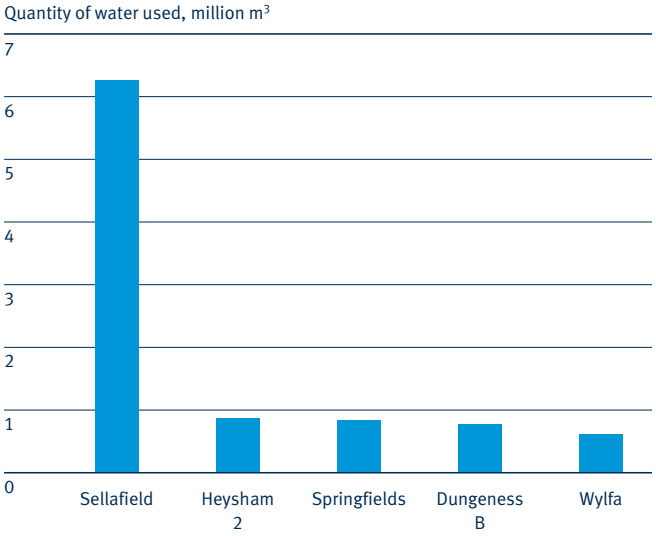


Figure 1.2a: **Total energy use**

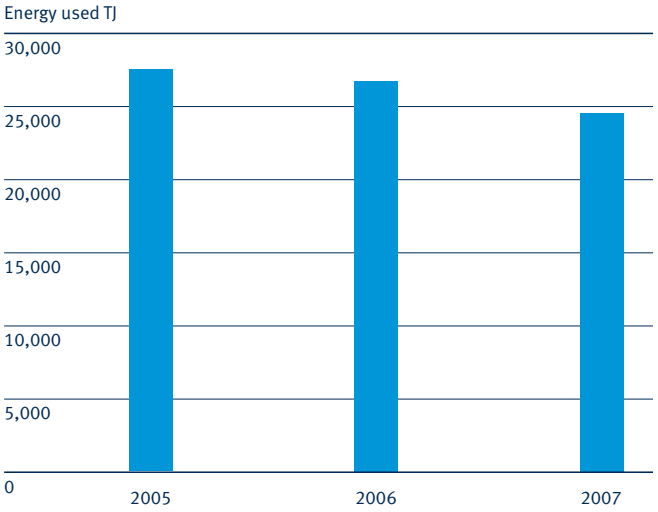


Figure 1.2b: **Energy use by sub-sector, 2007**

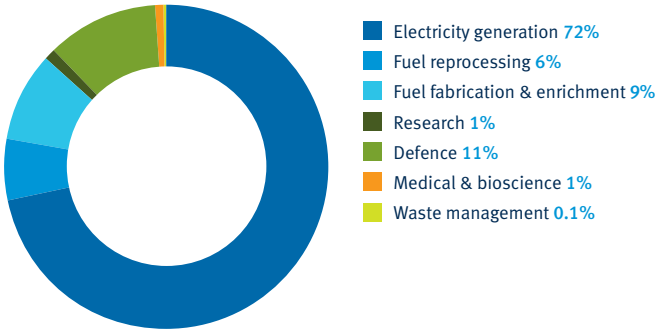
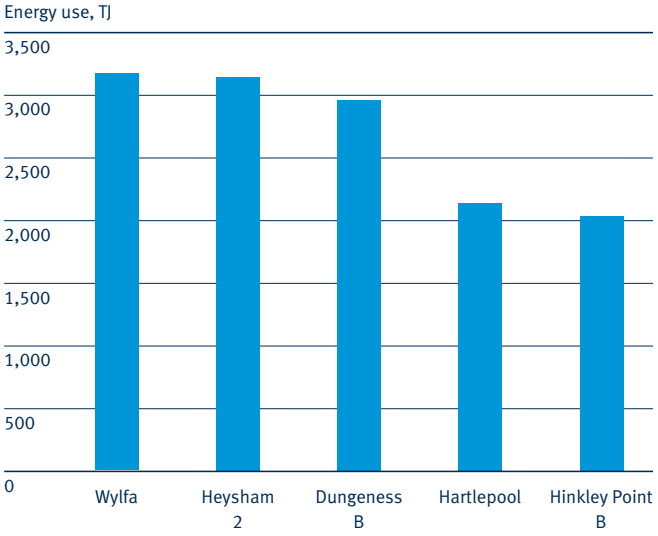
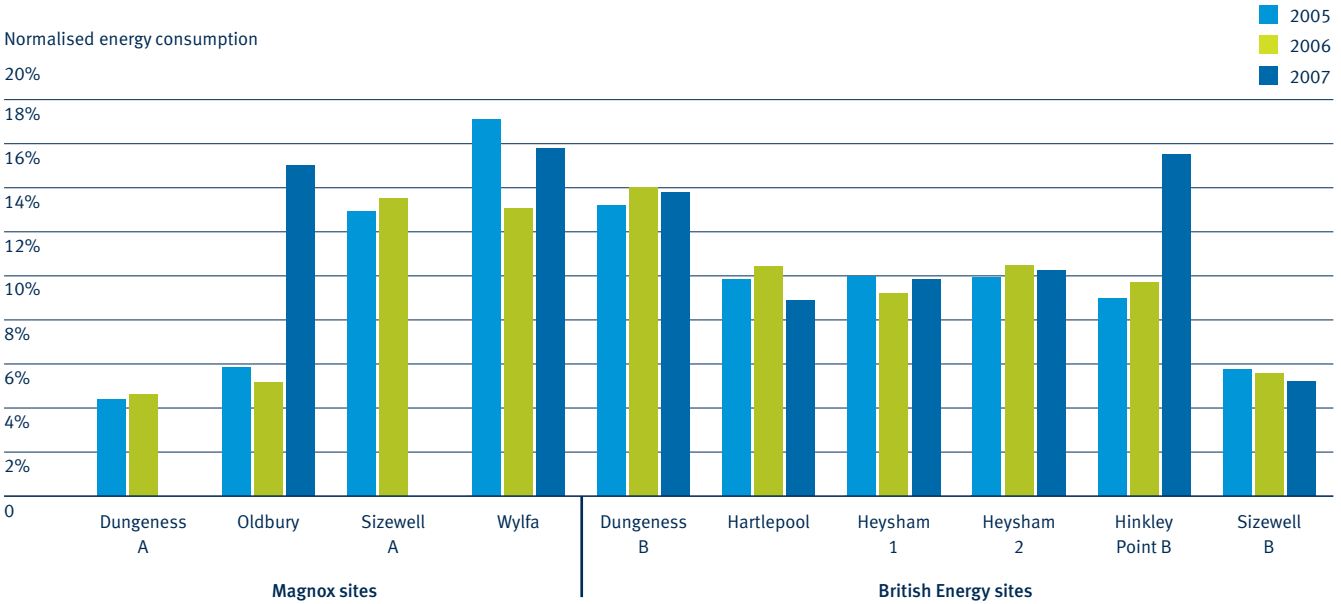


Figure 1.2c: **Sites with highest energy use, 2007**



- Eighteen sites (60 per cent) used less energy in 2007, compared with 2006, while eight sites (27 per cent) used more. The biggest reductions were at Sizewell A (95 per cent) and Dungeness A (81 per cent). These sites used much less energy in 2007 because they were no longer producing electricity, and key support systems previously needed for generation (for example, cooling water pumps) were shut down. At Winfrith, decommissioning of redundant nuclear facilities during 2007 lead to a doubling of energy use compared to 2006.
- Normalised energy use at Oldbury and Hinkley Point B increased significantly compared to 2006. This is because the reactors at both sites were shut down for a significant part of 2007, but other plant on site continued to operate.

Figure 1.2d: **Electricity generation sub-sector – normalised energy use**[3]



Note: Dungeness A & Sizewell A shut down at the end of 2006 so did not generate any electricity in 2007

3 Normalised energy use is energy used on site divided by energy sent out to the national grid. Typically, nuclear power stations use around 10 per cent of the energy they produce, but this can vary depending on their design and will not change significantly. Other factors which may affect the amount of energy used on site include older plant which may be less efficient, and project or decommissioning work which is taking place. Trends in the normalised energy consumption will help to identify genuine increases or decreases in efficiency at power stations.

