

improving environmental performance

Sector plan for the nuclear industry

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Foreword

In 'Delivering for the Environment – a 21st Century Approach to Regulation', we have set out how we are seeking to improve the effectiveness and efficiency of our regulatory approach. We are aligning our regulatory priorities in order to address the environmental outcomes and targets identified in our Environmental Vision and Corporate Strategy. We also encourage businesses to keep the environment at the centre of their thinking. To progress these objectives, we are now identifying and addressing the priority environmental issues resulting from individual sector activities.

We will develop and implement environmental improvement plans for regulated business sectors. These will be known as Sector Plans. The purpose of Sector Plans is to:

- focus on the most significant risks and impacts that the sector poses to the environment;
- deliver improvements in the sector's environmental management and performance;
- prioritise and target our effort within and across sectors;
- achieve, through co-operation with sectors, environmental benefits beyond those which can be achieved through regulation;
- monitor progress in delivering environmental improvements, within and between sectors.

The nuclear sector covers a wide range of operations and products. These include the generation of electricity, national defence and the development of medical applications that help us understand and treat human illnesses.

If nuclear science is to benefit society in a sustainable manner, we must continue to mitigate its environmental impacts and deal with its legacy safely and responsibly.

The nuclear sector has reduced its impact on the environment, particularly its radioactive discharges to air and water, over the past 20 years. But the industry still faces serious challenges. The targets for discharges will continue to get tougher, especially in relation to the marine environment. The decommissioning of nuclear plants and clean up of nuclear sites will continue well into the 21st century, and in some cases beyond. Decommissioning and clean-up will also generate significant challenges, especially as the UK still has no agreed strategy for the long-term management of solid radioactive waste.

This Plan provides an overview of the nuclear sector in England and Wales. It looks at the sector's impacts on the environment. And it identifies what the sector, we and others must do to ensure that these environmental impacts are minimised and managed safely. This is not the end of a process, but a beginning. We will revisit this analysis. With continued investment and sound management by the industry, and a modern approach to regulation, positive progress can be made.

Barbara Young
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1. BACKGROUND

This document sets out the Environment Agency's Sector Plan for the nuclear industry in England and Wales. The purpose of the Plan is to promote continuous improvements of the industry's performance in order to deliver environmental benefits that include, but extend beyond, those that can be achieved by regulatory compliance alone.

Based on a strategic review of the Sector's environmental issues (the 'Sector Report'¹), the Plan identifies high level environmental priorities and objectives for the next five to fifteen years. The aim is to achieve these environmental objectives through a programme of key actions for industry and the Agency, covering both statutory and voluntary activities. Indicators of performance are proposed for monitoring the effectiveness of these actions.

We have certain regulatory responsibilities and will ensure that these are carried out appropriately. However, one of the main features of this Plan is to identify those parts of the nuclear industry that have greatest environmental impact and to identify those areas where we may be able to work with industry to achieve most overall environmental benefit. These priorities need to be identified in order for our regulatory resources to be targeted most effectively. It is likely that we will be unable to influence directly all of the outcomes. The suitability of other instruments, e.g. voluntary agreements, will therefore need to be investigated, where regulation is not possible or suitable.

This first version of the Nuclear Sector Plan provides an initial view of the most important objectives, but it does not reflect an exhaustive analysis of the issues. We need to work with the nuclear industry and other stakeholders to identify gaps in knowledge and establish mechanisms for data gathering. The Plan has been developed in discussion with the industry and now forms the basis for wider stakeholder consultation.

Operators of nuclear licensed sites² and those carrying out licensable activities at defence installations have committed to use this framework to set environmental performance targets, monitor their performance and report publicly on their performance.

¹ The Sector report is available from www.environment-agency.gov.uk/sectorplans

² Other than some very small nuclear licensed sites such as Imperial College Reactor Centre and ICI Billingham, whose impacts are trivial

2. OVERVIEW

The Nuclear Sector Report describes the industries that make up the nuclear sector, the benefits these industries bring to society and the impacts they have on the environment.

Composition of the ‘Nuclear Sector’

The nuclear sector is diverse. It covers power generation, defence, research and development, site restoration and liabilities management as well as products and services for health care and the medical sector. The main industries, activities and sites in England and Wales are listed in the table below. All organisations in the sector are regulated under the Nuclear Installations Act 1965 and all have a Nuclear Site Licence under this legislation (or would have if they were not government owned, in the case of certain Ministry of Defence sites).

Nuclear sites in England and Wales			
Industry	Activity	Company	Sites
Electricity generation and associated fuel cycle activities Reactor Defuelling and decommissioning	Electricity generation	Magnox Electric Ltd ¹	Dungeness A, Oldbury, Sizewell A, Wylfa
		Magnox Electric Ltd ¹	Trawsfynydd, Berkeley, Bradwell, Hinkley Point A
		British Nuclear Group Sellafield Ltd ¹	Calder Hall
		British Energy	Dungeness B, Hartlepool, Heysham I & II, Hinkley Point B, Sizewell B
	Fuel fabrication. Fuel enrichment	Springfields Fuels Ltd ¹ Urenco	Springfields Capenhurst
	Fuel reprocessing	British Nuclear Group Sellafield Ltd ¹	Sellafield
Research facilities;		UKAEA	Harwell, Winfrith, Windscale
Defence	Nuclear submarine design, build and commissioning	BAE Systems	Barrow
	Nuclear submarine repair & overhaul; and de-fuel, de-equip & lay-up	DML	Devonport
	Nuclear submarine repair and maintenance	MOD	Devonport
	Atomic weapons	AWE	Aldermaston, Burghfield
	Nuclear submarine reactor system production	Rolls Royce	Derby
Medical and Bioscience	Medical and Bioscience Research and Products	GE Healthcare	Amersham, Cardiff
Waste management	LLW disposal	British Nuclear Group Sellafield Ltd ¹	Low Level Waste Repository at Drigg

¹Part of the BNFL Group of Companies

Many of these sites use or produce significant quantities of radioactive substances. As a consequence, compared to other users of radioactive substances, they tend to generate greater quantities of radioactive wastes. In general, they also generate a considerable degree of public interest.

