



Department  
of Energy &  
Climate Change

**The United Kingdom's fifth national report on compliance with the obligations of the Joint Convention on the safety of spent fuel management and the safety of radioactive waste management**

October 2014

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Natural Resources Wales

Northern Ireland Environment Agency

Nuclear Decommissioning Authority

Research Sites Restoration Limited

Scottish Environment Protection Agency

Scottish Government

Sellafield Limited

Springfield Fuels Limited

Urenco UK Limited

Welsh Government

# Foreword

This is the fifth report to be submitted by the United Kingdom (UK) in compliance with Article 32 of the Joint Convention on the Safety of Spent Fuel Management and the Safety of Radioactive Waste Management (hereafter referred to as 'the Joint Convention'). Since the Joint Convention came into force in 2001, the UK has participated fully in the four reporting cycles and remains committed to meeting its obligations with regard to all the Joint Convention's requirements.

In accordance with the Joint Convention's guidance on the scope and nature of national reports, the UK has highlighted the main developments to its legislative and regulatory framework since the fourth Review Meeting in May 2012. These include:

- The UK made a significant change to its regulatory organisations on 1 April 2014, when the Office for Nuclear Regulation (ONR) vested as a standalone statutory body with modernised regulatory powers and duties as the principal UK regulator for nuclear safety, civil nuclear security and transport of civil radioactive materials.
- Natural Resources Wales replaced the Environment Agency as the relevant statutory body for enforcement under the Environmental Permitting Regulations 2010, covering nuclear sites and other aspects of radioactive substances regulation in Wales.
- The UK has also reviewed its approach to the siting of a geological disposal facility for Higher-Activity Wastes (HAW). The UK Government considered lessons learnt from the programme that ran from 2008 to 2013 and refreshed its approach, taking account of international good practice, in a new White Paper 'Implementing Geological Disposal', published in July 2014.

This report also provides the UK's response to the feedback provided at the fourth Joint Convention Review Meeting via the respective President's, Summary and Rapporteur's Reports.

The UK can confirm it has met the nine challenges identified in the President's Report to the fourth Joint Convention Review Meeting and the four key headlines of the Summary Report, which included:

- *Safety implications of very long storage periods and delayed disposal of spent fuel and radioactive wastes*

A robust regime of interim storage is acknowledged to be crucial to the UK's long-term strategies for HAW and spent fuels. Specific industry guidance has been developed on interim storage of HAW, covering: waste package performance; store longevity; monitoring and inspection; and store maintenance and refurbishment.

- *Prevention of orphan sources and robust management of contaminated scrap metals*

The UK applies a system of authorisation and permitting to the management of radioactive sources, based on implementation of EU Directive 2003/122/Euratom. Stringent conditions are in place on the use, storage, movement, security and disposal of sources, assured by the UK's environmental regulators and ONR. In addition, the UK Government has funded a Surplus Source Disposal Programme.

- *Utilisation of IAEA safety review services such as IRRS*

The UK has received 3 IRRS missions, the latest of which in October 2013 focussed on the management of radioactive wastes, decommissioning, radioactive sources and radiological protection. The review of these final

modules ensured the UK has received the full scope of the IRRS process. In its final report the IAEA team commended:

- the systematic way in which ONR had taken account of the recommendations and suggestions made in previous missions, and;
- the significant progress made in further developing its regulatory approach

A first of a kind 'IAEA Expert Mission' will be completed in November 2014 to consider and close out the UK's outstanding findings.

The UK has also made tangible and timely progress with the four initiatives identified by the Joint Convention Country Group Rapporteur in 2012, which included:

- *Implementing lessons learnt from the Fukushima accident*

A national programme of enhancements of particular relevance to the management of radioactive wastes and spent fuels has included: improved robustness of cooling ponds; increased stocks of essential supplies; increased redundancy in electrical supplies; increased stocks of safety-related equipment, and; enhanced resilience of buildings to the entry of floodwater.

- *Implementation of a national strategy for radioactive discharges*

The UK has continued the successful implementation of its national strategy for radioactive discharges that was published in 2009 and covers the period to 2030. The UK aims to meet international agreements on radioactive substances from OSPAR ministerial meetings by 2020.

This report demonstrates that the UK's approaches to safety and environmental protection relevant to the management of radioactive wastes and spent fuels are well-established, effective, drive continuous improvement and meet the requirements of the Joint Convention. Responsibility for adequate safety and environmental performance rests with the UK's nuclear operators, who have to meet the expectations of a comprehensive, goal-setting, regulatory regime.

The periodic safety review requirements of UK nuclear site licences have meant that for many years the UK has been continuously scrutinising and improving the safety of its nuclear installations. The environment agencies also periodically review their permits and authorisations for nuclear sites, to drive improvements in environmental performance. These fundamental regulatory expectations will continue to drive further improvements into the future.

The UK works closely with its counterparts in other countries to ensure its approaches reflect international good practice and capture lessons learnt from experience elsewhere.

Challenges remain, especially delivery of the planned GDF; maintenance of the UK's spent fuel management infrastructure; the remediation of high-hazard facilities at Sellafield is recognised as a national priority; and sustainability of the UK nuclear skills base.

The UK believes that its approaches to nuclear safety, nuclear security and environmental protection, founded on the requirements of the Joint Convention and IAEA Fundamental Safety Principles, are in a strong position to meet these challenges.

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# Section A

## 1 Introduction

### Structure of the report

A.1.1. This is the fifth report explaining how the United Kingdom complies with the safety, radiation protection, planning and environmental standards required by the 44 Articles of the Joint Convention on the Safety of Spent Fuel Management and the Safety of Radioactive Waste Management – hereafter referred to as the ‘Joint Convention’ (Ref. 1).

A.1.2. In accordance with established guidance (Ref. 2), the remainder of Section A concentrates on significant UK developments of relevance to the Joint Convention that have occurred since publication of the fourth UK Joint Convention report in September 2011 (Ref. 3) and the related Review Meeting in May 2012 (Refs. 4 and 5). Subsequent sections provide comprehensive evidence to demonstrate how the UK meets each of the Joint Convention’s articles.

A.1.3. The present-day UK nuclear industry reflects the UK’s prominent role in the development of nuclear technology since the 1950s and in more recent times a policy to develop a new generation of nuclear power stations as part of the future energy mix in England and Wales. The UK therefore has a very diverse range of nuclear facilities relevant to the Joint Convention, with a broad spread of locations, functions and lifetimes, which includes: operational and decommissioning power stations; research facilities; fuel manufacturing; spent fuel storage and reprocessing; and radioactive waste processing, storage and disposal facilities.

A.1.4. While the UK has other types of sites that generate relatively small volumes of Low Level Waste (LLW) including disused radioactive sources, such as hospitals, educational facilities and non-nuclear industries, the UK’s policy is to primarily focus its report on the arisings of radioactive waste that occur from the UK’s nuclear industry. An overview of the relevant facilities is provided in the Office for Nuclear Regulation’s (ONR) Guide to Nuclear Regulation (Ref. 6).