Objective 2

Minimise and manage solid waste

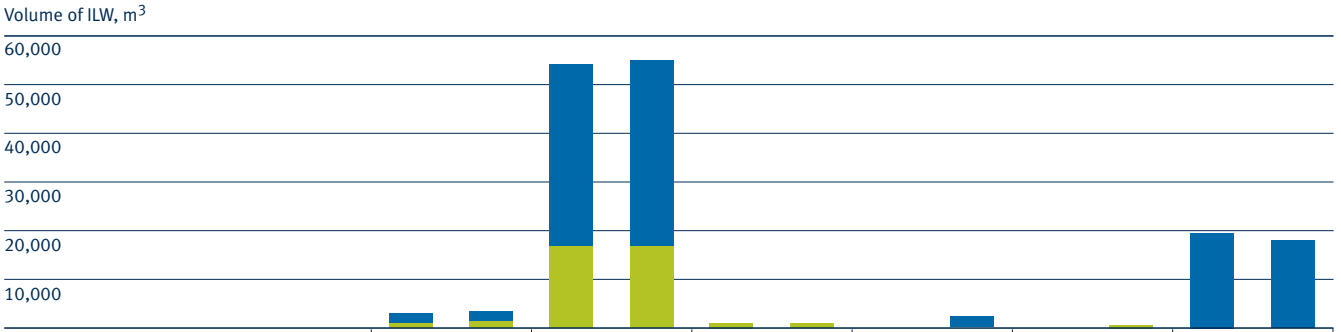
2.1 The percentage of intermediate level waste (ILW) at each site that has been conditioned and packaged in a form suitable for disposal

The Environment Agency and the NII require operators to produce Radioactive Waste Management Cases (RWMC) for all ILW waste streams. These address nuclear and environmental safety issues, in particular those relating to long-term storage and disposal. Some waste streams need to be conditioned and packaged early. Others may be dealt with at a later date, provided an acceptable RWMC is made.

Key messages[4]

- On 1 April 2007, the total volume of stored ILW from historic and current practices in England and Wales was 80,506 m^3, up from 76,378 m^3 in 2006. This

Figure 2.1a: **Progress with conditioning and packaging ILW at individual sites**



	Trawsfynydd		Sellafield		Windscale		Harwell		Winfrith		All other English and Welsh sites	
	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007
In stock but awaiting conditioning	1,879	1,631	36,847	38,333	173	174		1,967		467	19,220	18,200
Conditioned and packaged	861	1,129	16,753	17,767	645	697		43		98	0	0

4 For consistency, all volumes are quoted in conditioned state. For wastes which are not yet packaged, assumptions have been made about the conditioning and packing processes. These assumptions may change in the future.

waste 'in stock' includes raw, conditioned and/or packaged ILW. The NDA estimates that an additional 129,960 m³ of ILW will be produced during decommissioning of existing nuclear sites.

- Five nuclear sites have conditioned and packaged ILW in a form expected to be suitable for disposal. Harwell and Winfrith completed packaging of some ILW for the first time in 2007. The nuclear sector has conditioned and packaged a total of 19,734 m³ of ILW. This total is eight per cent more than the previous year, but there has only been a slight change in the proportion of waste conditioned and packaged – 25 per cent, up from 24 per cent in 2006 – due to increases in the stocks of raw waste.
- Waste from fuel reprocessing at Sellafield dominates the picture. Sellafield accounted for 70 per cent of the total volume of ILW currently 'in stock' in England and Wales, and for 90 per cent of the packaged and conditioned volume of ILW.
- Trawsfynydd has made substantial progress this year, increasing the volume of ILW conditioned and packaged from 31 per cent in 2006 to 41 per cent by volume of the waste 'in stock'.
- A total of 18,200 m³ of ILW was 'in stock' at other nuclear sites in England and Wales. This is yet to be conditioned and packaged into a form expected to be suitable for long- term storage and disposal.
- All ILW will need to be covered by Radioactive Waste Management Cases, but conditioning and packaging into a form suitable for disposal will be intentionally delayed for some waste streams, with the agreement of the NII and the Environment Agency. Examples include:
  - some decisions on timing of conditioning and packaging will be influenced by where sites are in their life cycle (some British Energy wastes will be retrieved and packaged at the end of the power stations' operational lives);
  - some wastes from older stores at Sellafield that were put into interim packages suitable for long-term storage but not for final disposal. This was done to reduce risks to the environment. There is 7,320 m³ of interim packaged waste at Sellafield;
  - some waste from GE Healthcare which will be suitable for release as exempt waste in a number of years when the radioactivity has decayed.
- The Environment Agency considers such practices on a case by case basis and will continue to review its position.
- Overall, both the Environment Agency and the industry wish to see more progress in conditioning and packaging waste, although it may be acceptable to delay in some cases. We recognise that the picture will not change quickly, as packaging and conditioning ILW involves considerable effort in developing plant and processes and preparing and obtaining approval for safety cases.

P2.2 Inert waste (non-radioactive) – developmental indicator

P2.3 Non-hazardous waste (non-radioactive) – developmental indicator

P2.4 Hazardous waste (non-radioactive) – developmental indicator

Operational or decommissioning activities on nuclear sites may generate significant amounts of non-radioactive waste. Most of this waste comes from construction and demolition projects. It is categorised as hazardous, non-hazardous, or inert. Types and quantities will change throughout the lifecycle of decommissioning projects.

It is important to maximise reuse or recycling of waste. However, this won't be possible for all waste. There may not be any opportunities to recycle (as in the case of asbestos) or the quantities may be too small for recycling to be practicable.

Key messages

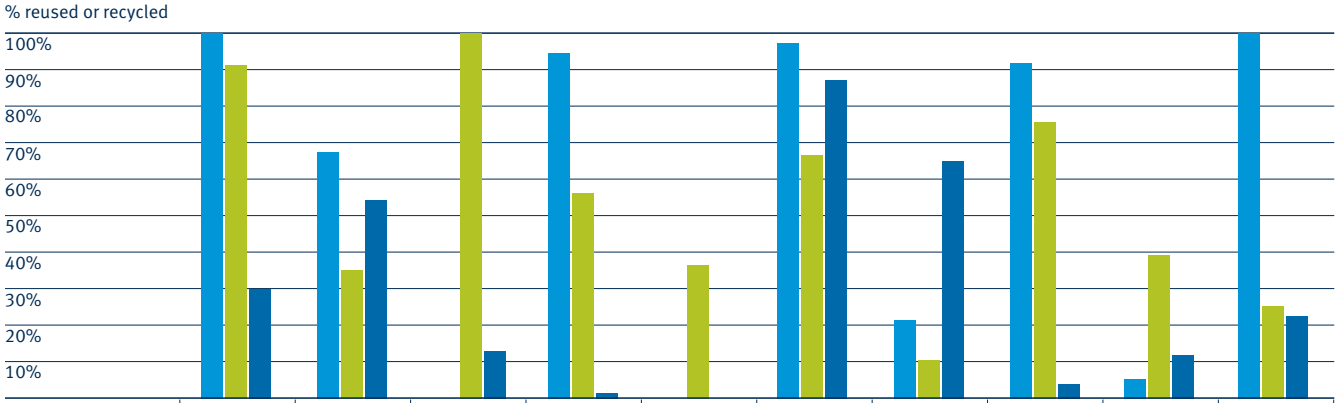
- The nuclear sector produced a total of 243,600 tonnes of non-radioactive waste in 2007 – five per cent less than in 2006. Sixty per cent of the waste was inert, and 29 per cent was non-hazardous.
- The nuclear sector recycled 69 per cent of its non-radioactive waste in 2007, up from 66 per cent in 2006. More inert waste was recycled in 2007, but less non-hazardous and hazardous waste was recycled.

- Recycling rates varied substantially for different types of waste, and between companies.
- Most companies recycled over 90 per cent of their inert waste, with Magnox and Urenco recycling all of theirs. Three companies significantly increased the proportion of inert waste they recycled this year:
  - At AWE, the company's integrated waste strategy is driving improvements in segregating and characterising waste, and making sure that off-site recycling routes are identified early. As a result, recycling rates increased from 0.02 per cent to 92 per cent.
  - Sellafield Ltd completed major demolition projects at Capenhurst, and over 90 per cent of the building material was reused or recycled.
  - UKAEA's increase was due to removal of equipment and decommissioning of redundant nuclear facilities at Winfrith during 2007.
- GE Healthcare only recycled five per cent of its inert waste in 2007 (compared to 21 per cent last year) because the total quantity reduced to a level that made recycling uneconomic.
- Five companies reused or recycled more than 50 per cent of their non-radioactive, non-hazardous waste in 2007, with Springfields recycling virtually all of theirs.
- UKAEA, British Energy and MoD recycled more than 50 per cent of their hazardous waste. All other companies apart from Magnox recycled less of their hazardous waste in 2007 than they did in 2006. The small volumes or nature of some hazardous wastes mean that recycling is either not feasible or not possible. Asbestos accounted for over six per cent of the hazardous waste produced on nuclear sites in 2007, and there are currently no recycling routes for this waste in the UK.