We suggest the Plan also eventually covers principal tenants on nuclear licensed sites, and also the Joint European Torus (JET) at Culham (a large, non-licensed research facility investigating the use of fusion as a power source). This remains, though, a developmental activity and has not been addressed in this first version.

The Plan does not cover other, 'non-nuclear', users of open and closed radioactive sources. These users include hospitals, universities and laboratories, which we also regulate under the Radioactive Substances Act 1993 (RSA 93). Nor does it cover users of naturally occurring radioactive materials (NORM), who may be conditionally exempted from the requirements of the RSA 93.

Much of the civil nuclear sector (in particular, electricity production, associated fuel cycle plants and research facilities) is undergoing significant changes; many facilities are nearing the end of their operating lives, and there is greater emphasis on decommissioning, site clean-up and restoration. The Government has established a Nuclear Decommissioning Authority (NDA), which became operational on 1 April 2005. The NDA is responsible for 20 public sector legacy facilities in the UK. It will oversee the strategic management and direction of decommissioning and clean up, and place contracts with site licensees for this work to be done. However, activities will continue on most nuclear sites for many years, whether or not any new nuclear generating plant is built in the future.

More information on the NDA can be found on the NDA website www.nda.gov.uk.

Key Environmental Issues

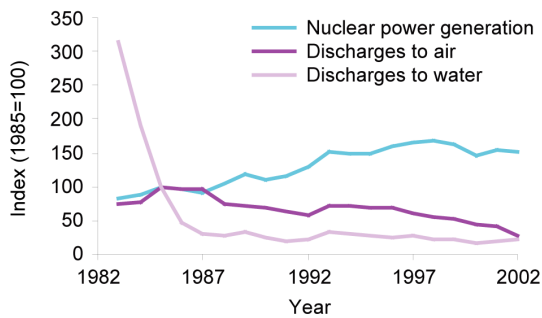
We regulate the nuclear sector's environmental impacts under a variety of legislation including the Radioactive Substances Act and, on some sites, the Pollution Prevention and Control Regulations. The environmental consequences of nuclear sector operations include the use of resources (fuel and raw materials), emissions to air and water, and the generation of solid waste. The sector strives to minimise its environmental impact. A fuller description of the sector's environmental impacts appears in the Sector Report.

Nuclear power currently generates about a quarter of the UK's electricity. As stations close, this contribution will steadily diminish. Where fossil fuels replace nuclear generation, carbon dioxide emissions will increase. The forthcoming Government proposals on energy policy will need to consider the appropriate fuel mix for the UK, taking account of environmental and economic impacts, and public acceptability.

Radioactive discharges

Over recent years, the industry has reduced its radioactive discharges (particularly discharges of the most radiotoxic radionuclides) through the effective application of Best Practicable Means (BPM) – see figure below. In all cases, the doses from these discharges are within legal limits and are unlikely to cause harm, although we are seeking further reductions in discharges in order to keep doses to the public as low as reasonably achievable (ALARA).

Nuclear industry discharges in the UK, 1983 to 2002



Source: DTI, MOD, SEPA, BNFL, UKAEA, British Energy Generation, GE Healthcare

At the 1998 Ministerial meeting of the Oslo and Paris (OSPAR) Commission, contracting parties to the 1992 Convention for the Protection of the Marine Environment of the North East Atlantic agreed a strategy with regard to radioactive substances. The strategy was endorsed in a Ministerial Declaration, signed by the UK and all other OSPAR contracting parties. The strategy sets challenging targets for the reduction of radioactive discharges by 2020.

The UK Strategy for Radioactive Discharges 2001 – 2020 [1], provides a strategic framework for achieving these targets. Its aims are:

- progressive and substantial reduction of radioactive discharges and discharge limits, to achieve the strategy targets;
- progressive reduction of human exposure to ionising radiation arising from radioactive discharges, as a consequence of reductions in discharges, such that a representative member of a critical group of the general public will be exposed to an estimated mean dose of no more than 0.02 millisieverts (mSv) a year from liquid radioactive discharges to the marine environment made from 2020 onwards;
- progressive reduction of concentrations of radionuclides in the marine environment resulting from radioactive discharges, such that by 2020 they add close to zero to historic levels.

As well as providing a long-term framework, the strategy also includes a number of numerical targets for annual discharges (see table below). The Government has said [1] that it is not its intention that the UK strategy be an immutable blueprint for radioactive discharges for the whole of the period to 2020. It will, though, continue to apply its policy of progressive reduction of such discharges.

Achieving these targets by 2020 is one of the major challenges facing the industry. Operators have a responsibility to ensure that their own strategy targets conform to the National Strategy. By periodically reviewing authorisations, we will ensure that the industry adheres to strategy targets. The Government expects that the application of the 'As Low As Reasonably Achievable' (ALARA) principle, which is a requirement in UK and European Law, will achieve the objectives of the OSPAR strategy.