A.1.5. The safety of the UK’s civil nuclear reactors is the subject of the UK’s reports to comply with Article 5 of the Convention on Nuclear Safety, the latest of which was submitted in 2013 (Ref. 7). Consequently, reactor safety is not covered here, although this report does cover the management of the radioactive wastes and spent fuels that are generated at the UK’s nuclear power stations.

A.1.6. This report also omits any consideration of the UK nuclear plants that are explicitly out-of-scope of the Joint Convention (eg facilities used for national defence purposes).

A.1.7. The UK has reprocessed spent fuels at Sellafield and Dounreay. At the diplomatic conference that began the development of the Joint Convention, the UK made a declaration to the effect that the UK would voluntarily report on its spent fuel reprocessing practices (and the management of the radioactive by-products of reprocessing) as part of the spent fuel management requirements of the Joint Convention. The UK has therefore included spent fuel reprocessing in the scope of each of its Joint Convention reports to date and has continued that tradition in this report.

A.1.8. Further details on the report scope are provided in Section C.

A.1.9. For the purpose of this report, the term ‘government’ means the UK Government and the devolved administrations of Scotland, Wales and Northern Ireland, unless otherwise stated.

A.1.10. The principal regulator of nuclear safety, nuclear security and the inland transport of civil radioactive materials across the entire UK is ONR. Two distinct pieces of key environmental legislation apply to the management of radioactive wastes in the different countries of the UK; the Radioactive Substances Act 1993 (RSA93) (Ref. 8) in Scotland and Northern Ireland, and; the Environmental Permitting Regulations 2010 (EPR10) (Ref. 9) in England and Wales - however, the effects of these two pieces of legislation are consistent.

A.1.11. Consequently, the safety and environmental performance of all the facilities relevant to the Joint Convention across the whole UK is managed to a consistent set of legal requirements, technical standards and associated regulatory expectations.

A.1.12. England and each of the devolved administrations has a dedicated environmental regulator. A guide to devolution in the UK can be found on the UK Government website (Ref. 10).

A.1.13. 30 April 2014 was adopted as the cut-off date for reporting new issues in this report, with two exceptions that were considered to be sufficiently important to require inclusion:

- Publication of a White Paper on the long-term management of Higher Activity Waste (HAW), 'Implementing Geological Disposal' in July 2014 (Ref. 11).
- Publication of 'Strategy for the Management of Naturally Occurring Radioactive Materials (NORM) waste in the United Kingdom' in July 2014 (Ref. 12).

A.1.14. The UK presentation to the Fifth Joint Convention Review Meeting in Vienna in May 2015 will be based on this report, augmented with any relevant developments that occur in the interim time.

## **Basis of the report**

A.1.15. In addition to the requirements of the Joint Convention Articles (Ref. 1) and dedicated guidance (Ref. 2) a number of other information sources have informed the scope and structure of this report. These include:

- Final Summary Report of the Fourth Joint Convention Review Meeting (Ref. 4);
- President's Report of the Fourth Joint Convention Review Meeting (Ref. 5);
- Rapporteur's Report for the United Kingdom Country Group from the Fourth Joint Convention Review Meeting (Ref. 13);
- guidelines regarding the Joint Convention Review Process (Ref. 14); and
- questions raised by other contracting parties on the UK's fourth Joint Convention report and the answers that were provided by the UK.

A.1.16. Significant changes in the UK's arrangements to comply with the Joint Convention that have occurred since publication of the UK's fourth Joint Convention report are noted at the beginning of the section for the relevant Article.

A.1.17. Lists of facilities, inventories, reference data and links to further information are provided in Annexes in Section L. References are identified thus (Ref. X) and listed at the end of the report.

## 2 General Overview and Summary of Significant Developments since the last UK Joint Convention Report

### Nuclear policy in the United Kingdom

A.2.1. Nuclear policy in the UK is addressed under several topic areas, from general issues (eg energy policy) to specific topics (eg strategy for radioactive discharges). At the general level, it is a government policy objective that nuclear power should form part of a low-carbon energy mix, whilst the population, society and natural environment should be protected from harmful levels of radioactivity through appropriate national measures – whether derived from European Council (EC) Directives and regulations, international agreements or domestic legislation.

A.2.2. Some aspects of radioactive waste management policy are devolved to the government administrations of Scotland, Wales and Northern Ireland.

A.2.3. Applicable policies for: categorisation of radioactive wastes; discharges of aqueous and aerial radioactive waste discharges; long-term management of HAW; management of LLW; and decommissioning have not changed significantly since 2011 and are addressed in Section B, under Article 32.1(iii). The following sections focus on the relevant policy developments that have occurred in the last three years.

### Policy Developments in the United Kingdom

#### Energy Act 2013 and Change to the Regulatory Body

A.2.4. In December 2013, the Energy Act 2013 (Ref. 15) was enacted, which included measures to facilitate the building of a new generation of nuclear power stations in England and Wales and placed ONR on a statutory basis.

A.2.5. Establishment of ONR as a public corporation, with responsibility for holding the nuclear industry to account on behalf of the public in a fully transparent way, was seen by UK Government as important to address the anticipated regulatory demands of an expanding nuclear sector. Creation of ONR brought regulation of nuclear safety, regulation of the transport of civil radioactive materials, regulation of security compliance and the UK Safeguards Office into a single body. Further details can be found in paragraphs A.2.107 – A.2.114.

#### Implementing Geological Disposal White Paper

A.2.6. In October 2006 the UK Government accepted a recommendation from the Committee on Radioactive Waste Management (CoRWM), that the best approach for long-term management of HAW was deep geological disposal preceded by safe and secure interim storage (Ref. 21).

A.2.7. Following public consultation the UK Government, together with the devolved administrations for Wales and Northern Ireland, published a White Paper in June 2008, 'Managing Radioactive Waste Safely' (Ref. 22).

A.2.8. The 2008 White Paper set out a staged process for siting and development of a Geological Disposal Facility (GDF) for HAW, based on the principles of voluntarism and partnership with potential host communities.

A.2.9. The siting process set out in the 2008 White Paper operated for five years. A number of communities engaged with the process and participated in its early stages.

A.2.10. The UK Government received formal Expressions of Interest from three councils in West Cumbria, ie: Allerdale Borough Council; Copeland Borough Council; and Cumbria County Council (the latter being a higher tier of government with responsibilities in respect of the areas of Allerdale Borough Council and Copeland Borough Council). DECC reached an agreement with the three West Cumbrian

councils in order to apply the siting process in a manner that reflected the local circumstances in West Cumbria. This agreement required support at all the applicable levels of government – ie the borough council, the county council and central government – at key points in the process.

A.2.11. The West Cumbrian councils proceeded through the staged process described in the 2008 White Paper to the point at which a formal ‘Decision to Participate’ was required. This was not a final binding decision on whether to host a GDF, but on further work to identify and technically assess potentially suitable sites in West Cumbria.