Table 1: **Reuse/recycling rates by type of waste, 2007**

Type of waste	% reused or recycled
Inert	94%
Non-hazardous	38%
Hazardous	9%
Total	**69%**

Figure 2.4a: **Waste reuse/recycling rates by company, 2007**



	Magnox Electric	British Energy	SFL	Sellafield Ltd	LLWR Ltd	UKAEA	MoD	AWE	GEH	Urenco
Inert	100%	67%		94%		97%	21%	92%	5%	100%
Non-hazardous	91%	34%	100%	56%	36%	66%	10%	75%	39%	25%
Hazardous	30%	54%	13%	1%	0%	87%	64%	3%	12%	22%

Note: total for Magnox non-hazardous waste does not include Oldbury & total for MoD hazardous waste excludes data for one site. because these sites do not have reliable data on recycling yet. SFL and LLWR Ltd did not produce any inert non-radioactive waste

Objective 3

Reduce discharges to air and water

3.1 Proportion of BPM assessments required that have been completed and accepted by the Environment Agency

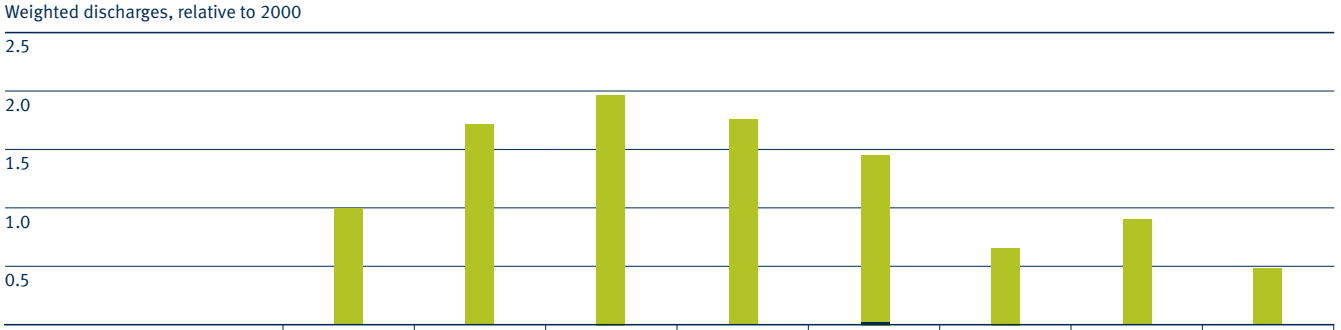
As stated in last year's report, this indicator is not an effective measure of sector performance and we will remove it when we revise the nuclear sector plan.

3.2-3.5 Annual liquid radioactive discharges

Key messages

- Reducing liquid radioactive discharges to meet the current UK discharge strategy targets by 2020 is one of the key environmental challenges facing the nuclear sector. Good progress is being made towards meeting these targets. The UK discharge strategy is currently being reviewed and will extend to 2030.

Figure 3.2a: **Trends in radioactive discharges to water**

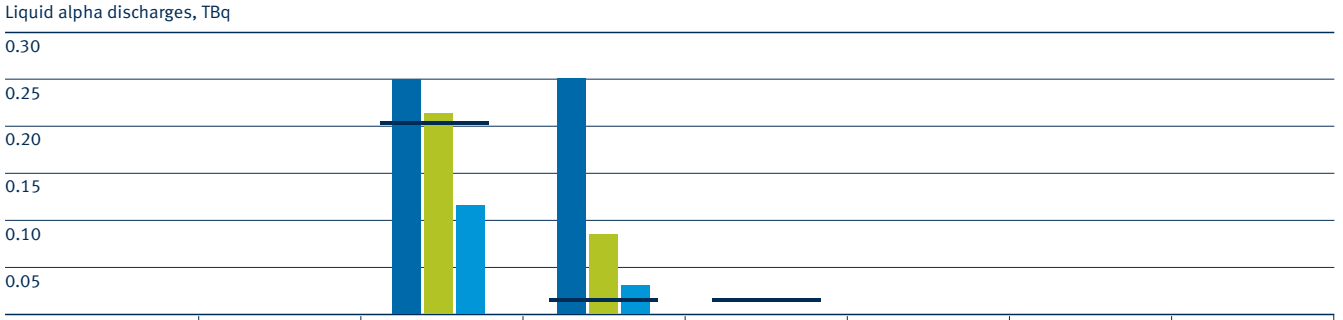


	2000	2001	2002	2003	2004	2005	2006	2007
Other	0.0012	0.0001	0.0000	0.0006	0.0006	0.0004	0.0004	0.0000
Fuel reprocessing	0.9883	1.6763	1.9647	1.7651	1.4373	0.6154	0.8554	0.4600
Fuel fabrication/enrichment	0.0017	0.0025	0.0024	0.0018	0.0032	0.0024	0.0014	0.0000
Electricity generation	0.0088	0.0216	0.0125	0.0190	0.0246	0.0223	0.0184	0.0129

Note: 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, so the graph does not have any units. This does not equate to actual impact. The 'other' category includes the research, defence, medical and bioscience, and waste management sub-sectors – they are not shown separately because the contribution they make to the total is so small.

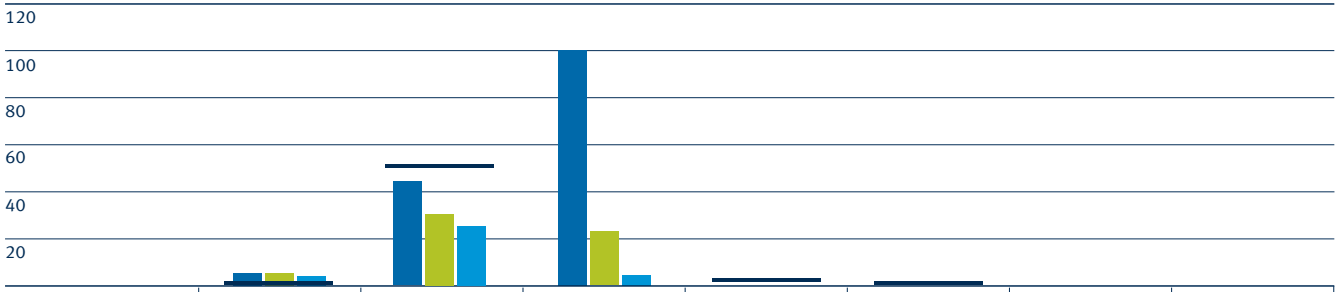
- Total radioactive discharges to water have been significantly lower than usual since 2005 because some of the reprocessing plants at Sellafield have been shut down several times, often for long periods.
- Total discharges of alpha activity to water from the nuclear sector halved compared to 2006, liquid beta/gamma discharges decreased by 42 per cent and discharges of liquid tritium decreased by 24 per cent.
- Liquid alpha discharges from the fuel fabrication/ enrichment and fuel reprocessing sub-sectors decreased significantly between 2006 and 2007, by 69 per cent and 43 per cent respectively. Discharges from Springfields continued to fall following the shutting down of uranium ore processing operations. Reductions in discharges from Sellafield were partly due to less fuel being reprocessed.
- Liquid alpha discharges from the fuel reprocessing and research sub-sectors were within the 2020 targets.
- Liquid beta/gamma (excluding tritium) discharges from all sub-sectors except waste management decreased between 2006 and 2007. Increases at LLWR were associated with increased rainfall.
- Liquid beta/gamma discharges from the fuel reprocessing, research and defence sub-sectors were within the 2020 targets.

Figure 3.2b: **Annual liquid alpha discharges**



	Electricity generation	Fuel reprocessing	Fuel fabrication & enrichment	Research	Defence	Medical & bioscience	Waste management
2005 discharges	4.2E-04	2.5E-01	2.5E-01	3.0E-04	8.8E-05	1.0E-05	7.4E-04
2006 discharges	5.1E-04	2.1E-01	8.4E-02	1.2E-04	5.8E-05	1.2E-05	4.5E-05
2007 dischrges	1.4E-04	1.2E-01	2.6E-02	1.5E-04	8.2E-05	1.3E-05	1.3E-04
2020 targets	None	2.0E-01	1.0E-02	8.0E-03	None	None	None

Figure 3.3a: **Annual liquid beta/gamma discharges (excluding tritium)**



	Electricity generation	Fuel reprocessing	Fuel fabrication & enrichment	Research	Defence	Medical & bioscience	Waste management
2005 discharges	4.2E+00	4.3E+01	1.0E+02	1.2E-02	1.0E-03	2.8E-01	6.0E-05
2006 discharges	4.0E+00	2.9E+01	2.1E+01	2.8E-02	1.0E-03	2.9E-01	7.1E-04
2007 discharges	3.3E+00	2.5E+01	3.0E+00	3.6E-04	8.7E-04	1.5E-01	1.3E-03
2020 targets	1.5E+00	5.0E+01	virtually zero	9.0E-01	3.0E-03	None	None

- Discharges of tritium to water from the electricity generation sub-sector decreased by 12 per cent between 2006 and 2007, mainly due to decreases in discharges from Hinkley Point B resulting from a long interruption to generation for inspection and maintenance. Discharges from Dungeness A increased by 30 per cent in 2007 because there was a campaign (agreed with the Environment Agency) to dispose of tritiated liquid from the gas conditioning plant.
- Liquid tritium discharges from the fuel reprocessing sub-sector decreased by 43 per cent between 2006 and 2007, partly because less fuel was reprocessed.
- Discharges of tritium to water from the defence sub-sector were within the 2020 target.
- Introducing a new abatement technique and other changes to processes enabled Sellafield to reduce discharges of technetium-99 from from 190 TBq in 1995 to less than 10 TBq in 2006, meeting the interim target in the UK discharge strategy. Discharges of technetium-99 from fuel reprocessing continued to decrease in 2007, partly because less fuel was reprocessed. Meeting the 2020 target will be challenging.