A principal aim of this Plan is to set out operators' and our own activities over the next 5 to 10 years to achieve ALARA/BPM and thus contribute to delivering the National Strategy.

Table **UK Strategy targets for radioactive discharges to the environment**

Sector	Discharge parameter	2004 Total UK discharge (TBq)	2004 Total England and Wales discharge (TBq)	Target in UK strategy for radioactive discharges (TBq/y)	Date target applies
Fuel Production and uranium enrichment	Alpha	0.23	0.23	0.01	2020
	Beta (excluding tritium)	120	120	"Virtually zero"	2020
Energy production	Beta/gamma (excluding tritium)	5.8	4.7	1.5	2020
	Tritium	2,400	1,600	850	2020
Reprocessing	Alpha	0.29	0.29	0.2	2020
	Beta (excluding tritium)	73	73	50	2020
	Technetium-99	14	14	10	2006
		-	-	1	2020
Research	Alpha	0.001	0.00044	0.008	2020
	Beta (excluding tritium)	0.51	0.04	0.9	2020
	Tritium	36	36	20	2020
Defence	Beta/gamma	0.001	0.0009	0.003	2020
	Tritium	0.16	0.11	0.4	2020

Site restoration and clean up

A number of the plants on nuclear sites covered by this document have reached, or are nearing, the end of their operating lives. As this happens, the focus of their management switches from operation to cleaning up the operation's 'legacy'. This covers the decommissioning of plant, the remediation of contaminated land and the management of radioactive wastes.

The Government has established the Nuclear Decommissioning Authority (NDA) to oversee the discharge of the UK's public sector civil nuclear liabilities. Strong and effective regulation is crucial to this, not least in order to maintain public confidence. We, SEPA and the Health and Safety Executive's Nuclear Installations Inspectorate (HSE-NII) have important roles to play alongside the NDA in this respect, in addition to the internal regulatory processes within the operating organisations themselves. All parties want to see a progressive reduction in hazard potential, improved environmental outcomes and the timely discharge of liabilities in a safe and effective manner. We will work with the NDA, operators, SEPA and HSE-NII to ensure that plans and activities meet these criteria.

Radioactive Waste Management

A common feature of nuclear sites is that they produce radioactive wastes. Where disposal routes are available, wastes are generally routinely disposed of. This is particularly the case for LLW, which is disposed of to a disposal site near Drigg in Cumbria, currently operated by British Nuclear Group Sellafield Ltd. National policy for the management of LLW is the subject of review by Defra.

Other categories of waste are stored on the sites where they are produced, pending a decision on the appropriate long-term management option for the UK. The Government has published proposals for developing a policy for managing this waste [2]. It has set up an independent Committee on Radioactive Waste Management (CoRWM) to oversee a review of the options for dealing with the UK's solid radioactive waste. We and industry will be assisting CoRWM in its work.

Non-radioactive impacts

Wider environmental consequences of the nuclear industry's operations include the use of resources (energy, water and raw materials), the emission of liquid and gaseous pollutants and the disposal of various non-radioactive wastes. Most of these environmental consequences are minor in terms of scale and impact. The more significant impacts relate to water use at Sellafield and the discharge of nitrates to controlled waters from Sellafield and Springfields.

Habitats

Most nuclear sites are in rural locations. Several have flora or fauna of conservation value associated with them. The Conservation (Natural Habitats & Conservation) Regulations 1994 ("the Habitats Regulations") implement Council Directive 92/43/EC on "the conservation of natural habitats and wild fauna and flora" (the "Habitats Directive") and Council Directive 79/409/EEC on "the conservation of wild birds". The Habitats Regulations require that we review all European sites with regard to the impact of existing and proposed permissions issued by the Agency.

The development of Biodiversity Action Plans (BAPs) is a voluntary mechanism that enables companies to identify and protect species of conservation value on these sites.

Economic considerations

The 'Nuclear Sector' comprises a number of substantially different industries with different ownership and economic/commercial pressures. So the picture is complex:

- major parts of this sector are Government-owned, whereas some companies, such as GE Healthcare and BAE Systems, are private companies competing in global markets;
- electricity generators suffered from substantial reductions in the wholesale price of electricity in the wake of the New Electricity Trading Arrangements (NETA). This led to the well publicised difficulties of British Energy, which restructured early in 2005 with the help of a credit facility from the Government;
- the NDA will be responsible for overseeing the discharge of the liabilities on the 20 or so sites currently operated by BNFL and UKAEA, which represent about 85 per cent of the total UK civil nuclear liabilities. The cost of discharging these liabilities is currently estimated to be around £50 billion, but this could rise significantly in the future.

Social considerations

For various reasons, the nuclear sector is a source of concern to many sections of the public. It frequently attracts the attention of the media and NGOs. Improving the understanding between the industry, ourselves and other key stakeholders is crucial to the future of the sector.

In recent years, the industry has undertaken a number of initiatives to understand and respond to stakeholder concerns. An objective of this Plan is to encourage Industry to do even more, building on its good practices to date. This will increase the industry's transparency and improve dialogue.

3. **SECTORAL OBJECTIVES**

We have reviewed the significant environmental objectives of the nuclear industry and identified eight principal environmental objectives. These objectives will be promoted in England and Wales by implementation of the Nuclear Sector Plan.

The objectives reflect our commitments, and that of the nuclear industry to contribute to sustainable development as defined in our 'Vision for the Environment' [3].