A.2.12. On 30 January 2013, the three West Cumbrian councils took individual decisions on whether to participate in the next stage. Allerdale Borough Council and Copeland Borough Council both voted in favour of proceeding, Cumbria County Council voted against. Therefore, Cumbria County Council’s decision brought the siting process in West Cumbria to a close.

A.2.13. In 2012, Shepway District Council in Kent took soundings from local residents on making an Expression of Interest in the siting process, but ultimately decided against doing so.

A.2.14. By February 2013, no communities were actively involved in the siting process.

A.2.15. The UK Government then considered lessons learnt from the process that ran from 2008 to 2013. To support its considerations, the UK Government conducted a ‘Call for Evidence’ in May 2013 to encourage a wide range of stakeholders to provide inputs. Informed by this evidence, the UK Government and Northern Ireland Executive issued a consultation document in September 2013 that aimed to identify revisions and improvements to the siting process, to help communities engage with the process with greater confidence. The Welsh Government also issued the consultation, for the information of stakeholders based in Wales.

A.2.16. The UK Government published the responses it received to the consultation and a short summary report in February 2014. Informed by the responses, in July 2014 the UK Government published a further White Paper (Ref. 11) and its formal response to the consultation (Ref. 23).

A.2.17. ‘Implementing Geological Disposal’ updated and replaced (in England and Northern Ireland) the 2008 White Paper, set out a renewed overarching policy framework for implementing geological disposal and identified initial actions to be led by the UK Government and the intended developer (Radioactive Waste Management Ltd (RWM), a wholly owned subsidiary of NDA) to support a voluntarist process for siting a GDF. These initial actions included:

- a national geological screening exercise to bring together existing data and provide robust information on the potential for siting a GDF across England, Wales and Northern Ireland;
- establishment of a GDF in England to be recognised as a ‘nationally significant infrastructure project’ for planning consent purposes, and development of a National Policy Statement to support this; and
- further work with suitably qualified experts to improve the detailed process of working with communities.

A.2.18. The UK Government intends for these initial actions to be completed by around 2016 and believes the outputs will enable communities to engage with the process to implement a GDF with greater confidence.

#### Welsh Government Policy on Higher-Activity Waste

A.2.19. In relation to the 2008 White Paper, the Welsh Government reserved its position on geological disposal for HAW in Wales. However, the Welsh Government

continued to play an active part in the MRWS programme to ensure that the interests of the people of Wales were recognised in the process.

A.2.20. On 29 April 2014, the Welsh Government issued a call for evidence to seek views on whether or not it should review its policy (Ref. 24). The call for evidence closed on 24 June 2014 and at the time of this report being published the Welsh Government was considering whether to proceed with a review of its policy.

#### Scottish Government Policy on Higher-Activity Waste

A.2.21. The Scottish Government was not a sponsor of the MRWS programme for implementing geological disposal, but remained committed to the responsible management of the radioactive wastes arising in Scotland. The Scottish Government published its own policy on the long-term management of HAW in January 2011 (Ref. 25), based on management in near-surface facilities.

A.2.22. The Scottish Government believes the HAW management facilities should be located as near to the site where the waste was produced as possible (the 'proximity principle'). The Scottish Government also believes developers should demonstrate how the facilities will be monitored and how any stored waste or waste packages could be retrieved.

A.2.23. The Scottish HAW Policy does not include High-Level Waste (HLW), due to there being no HLW accumulated in Scotland, nor does it cover spent fuels or nuclear materials that are not presently classified as waste. The UK policy for the management of spent fuel is described in paragraphs B.3 to B.11.

A.2.24. The Scottish Government is committed to all long-term waste management options being subject to robust regulatory requirements. The Scottish Government is developing a strategy to support the implementation of its policy. The Scottish Government supports CoRWM's recommendations for a robust programme of interim storage of HAW and supports ongoing related research and development.

#### **Proposed New Nuclear Power Stations in England and Wales**

A.2.25. The UK Government believes nuclear power is a low-carbon, affordable, secure, dependable and safe means of electricity generation that can sustainably increase the diversity and security of energy supply. A number of commercial parties have expressed an interest in developing new nuclear power stations at several specified sites in England and Wales.

A.2.26. The Welsh Government is supportive of a proposal to develop a new nuclear power station next to the existing Magnox power station at Wylfa and believes the proposed Wylfa Newydd would provide a reliable low-carbon energy source to complement the intermittency of renewable energy sources.

A.2.27. The Scottish Government has made clear it will not grant planning consent to any forthcoming proposal to build new nuclear power stations in Scotland, though it recognises that lifetime extensions for the pre-existing operational power stations at Hunterston B and Torness could help maintain security of supply while the transition to renewable and alternative thermal generation takes place.

A.2.28. There are no proposals to introduce any nuclear power stations to Northern Ireland, which has never hosted any major nuclear facilities.

A.2.29. Full details of the UK approach to regulating proposed new nuclear power stations, including the process of Generic Design Assessment (GDA), was set out under Article 7 in the UK's Sixth Report on the Convention on Nuclear Safety (Ref. 7).

A.2.30. GDA is the process by which the UK regulators assess the safety, security and environmental implications of the proposed new reactor designs. GDA is not site-specific and has a number of stages through which the level of assessment becomes increasingly detailed. At the end of GDA the UK regulators publish a decision on whether the proposed reactor design is acceptable for use in the UK.

A.2.31. The lead regulator for the environmental protection aspects of GDA is the Environment Agency. Natural Resources Wales (NRW) is represented on the Environment Agency's GDA Programme Board and keeps stakeholders in Wales fully informed of the progress of GDA for the Hitachi-GE Advanced Boiling Water Reactor (ABWR) design that is proposed for Wylfa Newydd.

A.2.32. As an integral part of GDA, ONR and the Environment Agency ask requesting parties to provide evidence to demonstrate they can safely handle, store and dispose of the spent fuel and radioactive wastes expected to arise from the complete lifecycle of the proposed power station; from construction, through the operational phase, to decommissioning and final remediation. ONR and the Environment Agency ask for sufficient levels of design to:

- justify the safety of proposed storage options;
- demonstrate how spent fuel, radioactive wastes and packaging might evolve over the envisaged storage periods;
- manage all relevant data and records;
- address disposability, with priority given to the disposability of spent fuel and HAW at the UK's proposed GDF;
- highlight implications of the anticipated spent fuel and radioactive waste arisings for the national disposal programmes; and
- provide robust estimates of the required capacities.

A.2.33. The UK Government has determined that energy companies wishing to construct new nuclear power stations in England or Wales should meet the full lifecycle costs of developing and decommissioning their proposed plants, including the costs of managing and disposing of the lifetime arisings of spent fuels and radioactive wastes. To provide assurance on this aspect, the independent Nuclear Liabilities Financing Assurance Board (NLFAB) scrutinises Funded Decommissioning Programmes and cost estimates provided by the requesting parties and advises the Secretary of State for Energy and Climate Change on the robustness of those plans.