3.6 Annual radioactive discharges to air

Key messages

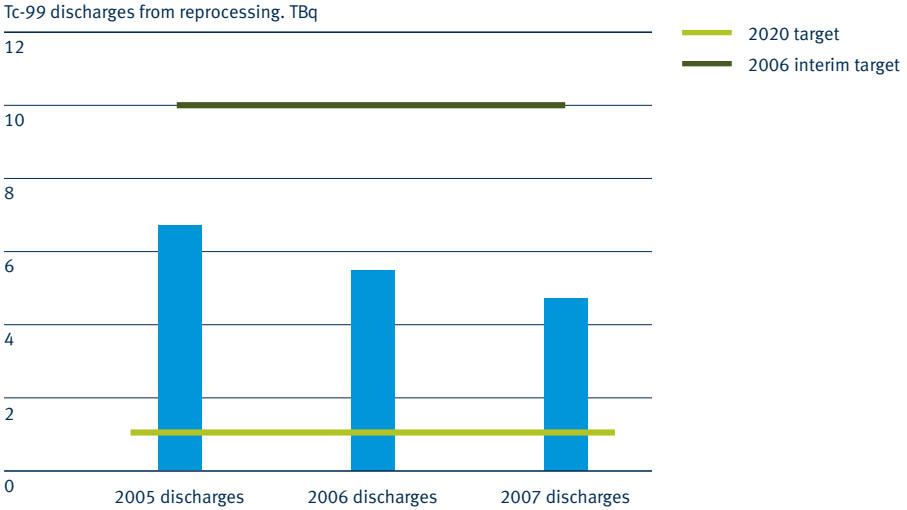
- Radioactive discharges to air from the nuclear sector as a whole continued to fall in 2007. This trend may not continue if the amount of fuel reprocessed at Sellafield returns to typical levels in the future.

Figure 3.4a: **Annual liquid tritium discharges**

	Electricity generation	Fuel reprocessing	Fuel fabrication & enrichment	Research	Defence	Medical & bioscience	Waste management
2005 discharges	1.5E+03	1.6E+03	brt	8.5E+00	2.0E-01	4.0E+01	brt
2006 discharges	1.5E+03	1.1E+03	brt	1.6E+01	1.1E-01	2.5E+01	brt
2007 dischrges	1.4E+03	6.3E+02	brt	2.3E+01	1.3E-01	2.8E+01	brt
2020 targets	8.5E+02	None	None	2.0E+01	4.0E-01	None	None

Note: brt means below reporting threshhold.

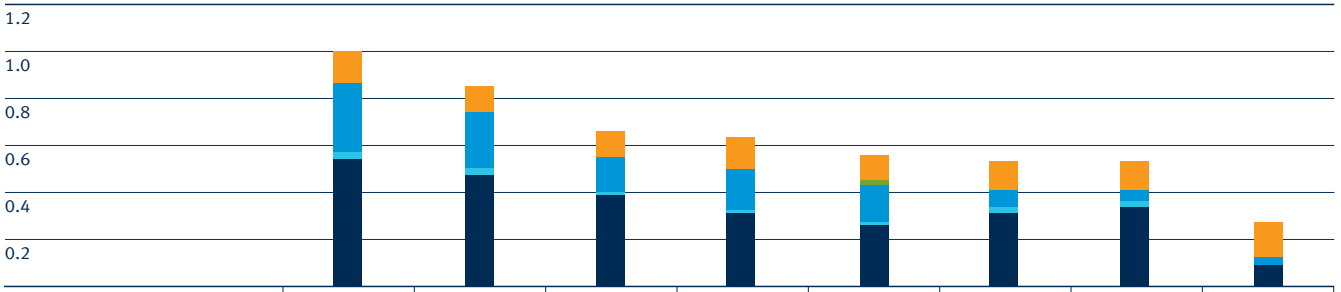
Figure 3.5a: **Annual technetium-99 discharges from reprocessing**



- Discharges of alpha activity to air increased by 51 per cent compared to 2006. Gaseous beta/gamma and tritium discharges decreased by 47 per cent and 12 per cent respectively (see below for further information).
- Discharges of alpha-emitting radionuclides to air from the medical/bioscience sub-sector, the main contributor, increased by over 50 per cent in 2007. This was due to increases in radon-222 discharges from stored wastes. This is due to a combination of factors – natural fluctuation, changes in ventilation and degradation of waste containment. The increase is not radiologically significant and the discharges will fall when the facilities are decommissioned in a few years time.
- Fuel reprocessing accounted for 99 per cent of the nuclear sector's discharges of beta/gamma-emitting radionuclides (excluding tritium) to air in 2007. Discharges from Sellafield decreased by almost 40 per cent compared to 2006. These discharges have been lower than would typically be expected since 2005, because the amount of fuel reprocessed has been lower than normal.
- As expected, beta/gamma discharges to air from the electricity generation sub-sector decreased significantly between 2006 and 2007, because the Magnox power stations at Dungeness A and Sizewell A shut down at the end of 2006.

Figure 3.6a: **Trends in radioactive discharges to air**

Weighted discharges, relative to 2000



	2000	2001	2002	2003	2004	2005	2006	2007
Waste management	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Medical & bioscience	0.1467	0.0721	0.0996	0.1279	0.1107	0.0965	0.0975	0.1313
Defence	0.0009	0.0006	0.0002	0.0015	0.0021	0.0016	0.0002	0.0001
Research	0.0003	0.0001	0.0000	0.0000	0.0058	0.0049	0.0052	0.0064
Fuel reprocessing	0.3001	0.2666	0.1576	0.1573	0.1393	0.0801	0.0659	0.0413
Fuel fabrication/enrichment	0.0102	0.0104	0.0071	0.0080	0.0107	0.0060	0.0038	0.0046
Electricity generation	0.5418	0.4777	0.3888	0.3387	0.2841	0.3306	0.3475	0.0766

Note: 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, so the graph does not have any units. This does not equate to actual impact.

- Discharges of tritium to air from GE Healthcare's Maynard Centre accounted for almost 80 per cent of the sector's total and increased by 16 per cent compared to 2006, linked to increases in production rates. Discharges of tritium from all other sub-sectors decreased in 2007.

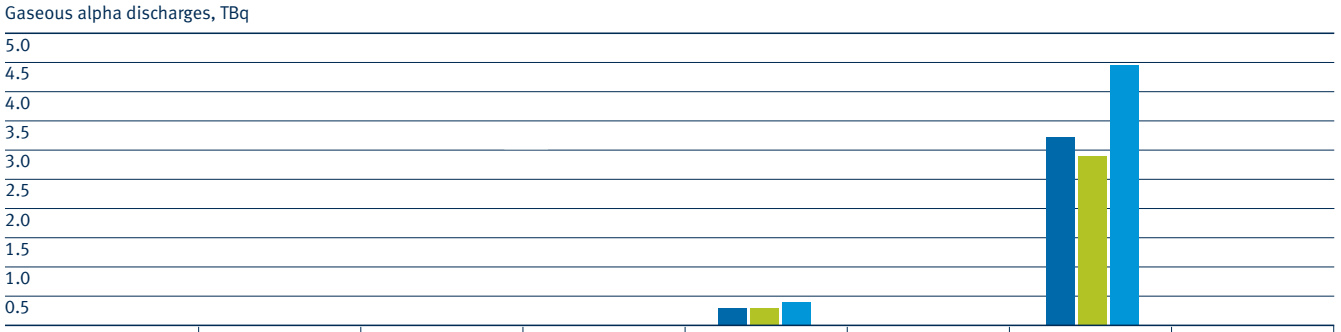
3.7 Critical group doses due to radioactive discharges

Food and the environment near nuclear sites are regularly monitored to find out what levels of radioactivity they contain. The monitoring results are published annually in the RIFE report. The Environment Agency uses this data, together with information on the habits of people who live near the sites, to assess radiation doses to the public as a result of waste discharges. Changes in doses occur from year to year and are mostly caused by variations in radioactivity concentrations and dose rates. However, in some years doses are affected by changes in people's habits, in particular the food they eat. The assessed doses for those groups that are most exposed to radiation near all nuclear sites in the UK are known as 'critical group doses'.

Key messages

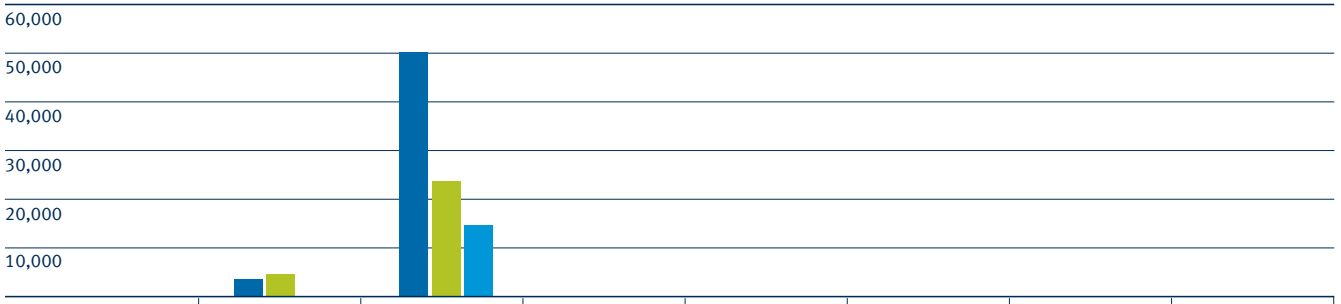
- Doses to critical groups as a result of liquid and gaseous discharges from nuclear sites are generally very small, and all remained well within the 1 milliSievert (mSv) limit for members of the public in 2007. Average radiation doses to the general public from all sources in the UK are around 2.7 mSv a year. Discharges from the nuclear industry account for less than 0.1 per cent of the average radiation dose.