There are some aspects linked to the nuclear industry's activities that are not covered in the Plan's initial objectives. We will consult industry and other stakeholders on the need for including further objectives. This will take into account examples where individual companies have proactively set objectives.

The Plan's initial principal objectives are to:

- Objective 1** Reduce the consumption of natural resources

- Objective 2** Minimise and manage solid wastes

- Objective 3** Reduce discharges to air and water

- Objective 4** Reduce greenhouse gas emissions

- Objective 5** Develop site restoration and biodiversity action plans

- Objective 6** Improve transparency, understanding and engagement between the Agency, industry and other stakeholders

- Objective 7** Promote product stewardship and wider supply chain benefits

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

4. INDICATORS OF PERFORMANCE

This section explains the background behind each objective and how each one contributes towards implementing the overall Plan. It also identifies the Indicators of Performance (IoP) that will be used to assess progress in achieving the objectives.

In some cases we have been unable to set an IoP – either due to a lack of data, or the complexity of formulating an appropriate metric. In these cases we have suggested IoPs that might provide meaningful measures against the objectives.

In developing the IoPs we have, where possible, followed these guidelines;

- IoPs are in a form that allows the identification of trends in the Sector's performance
- The IoP have cross-sectoral applicability and allow us to compare the performance of the chemical sector against other industrial sectors
- IoPs use existing data sources and reporting mechanisms – for example emission reporting from returns made to us under the Pollution Inventory reporting arrangements, and any existing data collection commitments required of industry by trade associations.

Programme tasks and milestones are also listed under each objective. The organisation responsible for each task and milestone is also set out, along with the target completion date.

<p>Objective 1: Reduce the consumption of natural resources</p> <p><u>Background</u> Like all industrial activities, nuclear sites use resources such as raw materials, water and energy.</p> <p>It is important to identify and control all impacts under this objective. This process should form part of any environmental management system (see Objective 7).</p> <p>One potentially important way of cutting the amount of resources used is by recycling materials and water, and recovering energy. The decommissioning process will produce a range of materials that can potentially be recycled. Where these need to be regulated as radioactive materials, recycling within the nuclear industry should be considered. □</p> <p><u>Performance indicators</u> <i>Indicators to be included:</i></p> <ol style="list-style-type: none"> 1. Water usage (excluding cooling water) 2. Energy consumption
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Nuclear Sector Plan: Objective 1		
Programme tasks and milestones	Responsibility	Target completion date
<i>1.1 Operators to identify significant areas of resource consumption and ensure these are addressed in environmental management systems</i>	Operators	September 2006

Objective 2:

Minimise and manage solid wastes

Background

Many sites are carrying out or planning the retrieval and packaging of 'legacy wastes' as part of their work to decommission old facilities and convert waste into a 'passively safe' form.

We are working with the HSE-NII and the Scottish Environment Protection Agency (SEPA) to introduce improved arrangements for the regulation of ILW. We have assembled a new 'Nuclear Waste Assessment Team' (NWAT) to do this work. The new arrangements focus on the following three inter-linked aspects of ILW packaging:

- the development by Nirex of the 'Phased Geological Repository Concept (PGRC)' which provides the basis for standards and specifications for waste packaging and may provide the basis for a reference safety and environmental design for an eventual disposal route;
- the assessment of operators' ILW packaging proposals by Nirex, for which they are able to issue a 'Letter of Compliance' (LoC); and
- proposals for challenging wastes, for which it may not be possible to demonstrate, in a timely manner, compliance with all the Nirex waste packaging standards and specifications but for which a pressing safety or environmental need to process the waste exists

Decommissioning and site clearance activities will generate large quantities of wastes. The development of 'integrated waste strategies' will be important to the management of these wastes (see Objective 3). Much will be building rubble, some of which will be lightly contaminated. Two aspects are particularly relevant to this objective: the use of appropriate procedures for the 'clearance' of materials from sites as non-active, and maximising opportunities to recycle waste materials (see Objective 1).

The industry recently issued a 'Code of Practice' [4] on the release of articles or materials from control on nuclear sites. This sets out the principles, processes and practices that should be used when determining whether an article or material may be released on the basis of radiological protection considerations.

Understanding the nature, content and characteristics of both current and historical radioactive wastes is paramount to their long-term management. A new 'British Radioactive Waste Information Management System' (BRIMS), managed by Nirex, is being introduced. This will provide a national database to support both short and long-term waste management activities. BRIMS aims to provide a generic, industry-standard tool capable of the long-term preservation of radioactive waste-related data created during all phases of waste management. We support this development.

□ Like all other industries, operational and decommissioning activities in the nuclear sector generate a range of hazardous and non-hazardous (non-radioactive) wastes. The merits of performance indicators to address these matters will be considered before the Plan is reviewed. □

Performance Indicators:

Indicators to be included:

1. The percentage of ILW at each site that has been packaged and conditioned according to Environment Agency and NII guidance

Indicators proposed, but for which workable definitions and/or the feasibility of using them in the longer term needs to be explored:

1. Inert waste arisings (non-radioactive)
2. Non-hazardous waste arisings (non-radioactive)
3. Hazardous waste arisings (non-radioactive)