A.2.34. Recent developments relevant to GDA include:

- In January 2013, ONR and the Environment Agency received a request for GDA on the ABWR which Hitachi-GE and Horizon propose to build alongside pre-existing Magnox power stations at Wylfa and Oldbury. ONR and the Environment Agency began Phase 2 of the GDA process in January 2014.
- In March 2013, the UK Government granted development consent to EDF to build a new nuclear power station based on reactors of the EPR design at Hinkley Point C in Somerset. The proposal has received the required initial regulatory agreements (a completed GDA, a site licence from ONR and an environmental permit from the Environment Agency).

### **Reform of Planning Law in England and Wales**

A.2.35. The UK Government has revised its system for granting planning permission for major infrastructure projects in England and Wales which includes the construction of new nuclear power stations. Such planning applications are considered by the Planning Inspectorate, which makes recommendations to the Secretary of State (in the case of energy projects this is the Secretary of State for Energy and Climate Change) who makes the final decision. The basis on which such applications are considered was set out in National Policy Statements, published in 2011 (Refs 16, 17 and 18) which included a list of potential sites for new nuclear power stations. The list was an output of the Government's Strategic Siting Assessment process (Ref. 19), as detailed in UK reports on the Convention on Nuclear Safety.

A.2.36. Under this system, the Secretary of State granted development consent to EDF's proposed new nuclear power station at Hinkley Point C in March 2013.

A.2.37. The process of gaining planning permission is entirely separate from the nuclear site licence system administered by ONR and the environmental permitting system administered by the Environment Agency in England and NRW in Wales, although the Planning Inspectorate consults ONR and the relevant environmental regulator when formulating its recommendations.

A.2.38. The White Paper 'Implementing Geological Disposal' included measures to classify the establishment of a GDF for disposal of HAW in England as a 'nationally significant infrastructure project' for planning consent purposes. Consequently the development of a GDF will be progressed under the revised planning regime - a National Policy Statement will be published to support this in due course.

#### **Regulatory Reform (Scotland) Act 2014**

A.2.39. The Regulatory Reform (Scotland) Act (Ref. 20) was passed by the Scottish Parliament on 16 January 2014.

A.2.40. The Act enabled regulation of environmental activities – defined as activities capable of causing, or liable to cause, environmental harm. The Act therefore shifted the focus of the Scottish regulatory framework from pollution control to potential for environmental harm. It allowed for the implementation of a simpler, proportionate single integrated regulatory framework and enabled integration of the Scottish Environmental Protection Agency's (SEPA) four main regimes of water, waste, radioactive waste, and pollution prevention and control.

A.2.41. The requirements of RSA93 (Ref. 8) will be incorporated into the new Scottish regulatory framework in coming years.

#### **Developments in Integrated Waste Strategies and Plans**

A.2.42. The Nuclear Decommissioning Authority (NDA) has responsibilities for effective management of radioactive wastes and spent fuels across an estate of 17 civil licensed nuclear sites that are under NDA's ownership and feature the majority of the UK's nuclear liabilities. These sites are: Berkeley; Bradwell; Capenhurst; Chapelcross; Dounreay; Dungeness A; Harwell; Hinkley Point A; Hunterston A; the Low Level Waste Repository near Drigg in Cumbria; Oldbury; Sellafield; Sizewell A; Springfields; Trawsfynydd; Winfrith; and Wylfa.

A.2.43. The UK Government has additionally made NDA responsible for delivery of a number of initiatives on the pre-treatment and disposal of radioactive wastes arising from the whole of the UK nuclear industry, inclusive of licensed nuclear sites owned by other organisations including private operators and defence sites. These initiatives include:

- development and implementation of strategies for pre-treatment and disposal of Very Low Level Waste (VLLW) and LLW;
- implementation of a GDF for HAW by NDA's wholly owned subsidiary Radioactive Waste Management Ltd (RWM); and
- at its sites in Scotland, NDA is working with the Scottish Government on measures to implement Scottish HAW policy and has a leading role in the development of supporting strategies.

A.2.44. The achievement of hazard reduction at its sites by retrieval and immobilisation of legacy radioactive wastes is NDA's chief priority. However, NDA also has wider responsibilities to secure optimum waste management practices upon its sites in terms of safety, environmental protection, security and value for money.

A.2.45. In 2009, NDA set out a strategy for management of the radioactive wastes arising from the NDA estate (Ref. 26). NDA has since progressed its objectives by

publishing an Integrated Waste Management Programme in May 2012 (Ref. 27) setting out the strategic tasks to implement NDA commitments.

A.2.46. NDA takes a coherent approach to its operations across all the UK sites it owns and has developed tools and techniques to enable this in an objective manner. NDA will review the outputs of the individual site-level Integrated Waste Strategies that have been produced by each of its Site Licensee Companies (SLCs) during the financial year 2014/15.

#### **NDA Business Plan and Strategy 2013–16**

A.2.47. The NDA Business Plan 2013–16 was approved by the Secretary of State for Energy and Climate Change and Scottish ministers and presented to both the UK and Scottish parliaments in March 2013 (Ref. 28).

A.2.48. The business plan set out NDA's key objectives, plans and priorities over the subsequent three years and was compatible with delivery of the NDA Strategy published in 2011 (Ref. 29). This was the second NDA Strategy published in accordance with the Energy Act 2004, which requires NDA to review its strategy at least every five years. NDA is obliged to consult the UK regulators in the process of those reviews.

A.2.49. Ongoing governmental support for NDA recognises the importance of tackling the UK's nuclear legacy. NDA's funding (made up of a combination of commercial income and funding from government) has been maintained at over £3 billion per year, enabling NDA to progress the decommissioning of its sites, the main focus being remediation of high-hazard radioactive wastes and materials into a passively safe form. NDA's commercial income is declining (due to the planned closure of Magnox power stations and completion of reprocessing contracts), while the expenditure required to address legacy issues is fixed or rising. The government proportion of funding to NDA has consequently increased from £1.1 billion in the first full financial year of NDA's existence in 2005/06, to £2.3 billion in 2013/14.

A.2.50. NDA's principal themes for 2013–16 of relevance to the Joint Convention are:

- Spent Fuels – safe, secure and cost-effective lifecycle management of the diverse range of spent fuels for which NDA has responsibility. This includes Magnox, Oxide and Exotic spent fuels.
- Nuclear Materials – safe, secure and cost-effective lifecycle management of the inventory of uranics and plutonium currently stored on sites owned by NDA.
- Integrated Waste Management – management of all forms of waste arising from operations and decommissioning on NDA sites, including waste retrieved from legacy facilities, in a manner that protects people and the environment now and in the future. This is undertaken in ways that comply with UK Government and Scottish Government policies, provides value for money and includes the work of RWM to progress the development of a GDF.

A.2.51. NDA has identified critical enablers that support delivery of its mission and apply across the strategic themes. These enablers include the topics of Health, Safety, Security, Safeguards, Environment and Quality, which have the objective of reducing the inherent risks associated with dealing with the UK nuclear legacy. NDA therefore insists upon high standards from the operators of its sites across these topic areas.