Figure 3.6b: **Gaseous alpha discharges**



	Electricity generation	Fuel reprocessing	Fuel fabrication & enrichment	Research	Defence	Medical & bioscience	Waste management
2005 discharges	brt	8.7E-05	6.7E-04	2.7E-01	brt	3.2E+00	9.0E-08
2006 discharges	brt	1.1E-04	4.3E-04	2.9E-01	5.9E-08	2.9E+00	brt
2007 discharges	brt	1.4E-04	5.2E-04	3.8E-01	brt	4.5E+00	brt

Figure 3.6c: **Gaseous beta/gamma discharges (excluding tritium)**

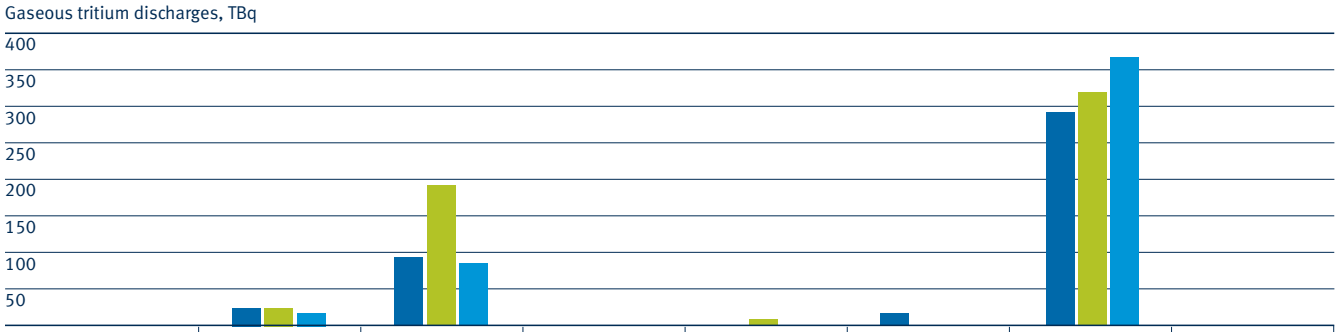


	Electricity generation	Fuel reprocessing	Fuel fabrication & enrichment	Research	Defence	Medical & bioscience	Waste management
2005 discharges	3.1E+03	5.0E+04	brt	1.8E-03	9.0E-03	1.9E+01	1.6E-07
2006 discharges	3.5E+03	2.3E+04	2.4E-06	1.2E-01	3.1E-02	1.9E+01	brt
2007 discharges	9.9E+01	1.4E+04	1.7E-06	1.4E-03	1.3E-02	2.0E+00	brt

* From sources other than natural background and medical procedures

- A group of people in Cumbria that consumed a large quantity of fish and shellfish received the highest dose of radiation due to liquid discharges. Discharges from the Sellafield and Windscale complex were estimated to have contributed 0.24 mSv to this dose in 2007. Most of the dose was due to the accumulation of caesium-137, plutonium isotopes and americium-241 in seafood and the environment from past liquid discharges. Other groups as far afield as South Wales also received radiation doses as a result of discharges from Sellafield, but at lower levels than the Sellafield critical group doses.
- Critical group doses as a result of liquid discharges from eight nuclear sites were less than 0.5 per cent of the dose limit for members of the public.
- In 2007, the highest critical group dose from gaseous discharges was just over 2 per cent of the dose limit. Infants living near Sellafield received this dose, which was mostly due to strontium-90 discharged during routine operations at the site.
- Critical group doses as a result of gaseous discharges from 17 nuclear sites were less than 0.5 per cent of the public dose limit of 1 mSv/y.

Figure 3.6d: **Gaseous tritium discharges**



	Electricity generation	Fuel reprocessing	Fuel fabrication & enrichment	Research	Defence	Medical & bioscience	Waste management
2005 discharges	2.0E+01	9.3E+01	brt	7.0E-01	1.4E+01	2.9E+02	brt
2006 discharges	2.0E+01	1.9E+02	brt	2.6E+00	1.2E+00	3.2E+02	brt
2007 discharges	1.6E+01	8.3E+01	brt	9.2E-01	7.2E-01	3.7E+02	brt

Figure 3.7a: **Highest critical group doses due to liquid discharges**

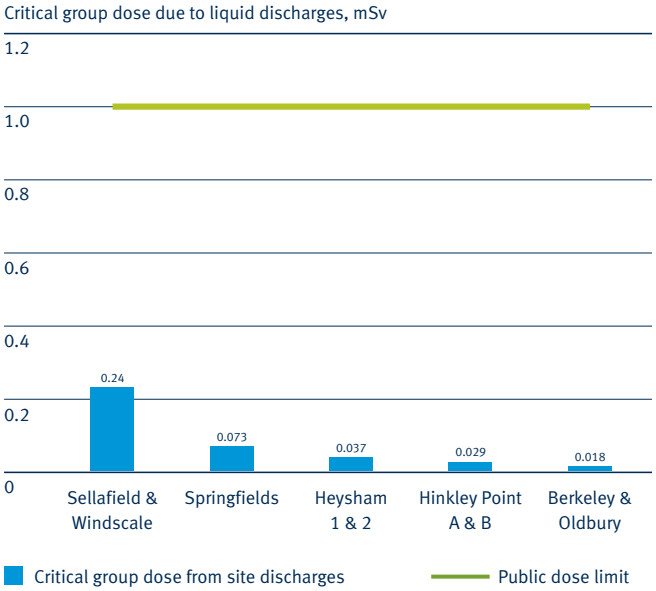
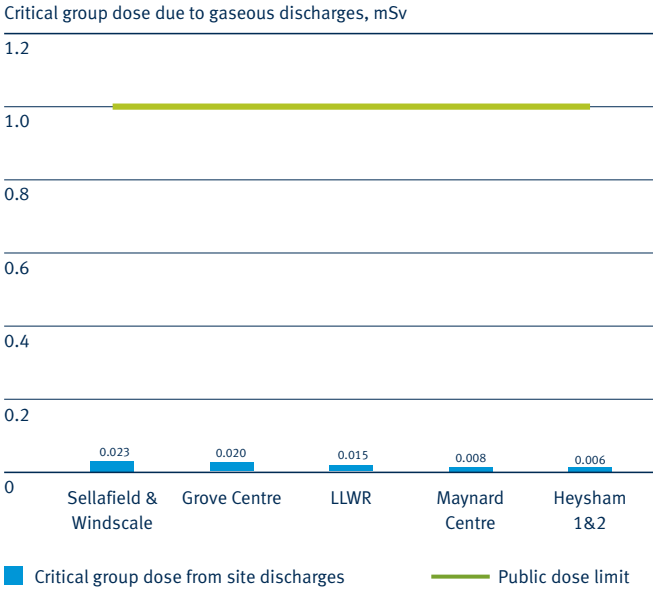


Figure 3.7b: **Highest critical group doses due to gaseous discharges**



3.8 Discharges of nitrates and nitrites to controlled waters

Nitrate and nitrite are some of the most substantial non-radioactive discharges from the nuclear sector. They are mainly produced when nitric acid is used to dissolve nuclear fuel or uranium-rich residues from fuel manufacturing processes. Discharges of nitrates and nitrites from Sellafield and Springfields are a small percentage of the total quantity of these nutrients discharged to the Irish Sea. However, they have a measurable impact on nutrient levels near the discharge points.

Key messages

- The nuclear sector discharged 1,113 tonnes of nitrate and nitrite to water in 2007 – 29 per cent less than in 2006.
- Discharges from Sellafield decreased partly because less fuel was reprocessed.
- Discharges from Springfields continued to reduce after uranium ore processing operations at the site were shut down in 2006.