Nuclear Sector Plan: Objective 2		
Programme tasks and milestones	Responsibility	Target completion date
<i>2.1 All operators to assess their ability to use BRIMS for recording information on radioactive wastes and packages</i>	Operators	March 2006
<i>2.2 Review interim industry Code of Practice [4] for off-site clearance of radioactive wastes and materials and issue</i>	Operators	December 2005
<i>2.3 Agency to consider the industry Code of Practice with a view to recognising its use in contributing to compliance with RSA Exemption Orders</i>	Agency	December 2005
<i>2.4 Operators to identify approximate quantities of hazardous, non-hazardous and inert waste produced annually, and the fates of this waste</i>	Operators	September 2006
<i>2.5 Agency to work with operators to assess, and if appropriate, define potential performance indicator for hazardous, non-hazardous and inert wastes</i>	Agency/operators	End 2006

Objective 3:

Reduce discharges to air and water

Background

A challenge for industry is always to meet authorisation requirements, including the application of 'best practicable means' (BPM). Where appropriate, this means preparing reduction strategies, taking into account national and international developments in best practice for minimising discharges. Industry needs to consider this for all new waste streams. At intervals, industry also needs to reassess existing waste disposals. Our challenge is to develop common methodologies and standards across the industry.

At the core of our regulatory approach is the need to understand, assess and act on alternatives for the mix of operational, decommissioning and clean up activities in the nuclear sector. We are convinced of the importance of developing integrated and optimised waste management strategies (IWS) on nuclear sites. These address the management of all forms of waste, both radioactive and non-radioactive, and of material, which may become waste in the future. They cover waste avoidance and creation, as well as waste storage and disposal. In developing an IWS, on and off-site aspects are considered and reviewed for synergies. An IWS can be considered to be optimised when it is the outcome of a systematic and consultative decision-making process that has considered a range of options and their practicability. All relevant factors, including safety, environmental and security should be seen to be appropriately balanced. The NDA is taking forward the IWS concept and we will be providing active support.

It is within that context that the Agencies have drafted joint guidance to regulators on the assessment of Best Practicable Option Studies (BPEO). The guidance sets out what we see as a suitable framework by which operators may inform their strategies by undertaking transparent and inclusive analyses of options.

As well as radioactive discharges, the nuclear sector also produces actual or potential non-radioactive discharges with the potential for local, regional or global effects (climate change is addressed separately under Objective 4).

The pollution impact of some activities may require consent under other legislation, including the Pollution Prevention and Control (PPC) Regulations. Though some site-specific impacts are significant, emissions from the sector as a whole are small.

It is important to identify and control all discharges as part of any environmental management system (see Objective 7).

Performance Indicators

Indicators to be included:

- 1. Proportion of BPM assessments required that have been completed and accepted by the Agency**
- 2. Annual liquid alpha discharges**
- 3. Annual liquid beta/gamma discharges (excluding tritium)**
- 4. Annual liquid tritium discharges**
- 5. Annual technetium 99 discharges from reprocessing**
- 6. Annual radioactive discharges to air**
- 7. Critical group doses due to discharges (retrospective assessment)**
- 8. Discharges of nitrates and nitrites to controlled waters**

Indicators proposed, but for which workable definitions and/or the feasibility of using them in the longer term needs to be explored:

- 1. Proportion of activities or wastestreams for which Integrated Waste Strategies have been constructed and maintained**
- 2. Environmental concentrations of key nuclides in various media e.g OSPAR monitoring locations**

Nuclear Sector Plan: Objective 3		
Programme tasks and milestones	Responsibility	Target completion date
<i>3.1 Sellafield Tc-99 in liquid discharges to reduce to 10TBq/y</i>	BNG Sellafield Ltd	End 2006
<p><i>3.2 Continued reduction in total alpha liquid discharges from Springfields due to cessation of Magnox fuel fabrication</i></p> <p><i>Milestones:</i></p> <ul style="list-style-type: none"> <i>Implement new authorisation limits (lower than present)</i> <i>Uranium ore conversion plant to close</i> 	Springfield Fuels Ltd	<p>As specified in new authorisation</p> <p>End 2006</p>
<i>3.3 Reduction in liquid discharges from Sellafield associated with cessation of reprocessing of spent Magnox fuel(to cease by the end of 2012)</i>	BNG Sellafield Ltd	End 2012
<i>3.4 Waste Recovery and Recycling Plant commissioned at Cardiff</i>	GE Healthcare	End 2006
<i>3.5 MOD to replace submarine primary circuit ion exchange resins with higher specification resins. Activity will complete concurrently with overhaul and refuel periods</i>	MOD	2012
<i>3.6 Implement requirements of BSS Direction 2000 and report retrospectively on total doses in Radioactivity in Food and the Environment Report</i>	Agency (with FSA, SEPA, HSE-NII and DoE NI)	Annually, in November
<i>3.7 Review environmental monitoring arrangements at specific sites with industry and FSA</i>	Agency	In line with authorisation reviews
<i>3.8 Review applicability of MCERTS¹ to monitoring of radioactive discharges</i>	Agency	End 2005
<p><i>3.9 Continue to fund and participate in European projects to develop radiological protection framework for non-human species</i></p> <p><i>Milestones:</i></p> <ul style="list-style-type: none"> <i>'ERICA' final report</i> 	Agency	Jan 2007
<i>3.10 All significant emissions to air and water addressed in environmental management systems</i>	Operators	September 2006
<i>3.11 Agency to work with operators to assess, and if appropriate, define potential performance indicator: "Proportion of activities or wastestreams for which Integrated Waste Strategies have been constructed and maintained"</i>	Agency/operators	September 2006
<i>3.12 Agency to work with operators to assess, and if appropriate, define potential performance indicator: "Environmental concentrations of key nuclides in various media e.g OSPAR monitoring locations"</i>	Agency/operators	September 2006

¹ MCERTS:- is the Environment Agency's Monitoring Certificate scheme. It sets Environment Agency standards for regulatory monitoring and provides the means to assess compliance with those standards. It is intended to improve the quality of regulatory monitoring, particularly that carried out by operators under self monitoring arrangements.