#### **Implementation of Policy and Strategy for the Management of Solid LLW**

A.2.52. The 'UK Strategy for the Management of Solid Low-Level Radioactive Waste from the Nuclear Industry', known as the 'Nuclear LLW Strategy' and published in 2010 (Ref. 30), was prepared for the UK Government and devolved

administrations by NDA in response to 'Policy for the Long-Term Management of Solid Low-Level Radioactive Waste in the United Kingdom' published in 2007 (Ref. 31).

A.2.53. The strategy targeted a reduction in the amount of solid LLW being generated by the nuclear industry through improvements to processes and designs, together with greater levels of recycling and reuse to drive down the industry's reliance on disposal. A key objective of the strategy was to optimise the use of the existing capability for disposal of LLW in the UK, by ensuring the valuable capacity of the LLWR is used only for those types of LLW that require the level of engineered protection the LLWR offers.

A.2.54. The strategy required the management of LLW to be integrated with the management of other categories of radioactive wastes and non-radioactive wastes.

A.2.55. Oversight of the strategy's implementation has been provided via the Nuclear LLW National Programme. To facilitate the required change in emphasis, the role of LLW Repository Ltd was enhanced such that it now provides a broad range of waste treatment services for LLW from across the UK nuclear industry, secured through framework agreements with a range of specialist suppliers.

A.2.56. A commitment was given in the 2010 publication to review the strategy by 2015; the scope of this review will be agreed during 2014.

#### **Revised Exemption Regime for Materials and Wastes featuring Low Levels of Radioactivity**

A.2.57. The UK Government and devolved administrations have reviewed and amended their approach for exempting substances featuring low levels of radioactivity from some aspects of regulatory control. The review introduced a risk-informed approach consistent with European Standards, delivered across the UK's devolved administrations through the environmental legislation appropriate to each country.

A.2.58. In Scotland and Northern Ireland the review was implemented through an overhaul of the exemption orders that historically existed under RSA93. The changes pertinent to EPR10 applicable in England and Wales were introduced through the Environmental Permitting (England and Wales) (Amendment) Regulations 2011.

A.2.59. In addition to the legislative changes, the revised approach was supported by:

- guidance setting out expectations of the UK Government and Devolved Administrations, the underpinning reasons for revising the exemptions regime and an aid to interpretation of the new legislation; and
- regulators' guidance (procedural guidance) setting out the procedural details to accompany the revised regime, examples of good practice and detailed explanation of application of the legislation to particular industrial sectors.

A.2.60. The Environment Agency, SEPA, NRW and the Northern Ireland Environment Agency (NIEA) are committed to co-ordinated regulation to ensure a consistent approach in the implementation of the new exemption regime across all the administrations of the UK.

#### **Proposal to Exclude Disposal Sites for LLW and VLLW from the Requirements of the Paris-Brussels Conventions**

A.2.61. The UK is in the process of implementing changes to the Paris and Brussels Conventions on nuclear third party liability (which govern the payment of compensation for damage caused by nuclear incidents) into UK law, in particular the Nuclear Installations Act 1965 (NIA65). The revised Paris Convention imposes a liability regime on installations for the disposal of nuclear substances, including

landfill sites that accept LLW and VLLW, in their pre-closure and post-closure phases and requires insurance or other approved financial security to cover third party liability.

A.2.62. The UK Government considers this liability regime should not apply to such landfill facilities, on the basis that those sites do not present a sufficient level of risk to warrant compliance with the requirements of the Paris regime. The UK Government has therefore made proposals to the OECD NEA Nuclear Law Committee, seeking an exclusion from the Paris regime for this type of site. Exclusion from the Paris regime would not affect the regulation of the landfill facilities and any person suffering damage as a result of an incident at such facilities would be able to claim compensation under ordinary tort law.

#### **Change in Policy for Determining Off-Site Emergency Planning Areas**

A.2.63. The Radiation (Emergency Planning and Public Information) Regulations 2001 (REPPiR) place a duty upon ONR to determine the area surrounding a nuclear site within which a local authority is required to have an off-site emergency plan, to protect the public in the event of a reasonably foreseeable radiation emergency. ONR has recently developed its approach to encompass two stages of assessment, ie:

- an assessment of the licensee's technical report, relating to the area in which members of the public or emergency workers may be significantly affected by a radiation emergency, against dose criteria defined in REPPiR; and
- an assessment of the practical and strategic implications of implementing countermeasures and aid to members of the public likely to be affected by a reasonably foreseeable radiation emergency. This assessment involves consultation with local authorities and includes local demographic, logistical and geographical considerations (for example, it may not be practicable for a boundary of emergency response to include only a portion of a school, major industrial premises or retail outlet).

A.2.64. The consideration of practical and strategic factors in Step 2 was a revision from ONR's previous approach. Further details are available in ONR's dedicated Technical Assessment Guide (TAG) (Ref. 32).

#### **European Council Directive (Euratom) on Nuclear Safety**

A.2.65. EU Directive 2009/71/Euratom of 25 June 2009 (the 'Nuclear Safety Directive'), establishing a European Community framework for the nuclear safety of nuclear installations, was adopted in July 2009 by publication in the Official Journal. The UK transposed the Directive in July 2011. The purpose of the Nuclear Safety Directive is to establish a Community framework to maintain and promote the continuous improvement of nuclear safety and its regulation, and to ensure that Member States provide appropriate national arrangements for high levels of safety to protect workers and the general public.

A.2.66. The UK approach to compliance with the Directive was reported in the UK's sixth report to the Convention on Nuclear Safety. The European Commission proposed an amendment to the Directive which was adopted by Council on 8 July 2014 and will need to be transposed in the UK by 2017.

#### **European Council Directive (Euratom) on the Responsible and Safe Management of Spent Fuel and Radioactive Waste**

A.2.67. EU Directive 2011/70/Euratom of 19 July 2011, establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste, was adopted in August 2011 by publication in the Official Journal. The UK transposed the Directive within the August 2013 deadline.

A.2.68. The aim of the Directive is to establish a Community framework for ensuring the responsible and safe management of spent nuclear fuel and radioactive waste arising from both the nuclear and non-nuclear sectors. It applies to all stages of spent nuclear fuel management and all stages of radioactive waste management, from generation to disposal. The Directive is based on the principles and requirements of the Joint Convention making some of them legally binding and enforceable under EU law.

### **International Framework for Nuclear Energy Cooperation**

A.2.69. The UK has played a positive role in ensuring the International Framework for Nuclear Energy Cooperation (IFNEC) considers the whole fuel cycle, including radioactive waste management and decommissioning.

## **Other Developments in Radioactive Waste Management**

### **UK Response to the Accident at the Fukushima Dai-ichi Power Plant**

A.2.70. The UK fully participated in the international response to the Fukushima accident. Following the accident, the Secretary of State for Energy and Climate Change asked the then HSE Chief Inspector of Nuclear Installations to report to the UK Government on any implications of the accident and lessons to be learned for the UK nuclear industry. ONR published the final Chief Inspector's report in September 2011 (Ref. 33).