3.9 Integrated waste strategies (IWS) – developmental indicator

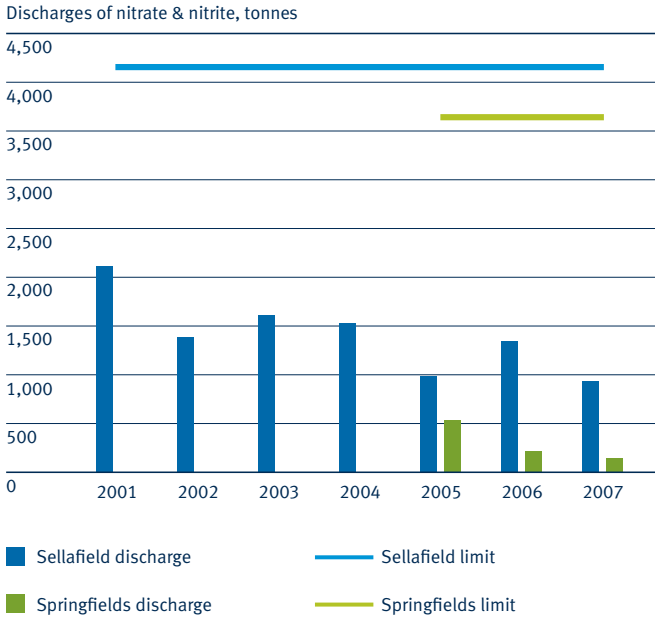
Key messages

- Since 2005 the NDA has required its site operators to produce integrated waste strategies (IWS), and to use these to support lifetime plans for decommissioning and clean up. The Environment Agency is encouraging other (non-NDA) nuclear operators to produce integrated waste strategies.
- Operators reported that 24 nuclear sites (80 per cent) had an IWS in place by the end of 2007. Sellafield Ltd published its first IWS for the Capenhurst site in 2007, and AWE published a company-wide IWS covering Aldermaston and Burghfield. The Environment Agency is currently reviewing integrated waste strategies with operators to ensure that they remain fit for purpose.
- Two-thirds of the sites that had an IWS in place had also developed an IWS action plan, and had discussed this with the Environment Agency and with interested organisations.
- IWS and accompanying action plans were being developed by Urenco and one defence site, but not at two defence sites or at LLWR (which produces only trivial quantities of waste).
- The Environment Agency is working with the NDA to encourage them to build on the work on site IWSs to produce a national IWS.

3.10 Environmental concentrations of key radionuclides in various media – developmental indicator

As stated in last year's report, this indicator is not an effective measure of sector performance and we will remove it when we revise the nuclear sector plan.

Figure 3.8a: **Nitrate and nitrite (as nitrogen) discharges**



Objective 4

Reduce greenhouse gas emissions

4.1 Greenhouse gas emissions

Climate change is one of the Environment Agencys top priorities.

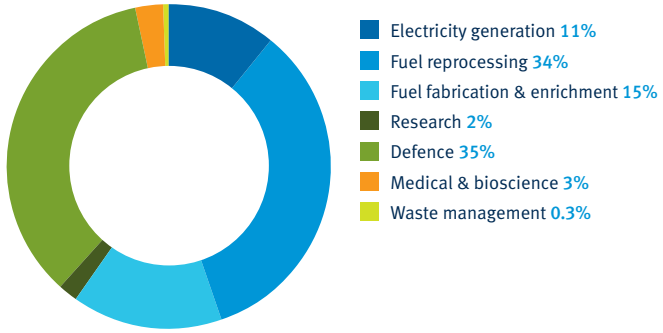
Key messages

- In 2007, the eight nuclear stations in England and Wales generated 12 per cent of the UK's electricity (if the output from Scottish nuclear power stations is included, the total nuclear contribution was 16 per cent) and the nuclear sector released greenhouse gases equivalent to 0.55 million tonnes of carbon dioxide – five per cent more than in 2006[5]. By comparison, producing this amount of electricity using fossil fuels would release about 30 million[6] tonnes of carbon dioxide.
- Emissions from the electricity generation, research and defence sub-sectors increased by around 10 per cent compared to 2006.
- Greenhouse gas emissions from Aldermaston and Burghfield may be higher than figures given by some of the other operators because they include emissions from staff commuter mileage, hire car mileage and claimed mileage as well as fuel used by vehicles filling up on-site.

Comparison with other sectors

- Some industrial sectors report greenhouse gas emissions associated with their activities to the Environment Agency's pollution inventory. Out of all the sectors that report, the energy sector is the major producer of greenhouse gases. In 2007, it produced 186 million tonnes of carbon dioxide (a two per cent increase on 2006 emissions). Emissions from the nuclear sector are equivalent to less than 0.3 per cent of the total emissions from the energy sector.

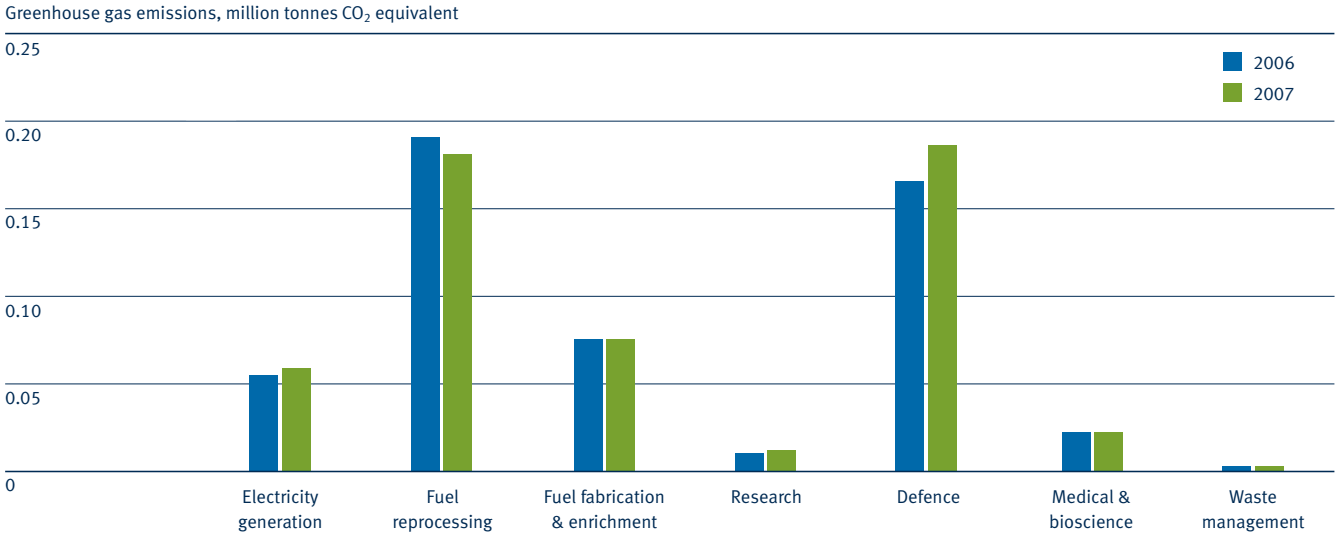
Figure 4.1a: **Greenhouse gas emissions by sub-sector, 2007**



5 Urenco's data for 2006 has been revised to take into account the fuel mix used by its electricity supplier. As a result, their greenhouse gas emissions were only 21,205 tonnes (compared to 81,132 tonnes reported in the 2006 report). This means that the total greenhouse gas emissions from the nuclear sector in 2006 were 0.52 million tonnes of CO2 equivalent.

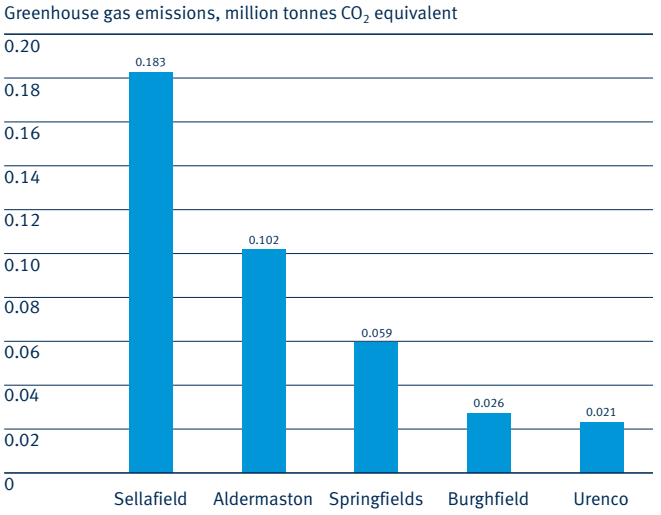
6 The value depends on the energy mix. If all the electricity was produced by coal approximately 42 million tonnes of carbon dioxide would be generated. For gas the equivalent figure is 19 million tonnes.

Figure 4.1b: **Trends in greenhouse gas emissions by sub-sector**



Note: data from 2005 have not been included because they were unreliable. Data for the fuel fabrication & enrichment sub-sector for 2006 have been revised to take into account the fuel mix used by Urenco's electricity supplier

Figure 4.1c: **Five biggest producers of greenhouse gases, 2007**



Objective 5

Develop site restoration and biodiversity action plans

5.1 Sites 'determined' to be affected by chemical contamination, as defined by the Environmental Protection Act 1990

Contaminated land is a potentially significant environmental and waste management issue for the nuclear sector. The scale of this issue differs widely between individual nuclear sites. In many cases, contamination is a legacy from the way sites were previously used.

For land on nuclear sites, the Contaminated Land Regulations issued under Part 2A of the Environment Protection Act 1990 only consider chemical contamination.