Objective 4:**Reduce greenhouse gas emissions****Background**

Greenhouse gas emissions may originate directly from the process, from the use of energy, or from transport activities associated with the industry. This objective aims to identify and target the greenhouse gas emissions from the nuclear sector.

It is important that operators identify and control all impacts under this objective as part of any environmental management system (see Objective 7).

Performance Indicators:***Indicators to be included:***

- 1. Greenhouse gases on and off-site, including transport**

Nuclear Sector Plan: Objective 4		
Programme tasks and milestones	Responsibility	Target completion date
<i>4.1 Develop and implement site specific strategies for the minimisation of significant greenhouse gas emissions (taking into account process, energy use and transport activities)</i>	Operators	End 2006

Objective 5:

Develop site restoration and biodiversity action plans

Background

The industry is responsible not only for controlling the amount of radioactive waste produced due to current operations, but also for dealing with historical (legacy) wastes.

Nuclear licensees on NDA sites will be required to develop comprehensive long-term plans (lifecycle baseline plans) for the clean up of each site. These living documents will map out the overall plan for restoring sites. The plans will also set the priorities for near-term work plans. They will be agreed with both the NDA and the regulators. They will be reviewed regularly and summaries are available on site web pages.

As regulator of radioactive materials on nuclear sites, HSE-NII drives the reduction of risks associated with the UK's legacy of radioactive wastes. It also regulates the safe decommissioning of redundant facilities. We regulate the disposal of radioactive wastes. We work with the NDA, HSE's –NII and site managers to identify and implement the best overall options for operational safety, environmental performance, and efficient and timely site restoration.

Site restoration will include the management of contaminated land - both radioactively and chemically. HSE-NII considers radioactively contaminated land to be an accumulation of radioactive waste which must be addressed in site waste management strategies. We will regulate chemically contaminated land on nuclear licensed and MOD sites causing 'significant harm', or 'significant possibility of significant harm' to receptors under Part IIA of EPA 90, as 'Special Sites'.

Many nuclear sites are now characterising their sites to understand the nature and extent of contamination. Some are restoring areas of land for re-use and/or sale. The aim must be to identify those areas of most concern, and from this to develop appropriate site restoration plans that can be monitored on a case-by-case basis. Where beneficial, remediation of radioactive and non-radioactive land should be performed in an integrated manner. The Construction Industry Research and Information Association (CIRIA) manages a learning network about contaminated land on nuclear and defence sites. This network, which includes contributions from the nuclear sector and regulators, is called 'SAFEGROUNDS'.

Another aspect under this objective is the development of Biodiversity Action Plans (BAPs). Most nuclear sites are in rural locations, and several have flora or fauna of conservation value. The development of BAPs is a voluntary mechanism that enables companies to identify and protect species of conservation value on these sites.

Performance Indicators:

Indicators to be included:

- 1. Sites affected by chemical contamination, as defined by EA 95**
- 2. Proportion of sites with contaminated land management plans, with timescales, developed in consultation with regulators**
- 3. Implementation of Biodiversity Action Plans at appropriate sites**

Nuclear Sector Plan: Objective 5		
Programme tasks and milestones	Responsibility	Target completion date
<i>5.1 Operators to have policies in place covering contaminated land management</i>	Operators	September 2006
<i>5.2 Operators to have management arrangements in place for contaminated land, stating who is responsible for the implementation of policy and arrangements</i>	Operators	End 2006
<i>5.3 Operators determine which sites will benefit from Biodiversity Action Plans</i>	Operators	June 2006
<i>5.4 Develop Biodiversity Action Plans for appropriate sites</i>	Operators	End 2006

Objective 6:

Improve transparency, understanding and engagement between the Agency, industry and other stakeholders

Background

The industry must understand the interests and demands of its stakeholders. This entails more than reacting to stakeholder requests. It should also involve making information on operators' activities understandable, accessible and useful to all stakeholders. The industry should also create channels through which stakeholders can communicate and discuss their concerns. This greater transparency provides an opportunity for operators to show that they are acting responsibly. A range of approaches has been used to identify and engage with stakeholders in recent years, such as AWE's PASCALEA project (Public and Stakeholder Consultation on AWE's Long-term Environmental Aims) and BNFL's stakeholder dialogue process.

All nuclear sites have some form of Local Liaison Committee (LLC). The NDA has recognised that for its sites, the existing LLCs need to be enhanced significantly to enable them to fulfil the function that the NDA and stakeholders require. The NDA is therefore assisting the LLCs to evolve into Site Stakeholder Groups with a remit to reflect local views, input advice and generally comment on the progress of work on a site. The NDA is also creating a National Stakeholder Group to act as the main interface between national stakeholders and the NDA at Board level. Both the Site Stakeholder Groups and the National Stakeholder Group have the capability to set up specific working groups to look in more detail at issues of interest to them.

We suggest that operators identify and use techniques that would best suit their own sites and issues.