A.2.71. In preparing his report, the Chief Inspector liaised with various pre-existing international bodies and forums such as:

- International Atomic Energy Agency (IAEA),
- the Organisation for Economic Co-operation and Development's (OECD) Nuclear Energy Agency (NEA),
- European Council's European Nuclear Safety Regulator's Group (ENSREG), and
- Western European Nuclear Regulators' Association (WENRA).

A.2.72. ONR also took advantage of its close links with other nuclear safety regulators globally, in particular the United States Nuclear Regulatory Commission (US NRC) and the French Autorité de Sûreté Nucléaire (ASN) in the immediate response to the accident and to co-ordinate follow-up work. The Chief Inspector held bilateral discussions with the Director Generals and senior staff of IAEA and NEA, with the Director General for Energy of the European Council and led an IAEA team of international experts on a fact-finding mission to Japan, initially to feed into the IAEA Ministerial Conference.

A.2.73. A significant proportion of the Chief Inspector's report focused on matters of reactor safety that are not relevant to the Joint Convention, but the report also covered technical and organisational issues relevant to management of spent fuel and radioactive wastes. These included: resilience of nuclear plant (including fuel ponds and waste storage facilities) to natural hazards; the robustness of spent fuel strategies; and severe accident analysis.

A.2.74. The UK then played a leading role in developing and applying post-Fukushima European Council Stress Tests. ONR published a national report that considered lessons identified from the Stress Tests for the UK nuclear power plants in December 2011 (Ref. 34). In May 2012, ONR provided a report that considered lessons learnt for the UK's non-power-generating nuclear facilities (Ref. 35).

A.2.75. Since publication of the Chief Inspector's Report and the Stress Test Reports the UK's progress in implementing lessons learnt, including those where further analysis was initially required, has been closely monitored. A report on the actions taken against all the issues raised on UK nuclear licensees, the Government and regulators was published by ONR in October 2012 (Ref. 36).

A.2.76. As well as maintaining an overview of the UK's response, ONR continues to support the European Stress Test follow-up in collaboration with other nations. A National Action Plan was published in December 2012 (Ref. 37) to update the position of the UK nuclear power plants in addressing Stress Test outcomes. The National Action Plan had a key objective of assuring that lessons learnt from the Stress Tests and the associated international peer reviews resulted in a consistent level of improvement to nuclear safety across Europe.

A.2.77. International co-operation greatly enhanced the UK's ability to respond to the Fukushima accident, by enhancing understanding of the details of the accident and identifying areas for possible improvements to safety.

A.2.78. With respect to facilities for the management of spent fuel and radioactive wastes, UK licensees committed to a prioritised programme of resilience enhancements to the key emergency management facilities, systems and procedures necessary for an effective emergency response capability to beyond design basis (severe accident) events. These included general improvements such as back-up pond water feed/fire pumps to provide further defence-in-depth, improved training on accident response and additional stocks of essential equipment (eg basic tools, flash lights etc) stored in diverse locations.

A.2.79. At nuclear power plants, a number of the improvements implemented by licensees have relevance to the robustness of arrangements on the sites for the management of spent fuel:

- diverse and seismically qualified pond water emergency filling lines;
- diesel-driven water pumps to supply essential reactor and pond cooling in the event of a loss of site electrical power;
- reverse osmosis equipment to supplement essential cooling water supplies;
- diesel-driven electricity generators and pond coolers as back-up equipment;
- equipment to restore containment integrity in the event of structural damage; and
- waste water capture and treatment facilities.

A.2.80. The Sellafield site houses a large inventory of radioactive materials and wastes, some of which are stored in potentially mobile forms and have heat-generating capability, in facilities that do not meet modern engineering standards. However, the heat-generating capability of the radioactive material on the site is lower than the fuel in operating nuclear power plants, therefore the modelled severe accident scenarios at Sellafield develop over longer timescales than those for nuclear power plants. Hence, the engineered safety and protection systems nuclear chemical plant facilities are significantly different to those for nuclear power plant.

A.2.81. After the Fukushima accident, Sellafield Ltd reviewed the expected availability and reliability of key safety systems (eg cooling, ventilation, inerting and containment systems) in plants across the site under postulated severe accident conditions and developed an enhancement programme. Sellafield Ltd reported its findings from application of the European Stress Tests on the Sellafield site to ONR (Ref. 38).

A.2.82. Sellafield Ltd has made good progress in implementing its enhancement programme. A significant number of the planned improvements require continued focus and effort to ensure they are delivered, due to their nature as long-term major projects that will take a number of years to deliver in their entirety. Notable improvements already secured include:

- improvements to the Emergency Cooling Water Systems;
- improvements to back-up electrical power systems; and

- improvements to Access Control Point communication systems to be used in the event of an emergency.

A.2.83. Other nuclear licensed sites involved in the management of spent nuclear fuel and radioactive wastes in the UK do not have any severe accident potential (as per the definition in ONR's Safety Assessment Principles (SAPs)), but do meet the REPIR criteria for a radiation emergency and therefore require an off-site emergency plan. These sites have provided a proportionate and tailored response to ONR's recommendations that recognises the respective radioactive inventories and hazard profiles of their facilities and the ongoing decommissioning and hazard reduction work they are undertaking. Good progress has been made on the programme to implement enhancements from lessons from the Fukushima accident and there are no major improvements outstanding.

### **Third IAEA Integrated Regulatory Review Service (IRRS) Mission to the UK**

A.2.84. The UK Government first invited IAEA to peer review the UK approach to the regulation of nuclear safety in 2005, since when the UK has received three IRRS Missions. IAEA conducted the first such Mission in April 2006, followed by a second in 2009 and a third in 2013.

A.2.85. At the completion of each Mission, the IAEA team reported its findings and recommendations to the UK Government. The reports highlighted many areas of good practice and implementation of international standards, but also raised suggestions for improvements.

A.2.86. During the third IRRS review, the team reviewed the UK's progress against the findings of previous Missions and assessed themes that were not within the scope of those Missions, including: radioactive waste management; decommissioning; management of radioactive sources; radiation protection; and lessons learnt from the Fukushima accident. The IRRS team also assessed compliance with IAEA's relevant standards and guides. Overarching themes included: regulatory independence; funding/resources; resilience; competence; and integration.

A.2.87. In its report of the 2013 Mission (Ref. 39) the IRRS team commended:

- the systematic and comprehensive way in which the UK had addressed recommendations and suggestions from the previous IRRS Missions in 2006 and 2009 (31 of the 32 recommendations were judged to be fully addressed and therefore closed);
- the engagement of ONR with prospective licensees in the areas of organisational governance, structures, competencies and resources based on documented regulatory requirements;
- the detailed guidelines and their application in the practices of ONR on a Graded Approach and principles for regulatory assessment;
- the use of comparative emergency capability maps for estimation of on-site and off-site emergency readiness, enabling identification of any gaps and facilitating benchmarking;
- the provision of a large range of information on radiation protection, available to employees and workers via the HSE and ONR websites;
- the establishment of a working group to exchange views between regulators and the potential operator of the future GDF; and
- the use of Radioactive Waste Management Cases for individual waste streams to demonstrate that the interdependencies between steps in predisposal waste management are considered in a comprehensive and coherent way.