Key messages

- By 2007, a total of 852 sites had been 'determined' as contaminated land in England and Wales.
- Aldermaston is the only nuclear site which has 'determined' contaminated land under the Part 2A regulations. AWE is currently carrying out voluntary remediation on part of the site contaminated by chemical solvents.

5.2 Proportion of sites with management plans for contaminated land developed in consultation with regulators

Many nuclear site operators are taking action to identify and manage land which is affected by chemical or radioactive contamination at levels below the threshold defined as 'contaminated' under the Part 2A contaminated land regulations. This contaminated land does not pose a significant risk to employees or the public, but managing it is recognised as good stewardship. This will be a long-term process. Sites which are to be fully decommissioned and de-licensed will need to be cleaned up at some point so that they are fit for purpose for the agreed future use.

Key messages

- Including Aldermaston, operators considered that 22 nuclear sites (73 per cent) had some areas with radioactive and/or chemical contamination in the soil. Eight nuclear sites (27 per cent) were not considered to be contaminated by their operators, and therefore do not need a management plan.
- Operators are carrying out or have completed survey and characterisation work to find out the extent of the contamination on the majority of sites. Monitoring is carried out routinely on most sites. Other management arrangements are generally less well developed. Sites may be making progress on more than one aspect at the same time, and are likely to continue to review management plans and refine them as more information becomes available.

The most significant legacy of contaminated land and groundwater is at Sellafield. Sellafield Ltd started a two-year programme in 2007 to understand more about the contamination. This includes developing a network of shallow and deep boreholes. Information obtained during construction of the boreholes may help to identify the most important sources of contamination and to establish how far the contamination has spread in soil and groundwater. Future monitoring data will be used to improve modelling of the spread of contamination.

5.3 Implementing biodiversity action plans at appropriate sites

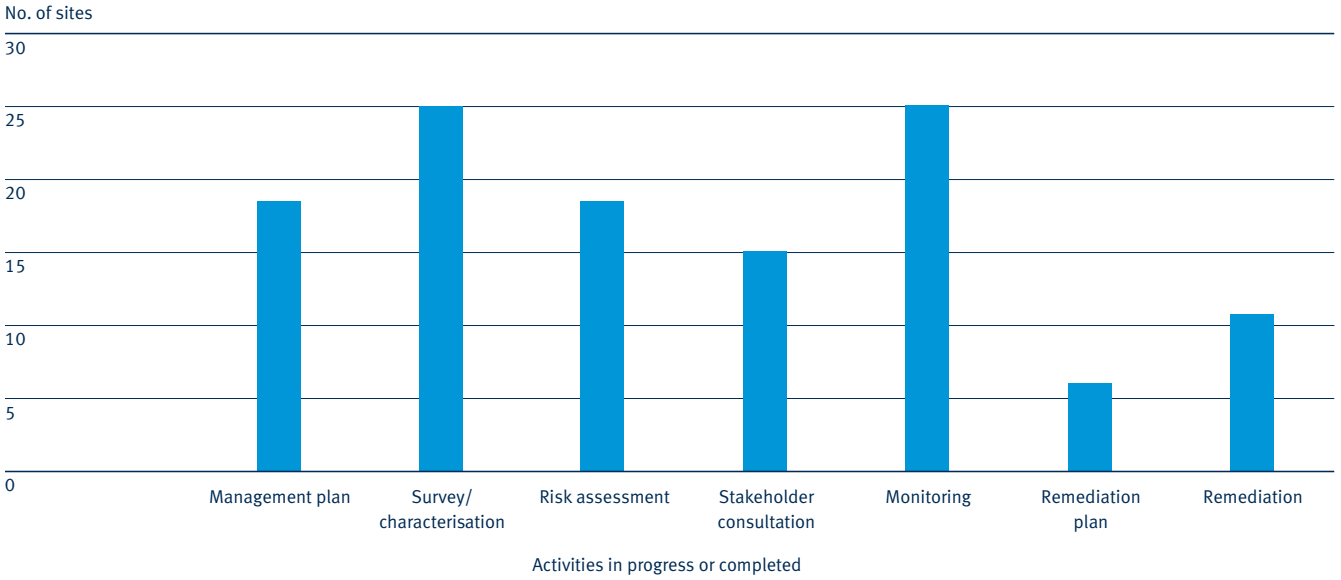
- Most nuclear licensed sites are in remote, rural locations, and many cover large areas of land. Several sites have unique habitats, and some are home to rare plants or animals. Most operators recognise that it is important to manage their sites for wildlife, and are actively promoting biodiversity by developing biodiversity action plans (BAPs).

Key messages

- By the end of 2007, 21 nuclear sites (70 per cent) had implemented BAPs. The first BAPs were published in 2004 and several are now well-developed, with recommendations being implemented and reviewed regularly. Oldbury and Urenco Capenhurst published their first BAPs and started implementing them during 2007. Trawsfynydd has developed a BAP but will not start implementing it until 2008.

- Operators considered that the remaining seven nuclear sites did not need BAPs because the land is of insufficient ecological interest.

Figure 5.2a: **Management arrangements in place for contaminated land, 2007**



Objective 6

Improve transparency, understanding and involvement between the Environment Agency, industry and other interested organisations

The nuclear industry needs to understand the concerns of individuals and organisations that are interested in or affected by its operations. This means more than just reacting to requests. The industry should make sure all interested groups and individuals know what operators are doing and that they can communicate and discuss their concerns.

6.1 Percentage of sites holding local liaison/site stakeholder group meetings

The Environment Agency encourages nuclear site operators to work closely with their local stakeholders to help them understand what is happening on the sites and how it may affect them, and to give them an opportunity to influence decisions on the site.

Key messages

- All nuclear sites hold some form of regular local liaison meeting, known either as a local liaison committee (LLC) or, at NDA sites, a site stakeholder group (SSG). These groups generally involve members of local authorities and trade unions, interested members of the public and other local organisations. All NDA site stakeholder groups are chaired by someone who is independent of the operator.

- The Environment Agency feels that there is scope for the industry to improve how it interacts with stakeholders. For example, operators in the sector could learn from each other, or from work done by other business sectors, nationally and internationally. Operators need to make sure that they involve stakeholders early in key decisions so that people have an opportunity to have their say, rather than simply being informed of the outcome of any decision-making.

6.2 Percentage of operators who publish environmental reports

Key messages

- All nuclear sites regularly submit information about radioactive discharges to the Environment Agency. Some also send information about environmental monitoring. In most cases this information is sent to public registers in the relevant Environment Agency Region and to relevant local authorities.
- 75 per cent of operators in the nuclear sector published their own environmental report in 2007.
- Sites also report on their environmental performance to site stakeholder groups.
- Reporting under the nuclear sector plan has improved overall reporting.

P6.3 Monitoring progress with operators' plans for involving interested organisations – *developmental indicator*

We still have to determine a valid performance indicator to monitor progress with operators' plans for involving interested organisations. We need to consider this further.

Objective 7

Promote product stewardship and wider supply chain benefits

'Product stewardship' is about managing the health, safety and environmental impacts of a product throughout its life cycle in a responsible and ethical way. Each company throughout the supply chain plays a part in determining the overall impact a product has. Controlling the environmental impacts of an operation needs to extend beyond the boundary of the operating site. Manufacturers can play a crucial role in promoting product stewardship by establishing sound environmental policies for how they behave as both purchasers and suppliers.

P7.1 Number of companies with published policies describing their aims and methods as a **purchaser** to promote product stewardship practices among their suppliers – *developmental indicator*

P7.2 Number of companies with published policies describing their aims and methods as a **supplier** to promote product stewardship practices among their customers – *developmental indicator*

The Environment Agency is promoting the concept of product stewardship, both internally and with industry. We will address this further as we review the nuclear sector plan.

Objective 8

Work to risk-based regulatory and environmental management systems

8.1 Number and proportion of modern, multi-media RSA disposal authorisations issued containing management conditions

The Environment Agency issues authorisations under the Radioactive Substances Act 1993 which allow operators to dispose of radioactive waste. These specify discharge limits and conditions that aim to protect people and the environment. Modern authorisations are integrated or multi-media, which means they cover all permitted disposal routes from a nuclear site in a single permit, and place management requirements on nuclear operators.

Key messages

- Ten new multi-media authorisations were issued in 2007, and by the end of the year 29 nuclear sites (97 per cent) had multi-media authorisations.

8.2 Pollution incidents
8.3 Breaches of permits

An incident is defined as 'a specific event which is being brought to the Environment Agency's attention, is within its areas of responsibility and which may have an environmental and/or operational impact.'

The Environment Agency aims to protect the environment by setting permit conditions that prevent or control the risk of polluting the environment and/or causing harm to human health. It defines breaches as non-compliance with permit conditions.

It classifies both incidents and breaches are both classified from category one to four, with category one being the most serious. Incidents are classified based on their actual impact, while breaches are classified on their potential impact. For example, a category one incident has a major impact on the environment, while a category two breach of permit has or could have a significant impact on the environment and a category four breach has no potential to have an effect.