Performance indicators

Indicators to be included:

1. **Local liaison and stakeholder engagement: percentage of sites holding local liaison / site stakeholder groups meetings**
2. **Environmental reports: percentage of operators who publish environmental reports**

Indicators proposed, but for which workable definitions and/or the feasibility of using them in the longer term needs to be explored:

1. **Monitoring of progress with stakeholder plans**

Nuclear Sector Plan: Objective 6		
Programme tasks and milestones	Responsibility	Target completion date
<i>6.1 Operators to identify key stakeholders and work with them to identify and prioritise issues of concern</i>	Operators	September 2006
<i>6.2 Operators agree forms of engagement with stakeholders to address identified issues</i>	Operators	March 2007
<i>6.3 Agency to work with operators to assess, and if appropriate, define potential performance indicator "Monitoring of progress with stakeholder plans"</i>	Agency/operators	September 2006

Objective 7:

Promote product stewardship and wider supply chain benefits

Background

Every company, up and down the supply chain, plays a part in determining impacts on human health and the environment. Controlling the environmental impacts of operations should therefore extend beyond the operating site. It includes influencing both the environmental performance of suppliers and the environmental impacts of products and services.

Product Stewardship is the responsible and ethical management of the health, safety and environmental impacts of a product throughout its total life cycle. Manufacturers can play a crucial positive role in Product Stewardship by establishing robust environmental policies concerning their conduct as purchasers and suppliers. And they can spread the message by promoting these policies to vendors, purchasers, hauliers and others with whom they have contact.

Performance indicators

Indicators to be included:

None initially

Indicators proposed, but for which workable definitions and/or the feasibility of using them in the longer term needs to be explored:

1. Number of companies with published policies describing their aims and methods as a purchaser to promote Product Stewardship practices among their suppliers.
2. Number of companies with published policies describing their aims and methods as a supplier to promote Product Stewardship practices among their customers.

Nuclear Sector Plan: Objective 7		
Programme tasks and milestones	Responsibility	Target completion date
<i>7.1 Develop and report on stewardship initiatives to influence entire life-cycle impacts of products, where applicable</i>	Operators	March 2007
<i>7.2 Agency to work with operators to assess, and if appropriate, define potential performance indicators on product stewardship among suppliers and customers</i>	Agency/operators	June 2007

Objective 8:

Work to risk-based regulatory and environmental management systems

Background

We need to ensure that the regulatory regimes that apply to the nuclear sector are effectively implemented, and support these with appropriate guidance.

The industry needs to meet regulatory requirements. It should control all environmental aspects of its operations by implementing robust management systems, of whatever type. We will ensure that industry has suitable management systems in place.

We are placing greater emphasis on risk-based and outcome-focused regulation. This means that regulatory effort should be proportionate, taking into account the impacts and how these will be managed. We are developing a risk assessment methodology for the regulation of radioactive substances. This may be based on the Operator Performance and Risk Assessment (OPRA) scheme used for the Pollution Prevention and Control (PPC) regime and the Waste Management Licensing (WML). As we develop this we look to include additional performance indicators, such as those mentioned below.

Performance indicators

Indicators to be included:

- 1. Number and proportion of modern, multi-media RSA disposal authorisations issued containing management conditions**
- 2. Pollution incidents: Annual number of Category 1 and 2 incidents¹**
- 3. Breaches of permits: Annual number of Category 1 and 2 breaches of permits²**
- 4. Number of companies with enforcement actions and prosecutions (annually, OPRA definitions)³**
- 5. Number (and proportion) of PPC applications and variations determined and issued within target time**
- 6. Number (and proportion) of Agency Decisions for RSA applications and variations completed within programme time**

Indicators proposed, but for which workable definitions and/or the feasibility of using them in the longer term needs to be explored:

- 1. Indicator based on scores from Radioactive Substance Regulation risk assessment methodology, such as:**
 - a) Operations and maintenance (OPRA score)**
 - b) Competences and training (OPRA score)**
 - c) Emergency planning (OPRA score)**
 - d) Organisation and environmental management (OPRA score)**

¹ See our Common Incident Classifications Scheme ('CICS'). CICS Categories 1,2 and 3 are major, significant and minor incidents respectively

² See our Compliance Classification Scheme ('CCS'). A breach is classed as CCS category 1,2 or 3 in accordance with the CICS classification for the incident associated with that breach.

³ See our Enforcement and Prosecution Policy. This indicator excludes prosecutions under appeal.

Nuclear Sector Plan: Objective 8		
Programme tasks and milestones	Responsibility	Target completion date
<i>8.1 Invite views from stakeholders on the Nuclear Sector Plan</i>	Agency	June 2006
<i>8.2 Publish review report of BPM and establish 'learning network'</i>	Agency/Scotland and Northern Ireland Forum for Environmental Research (SNIFFER)	End 2005
<i>8.3 Publish and consult on report on approaches to limit setting</i>	Agency (with SEPA)	To be addressed when Statutory Guidance to the Agency on regulation of radioactive discharges is finalised
<i>8.4 Complete roll out of multi-media RSA authorisations</i>	Agency	End 2007
<i>8.5 Develop risk assessment methodology for radioactive substances regulation (RSR)</i>	Agency	June 2006

5. THE WAY FORWARD

We intend to issue an annual report. This will be based on the performance indicators described in the Sector Plan, and success in meeting milestones and targets. Where possible, existing data sources and reporting mechanisms will be used to help reporting. For example, the discharge reporting will be obtained from returns made to us under the existing Pollution Inventory reporting arrangements. Information obtained from reporting will influence our future regulatory priorities.

This Nuclear Sector Plan is one of our pilot Sector Plans. It sets out our intentions and will be used to invite stakeholder views. There will be a learning process for all parties on aspects such as reporting against indicators, tasks and milestones. These processes may not be perfect in the first year. Given this, early review and revision will be appropriate following the first learning cycle.