A.2.88. The report identified 25 new findings (13 recommendations and 12 suggestions) relating to two main themes of: responsibilities and functions of ONR (including organisational capability, communications and training); and supervision of non-nuclear power plant facilities (including regulation of radioactive sources, radioactive waste management and decommissioning). The following findings were of particular relevance to the Joint Convention:

- The Government together with devolved administrations should continue to implement policy and develop strategies as necessary, specifying steps and responsibilities, for all radioactive waste streams in the UK.
- ONR should review the implementation of the present legal arrangements and ensure that all organisations responsible for the safety of decommissioning activities, and of the management of radioactive waste, are held accountable for their responsibilities and that their activities are co-ordinated.
- ONR should review its approach to authorising decommissioning plans and its guidance dealing with decommissioning.

A.2.89. The UK accepted all the Mission findings and put in place a detailed programme of work to address each of them. This report reflects the UK's response to the IRRS findings relevant to the Joint Convention in the text against pertinent Articles. IAEA has accepted a proposal from the UK to carry out an Expert Mission to review progress against all the 2013 IRRS Mission findings later in 2014.

#### **Publication of the 2013 UK Radioactive Waste Inventory**

A.2.90. The 2013 version of the UK Radioactive Waste Inventory (UKRWI) was published in February 2014. The Inventory consists of eight documents and is updated every three years as part of an ongoing programme of research conducted jointly by DECC and NDA (Refs 40, 41, 42, 43, 44, 45, 46 and 47).

A.2.91. DECC and NDA commissioned the 2013 Inventory to provide information on the status of radioactive waste stocks at 1 April 2013 and forecasts of the UK's future arisings. The aim of UKRWI is to provide data in an open and transparent manner for all those interested in the UK's radioactive waste issues.

#### **Strategies for LLW from the Non-Nuclear Industry**

A.2.92. The UK's strategy for the radioactive wastes that arise from applications outside of its nuclear industry is split into two parts:

- Part 1 – Arisings of wastes mainly containing anthropogenic radionuclides (Ref. 48).
- Part 2 – Arisings of wastes containing Naturally Occurring Radioactive Materials (NORM) (Ref. 12).

A.2.93. Demand from the nuclear sector for radioactive waste disposal facilities and a co-ordinated strategic national approach has stimulated opportunities for commercial waste management operators. Several new facilities for the treatment and disposal of LLW have been permitted in recent years. The UK Government has worked to ensure the broadening of the commercial treatment and disposal network has delivered benefits for the management of wastes from both the nuclear and non-nuclear sectors of industry.

A.2.94. The strategies introduced a responsibility on NDA, such that NDA can and will make provision within its supply chain arrangements for the disposal of non-nuclear LLW, provided such provision does not compromise (eg increase the costs of) its primary mission to manage the legacy wastes from NDA-owned sites. Part 1 of the non-nuclear strategy also established that, in line with Government expectations and only where necessary, NDA will continue to make facilities available for the

treatment and storage of redundant radioactive sources preparatory to the construction and operation of permanent disposal facilities in the UK. NDA is committed to supporting government in developing and maintaining UK-wide strategies for waste from the non-nuclear industry to help ensure that the strategies for the nuclear and non-nuclear sectors are suitably integrated.

### **LLWR Environmental Safety Case**

A.2.95. The LLWR located close to Drigg in Cumbria has been the UK's primary facility for the disposal of solid LLW by burial since its establishment in 1959, prior to which the site was a Royal Ordnance factory. LLWR is a licensed nuclear site owned by NDA and operated under contract by the SLC, LLW Repository Ltd.

A.2.96. Disposals at LLWR can only take place in accordance with a Permit issued by the Environment Agency under the terms of EPR10. It is a legal requirement of the extant permit that LLW Repository Ltd must maintain an Environmental Safety Case (ESC).

A.2.97. Since the 1980s containerised LLW from across the UK nuclear industry has been routinely transported to LLWR by road or rail, then grouted prior to emplacement in surface-level concrete-lined engineered vaults.

A.2.98. Before construction of the vaults, waste was disposed of in seven lined trenches in a similar manner to domestic landfill sites. The trenches have been filled to capacity and covered with a cap to minimise rainwater entry.

A.2.99. LLWR's environmental permit presently allows LLW Repository Ltd to dispose of conditioned containerised LLW to the concrete-lined surface-level vault known as Vault 8. Vault 8 is now full to capacity and LLWR Ltd has consequently constructed Vault 9 to give it additional space. However, the Environment Agency has not yet authorised the disposal of LLW into Vault 9, implying waste can only be stored there subject to regulation under the requirements of the site licence by ONR.

A.2.100. In May 2011, LLW Repository Ltd submitted an updated ESC (Ref. 49 and 50) to the Environment Agency in order to comply with the requirements of its environmental permit. LLW Repository Ltd published the background information that supported its 2011 ESC on a dedicated area of its website (Ref. 51).

A.2.101. The Environment Agency completed a technical review of the ESC and identified a number of issues and additional assessment work that needed to be addressed by LLW Repository Ltd. The Environment Agency has made further information on its assessment of the ESC and its regulation of LLWR available to the public on a dedicated area of the gov.uk website (Ref. 52).

A.2.102. Having consulted with the Environment Agency and provided additional information through the course of the Environment Agency's review of the 2011 ESC, in 2013 LLW Repository Ltd took the decision to apply to the Environment Agency for a variation to its EPR10 Permit. The requested changes related to operational criteria to support future LLW disposals at the LLWR and installation of closure engineering at Vault 8 and the trenches. LLW Repository Ltd published the background information that supported its application for a Permit variation on a dedicated area of its website (Ref. 53).

A.2.103. The Environment Agency held a public consultation on the application and, in autumn 2014, it will hold a further public consultation on its draft decision on whether to grant the requested variation to LLW Repository Ltd's Permit. Any significant changes to the disposal regime at LLWR will be the subject of a Euratom Article 37 submission to the European Commission.

### **New LLW Disposal Facility local to Dounreay**

A.2.104. In 2009, the Highland Council granted planning permission for development of a new near-surface disposal facility for solid LLW from the Dounreay decommissioning programme, based outside the licensed site boundary.

Construction began in December 2011 on a series of shallow, concrete-lined vaults that will receive up to 240,000 tonnes (approximately 175,000m<sup>3</sup>) of Dounreay's LLW.