Key messages

- There were no category one or category two pollution incidents or breaches of permit recorded in the Environment Agencys (CICS and CCS) databases for the nuclear sector in 2007.
- Operators track trends in the number of lower category pollution incidents and breaches to make sure that they are aware of any changes in environmental performance, and usually apply any lessons learned from investigating any events across other sites operated by the same company.

Table 2: **Number of pollution incidents and breaches of permits in nuclear and other sectors by category, 2007**

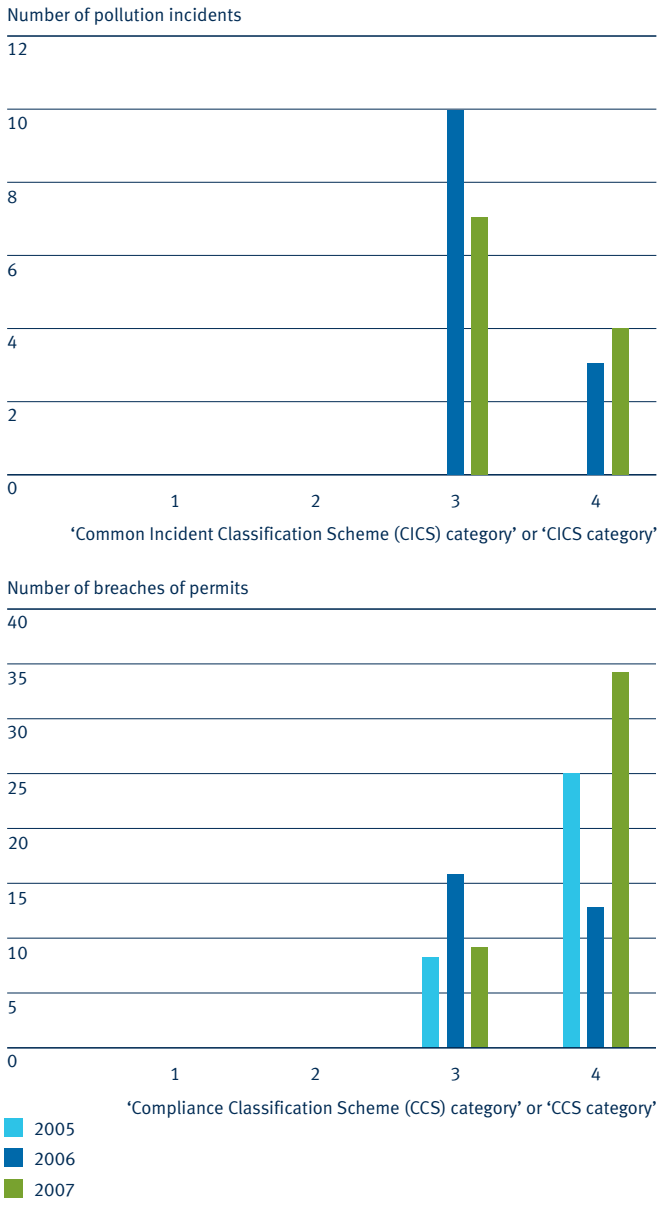
	Nuclear	All sectors
Pollution incidents		
Category 1	0	46
Category 2	0	761
Category 3	7	7,500
Category 4	4	1,182
Breaches of permit		
Category 1	0	188
Category 2	0	2,270
Category 3	9	18,515
Category 4	32	9,333

8.4 Number of companies with enforcement actions and prosecutions

Key messages

- The Environment Agency took enforcement action against two companies in the nuclear sector under the Radioactive Substances Act 1993 in 2007:
  - It issued an enforcement notice to Magnox Electric in June 2007, after an incident where liquid waste overflowed at Berkeley's active effluent treatment plant (AETP) in March 2007. The company has reviewed the operating and maintenance instructions for all discharge systems, put in place a revised and enhanced environmental maintenance schedule, and improved the training of supervisors. Further improvement work has been identified and will be included in an action plan.
  - Sellafield Ltd received an enforcement notice on 18 January 2007, after small holes were discovered in the secondary containment of one of the pipelines used to discharge liquid effluent to sea from Sellafield. Under the notice, the company has to review the arrangements for maintaining all systems handling liquid effluents at the site, and to justify the use of soakaways as discharge points. An initial report on arrangements for inspection, maintenance and testing of the sealines identified a number of improvements, which have been implemented.
  - The Environment Agency issued an enforcement notice to Sellafield Ltd on 2 May 2007 requiring them to improve the exclusion of solids from aqueous discharges from Sellafield. An initial report reviewing the 'best practicable means' for preventing solid entering aqueous wastes has been submitted, and improvements have already been made at several plants, with more improvements planned.
- The Environment Agency did not take any prosecutions against nuclear sector operators in 2007.

Figure 8.2a: **Trends in numbers of pollution incidents and breaches of permit**



8.5 Number (and proportion) of PPC applications and variations determined and issued within target time

8.6 Number (and proportion) of RSA applications and variations determined and issued within programme time

The Environment Agency grants permits to operators under the Pollution Prevention and Control Regulations (PPC) – now replaced by the Environmental Permitting Regulations (EPR) – and the Radioactive Substances Act (RSA93). It expects that the Radioactive Substances Act will be included in the next phase of the Environmental Permitting Regulations, taking effect in late 2009. The time taken to determine applications depends on the type of permit, for example whether it is a new application or a variation to an existing permission.

Key messages

- The Environment Agency determined 11 applications for PPC permits or variations in 2007. These included new permits for the six British Energy sites, Sellafield and one defence site. Some of these sites used to be regulated under the Integrated Pollution Control (IPC) regulations. Nine of these permits (82 per cent) were issued within the 'target time' agreed with the operators.
- The average time for determining PPC permits issued in 2007 was just under 15 months, but ranged from one month for a variation for Urenco to 37 months for the new permit for Dungeness B.
- The Environment Agency issued 21 RSA93 authorisations and variations in 2007. Twenty of these (95 per cent) were completed within the 'programme time' agreed with operators.
- On average, it took 11 months to determine an RSA93 authorisation or variation. Times ranged from one day for a minor variation for The Grove Centre to 21 months for AWE's new multi-media authorisations.

P8.7 Indicator based on scores from radioactive substances regulation risk assessment methodology – developmental indicator

The Environment Agency has reviewed its past regulatory effort. This showed a direct relationship with the size, complexity and hazards associated with individual nuclear sites. It is reasonably confident that its current planning system does result in a risk-based approach to nuclear regulation which is broadly comparable to other process industries. However, it does recognise that it needs to improve the robustness and transparency of how it employs its regulatory resources. No performance measure is appropriate at this time.

Areas for improvement

Overall, the environmental performance of the sector was good during 2007, with improvements over previous performance being made in a number of areas. Here, we highlight some areas for improvement that we have identified against the eight main environmental objectives.

Objective 1: Reduce consumption of natural resources

- Less water and energy was used at many of the sites in 2007. But we feel that there is still room for improvement at some sites, particularly those that have the opportunity to improve their infrastructure and management systems.

Objective 2: Minimise and manage solid waste

- Progress on conditioning and packaging intermediate level radioactive waste (ILW) for disposal varied from site to site, with good progress being made at Sellafield, Trawsfynydd, Windscale, Harwell and Winfrith. While this work will take time, as it is long-term, the Environment Agency expect to see continued and sustained progress.
- Most non-radioactive waste generated on nuclear sites is from construction and demolition. Recycling rates varied substantially between sites. Some operators need to improve their data on recycling. There are opportunities to share best practice within the nuclear sector, and to learn from other sectors, to help those sites that are not achieving high recycling rates to improve their performance.

Objective 3: Reduce discharges to air and water

- The Environment Agency expects to see the industry continue to make good progress in reducing discharges of radioactive waste, meeting all of the targets in the UK radioactive discharge strategy in the longer term.
- Considerable progress has been made in documenting integrated waste strategies at most nuclear sites. In many cases, these have identified significant opportunities for improving waste management. Progress towards developing and implementing a national integrated waste strategy needs to continue.

Objective 4: Reduce greenhouse gas emissions

- Most sites are developing strategies to reduce their greenhouse gas emissions, but there is scope to learn from good practice within the sector and from other sectors.

Objective 5: Develop site restoration and biodiversity action plans

- Considerable work has been done to understand more about the nature and extent of contaminated land on many nuclear sites, and on developing management plans to address the risks. This needs to continue, but is a long-term issue. We will look at measures to report progress on implementing these management plans.

Objective 6: Improve transparency, understanding and involvement between the Environment Agency, industry and other interested organisations

- Operators need to make sure that people are involved early enough to influence any key decisions being made, rather than simply being informed of the outcome of any decision-making.

Objective 7: Promote product stewardship and wider supply chain benefits

- Operators need to do more to assess and influence the environmental performance of their suppliers.

Objective 8: Work to risk-based regulatory and environmental management systems

- Operators must continue to make sure that there are no serious pollution incidents or breaches of permits, and therefore no need for enforcement.
- The Environment Agency will look to improve the robustness and transparency of how it employs its regulatory resources.

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