After the early review, substantial reviews are envisaged approximately every five years, with more frequent minor reviews when appropriate.

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ABBREVIATIONS

ALARA	As Low As Reasonably Achievable
AWE	Atomic Weapons Establishment
BAPs	Biodiversity Action Plans
BNFL	British Nuclear Fuels plc
BNG	British Nuclear Group
BPEO	Best Practicable Environmental Option
BPM	Best Practicable Means
Bq	Becquerel
BRIMS	British Radioactive Waste Information Management System
BSS	Basic Safety Standards
CoRWM	Committee on Radioactive Waste Management
DML	Devonport Management Ltd
EA 95	Environment Act 1995
EMS	Environmental management system
EPA 90	Environmental Protection Act 1990
ERICA	Environmental Risks from Ionising Contaminants: Assessment and Management (European 6 th Framework Programme research)
FSA	Food Standards Agency
GBq	Gigabecquerel
HLW	High level waste
HSE	Health and Safety Executive
ILW	Intermediate Level Waste
JET	Joint European Torus
kBq	kilobecquerel
LLW	Low Level waste
MCERTS	Environment Agency Monitoring Certification Scheme
MOD	Ministry of Defence
mSv	Millisievert
NDA	Nuclear Decommissioning Authority
NETA	New Electricity Trading Arrangements
NGO	Non-Governmental Organisation
NII	Nuclear Installations Inspectorate
NORM	Naturally Occurring Radioactive Material
OPRA	Operator Performance and Risk Appraisal
OSPAR	Oslo and Paris (Convention/Commission)
PASCALEA	Public and Stakeholder Consultation on AWE's Long-term Environmental Aims
PPC	Pollution Prevention and Control
RSA 93	Radioactive Substances Act 1993
RSR	Radioactive Substances Regulation
SEPA	Scottish Environment Protection Agency
Sv	Sievert
TBq	Terabecquerel
UKAEA	United Kingdom Atomic Energy Authority

GLOSSARY OF TERMS

Basic Safety Standards Directive (BSS) - European Community Directive 80/836/Euratom, Basic Safety Standards for the Health Protection of the General Public and Workers Against the Dangers of Ionising Radiation. These standards were adopted as European Law in 1980. A revised Directive 96/29/Euratom was adopted in May 1996 for implementation in Member States by May 2000.

Best Practicable Means - A term used in authorisations issued under the Radioactive Substances Act requiring operators to take all reasonably practicable measures in the design and operational management of their facilities to minimise discharges and disposals of radioactive waste. It takes account of such factors as the availability and cost of relevant measures, operator safety and the benefits of reduced discharges and disposals.

Becquerel (Bq) – Is the basic unit of activity of any given radionuclide in a particular material, where one becquerel represents the disintegration of one radioactive atomic nucleus per second.

Critical Group – A group of members of the public whose radiation exposure is reasonably homogeneous and is typical of people receiving the highest dose from a given source.

Construction Industry Research and Information Association (CIRIA) – Manages collaborative research projects and produces information aimed at providing best practice solutions to industry problems.

Half-life - The time taken for a radionuclide to decay to half its radioactivity. This can be a very long- (plutonium-239/240 has a half-life of 24,000 years) or very short- (argon-41 has a half-life of 110 minutes) time. After ten half-lives, the activity from any radionuclide will have decayed to around one-thousandth of its original level.

High Level Waste - Wastes in which the temperature may rise significantly as a result of their radioactivity, so this factor has to be taken into account in the design of storage or disposal facilities.

Intermediate Level Waste - Wastes exceeding the upper boundaries for LLW, but which do not need heat to be taken into account in the design of storage or disposal facilities.

Low Level Waste - Wastes not exceeding 4 GBq (gigabecquerels) per tonne of alpha, or 12 GBq per tonne of beta/gamma activity.

Operator and Pollution Risk Appraisal (OPRA) – The OPRA assessment methodology is an Agency tool for assessing the environmental risk of sites we regulate and the competence of the site operators.

Oslo and Paris Commission (OSPAR) – The Oslo Commission was established in 1974 by the Convention of the Protection of Marine Pollution by Dumping from Ships and Aircraft. The Convention for the Prevention of Marine Pollution from Land-Based Sources (the Paris Commission) entered into force in 1978. At the 1998 Ministerial meeting of the Commission, contracting parties to the 1992 Convention for the Protection of the Marine Environment of the North East Atlantic agreed an OSPAR strategy to reduce the concentration of radioactive substances discharged to the marine environment by 2020.

Pollution Prevention and Control Regulations 2000 – The PPC regulations aim to prevent, reduce and eliminate pollution at source through the efficient use of natural resources. Site operators will need to prevent or where this is not practicable reduce emissions to air, land and water using Best Available Techniques (BAT).

Radiation dose – The term used to describe the amount of radiation received by people and wildlife. Radionuclides can differ markedly in the way in which they decay, in their behaviour in the body and in the environment. These different factors have to be taken into account to allow the effects of different radionuclides to be assessed on a common basis. This requires the calculation of a quantity referred to as 'equivalent dose', for which the basic unit is the Sievert (Sv). The sievert, however, is a rather large unit and doses to members of the public are usually expressed in terms of the millisievert (mSv – one thousandth of a sievert) or the microsievert (μ Sv – one millionth of a sievert).

SAFEGROUNDS – Learning network for developing and disseminating good practice guidance for the management of radioactively and chemically contaminated land on nuclear and defence sites in the UK (www.safegrounds.com).

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