A.2.105. Construction of the vaults was completed in March 2014, SEPA has authorised the vaults to receive conditioned solid LLW for disposal, and the first waste consignments are expected to take place in late 2014 subject to further agreement from SEPA that adequate management systems are in place. The Dounreay nuclear site licensee, Dounreay Site Restoration Ltd, has taken receipt of a super-compactor and incorporated it into a new waste processing plant that will be used to condition and package the LLW prior to disposal in the new facility.

#### **Repatriation of Overseas Radioactive Wastes from Sellafield and Dounreay**

A.2.106. Programmes to repatriate waste by-products from reprocessing activities on spent fuels from overseas customers at Dounreay and Sellafield continue to make progress. In 2012, DECC and the Scottish Government in consultation with NDA, established that waste substitution was an acceptable practice to support waste repatriation. To date waste has been returned to the Netherlands, Belgium, France and Japan. NDA is continuing contractual discussions with further overseas customers, aimed at using waste substitution to repatriate the wastes from Dounreay.

### **Organisational Developments**

#### **ONR Becoming a Statutory Corporation**

A.2.107. In order to modernise and improve the regulation of the nuclear industry, the UK Government announced in February 2011 an intention to bring forward legislation (implemented by means of the Energy Act 2013) to create ONR. The first step was the formation of ONR as an agency of the Health and Safety Executive (HSE) on 1 April 2011. On this basis, ONR took responsibility for the regulation of: nuclear safety; nuclear security; ensuring compliance by the UK with international safeguards obligations; and regulation of the transport of civil radioactive material by road, rail and inland waterway.

A.2.108. On 1 April 2014 the ONR-related provisions of the Energy Act 2013 came into force and as a result ONR ceased to be an agency of HSE and was vested as a statutory body in its own right. ONR has since taken the status of a public corporation. The Energy Act 2013 defined the purposes and powers of the statutory ONR, improved ONR's ability to be demonstrably independent and ensured ONR's key purposes were captured in a single piece of primary legislation.

A.2.109. ONR's main purposes are:

- protecting people from the risks of harm from ionising radiations from Great British nuclear sites;
- protecting people from risks to health and safety from work activities on Great British nuclear sites, including risks from the storage of dangerous substances;
- ensuring the security of civil nuclear premises, the nuclear materials used there, and sensitive information, equipment and technology;
- ensuring compliance by the UK with its international safeguards obligations; and
- protecting against risks relating to the civil transport of radioactive material in Great Britain by road, rail, or inland waterway.

A.2.110. Environmental regulation was not incorporated into ONR and responsibility for this remained with the environment agencies.

A.2.111. To achieve its purposes, ONR appointed inspectors suitably qualified and experienced to carry out the functions of ONR, the majority of whom were previously employed by HSE's Nuclear Directorate. ONR's inspectors have diverse powers and

authorities to regulate the safety and security of the UK nuclear industry, to the extent of being able to bring prosecutions for a failure to comply with legal requirements.

A.2.112. The changes brought about by the Energy Act 2013 enabled ONR to retain the best of current practice while creating a modern independent regulator based on the principles of transparency, accountability, proportionality, targeting, and consistency.

A.2.113. The Energy Act 2013 did not affect the standards of safety or associated regulatory requirements that ONR places upon the UK nuclear industry.

#### **Creation of Natural Resources Wales**

A.2.114. On 1 April 2013 the UK revised its framework for the regulation of environmental protection in Wales. The functions of the Countryside Council for Wales, the Welsh operations of the Environment Agency and the Forestry Commission were combined into a new body known as Natural Resources Wales. NRW became the relevant statutory body for nuclear site permitting, permit compliance and enforcement under EPR10 and other aspects of radioactive substances regulation in Wales.

A.2.115. NRW has limited nuclear regulatory expertise of its own; agreement has been reached that the Environment Agency will carry out inspections of the nuclear sites in Wales and make recommendations to NRW over permitting, compliance and enforcement action. The due process of making enforcement decisions related to all of these aspects is the responsibility of NRW.

#### **Creation of Radioactive Waste Management Ltd**

A.2.116. On 1 April 2014 NDA changed the status of its Radioactive Waste Management Directorate (RWMD) to become a wholly-owned subsidiary, named Radioactive Waste Management Ltd. The change in company status was an evolution to position RWM in the best way to take forward government policy, by separating NDA's responsibilities for developing a GDF from its role as owner of the majority of the UK civil nuclear liabilities.

A.2.117. The Environment Agency and ONR have reached agreements with RWM to facilitate regulatory review and scrutiny of RWM's work. This will help RWM to progress its designs and safety cases for a GDF in a manner that satisfies regulatory expectations and will inform the preparation of any necessary applications for licences or permits.

#### **National Nuclear Archive**

A.2.118. NDA is committed to building the UK's National Nuclear Archive in Caithness, Scotland. NDA has a statutory obligation to manage public records, keeping them safe and making them accessible to the public and the UK nuclear community. The National Nuclear Archive will manage between 20 and 30 million digital, paper and photographic records, primarily relating to the UK's civil nuclear industry dating back to the 1940s. The programme is currently entering into competition to find a commercial partner to operate the facility on NDA's behalf and it is anticipated the facility will be operational from 2016.

#### **NDA Competitions for Parent Body Organisations**

A.2.119. Competition is a central concept for delivery of NDA's strategy to meet statutory duties in the Energy Act 2004 to secure value-for-money, enhance performance, encourage innovation and promote best practice. NDA refers to the companies that hold the nuclear site licences on the sites it owns as SLCs.

A.2.120. Private sector expertise has been introduced through competition of the management and leadership of one or more SLCs to parent body organisations (PBOs). These competitions do not affect the status of the SLCs as the enduring legal entities that hold the nuclear site licences.

### Low Level Waste Repository

A.2.121. In April 2008, the contract to manage and operate LLW Repository Ltd was awarded to UK Nuclear Waste Management Ltd (UKNWM), a consortium of URS Washington Division, Studsvik, Areva and Serco Assurance. After the successful implementation and delivery of key commitments, in 2013 UKNWM was awarded another five-year term (although Serco Assurance are no longer part of the PBO having been taken over by AMEC, with the result that AMEC has replaced Serco Assurance in the consortium).

### Sellafield Ltd

A.2.122. In November 2008, a contract was awarded to Nuclear Management Partners Ltd, a consortium of URS Washington Division, AMEC and AREVA NC to act as the PBO for Sellafield Ltd, which operates and manages the Sellafield site. The first contract term concluded on 31 March 2014. During autumn 2013, NDA took the decision to extend the parent body agreement with Nuclear Management Partners Ltd for a second five-year term.

### Capenhurst

A.2.123. In September 2011, commercial arrangements were put in place to transfer ownership of a section of the Capenhurst site from NDA to the private company URENCO. In 2012, the overall site transitioned from two separate site licences, previously held by Sellafield Ltd and URENCO UK, to one licence covering the whole Capenhurst site and held by URENCO UK.

A.2.124. The relicensing activities saw the establishment of a wholly owned subsidiary of URENCO, called Capenhurst Nuclear Services. Employees who previously worked for Sellafield Ltd on the site were transferred to Capenhurst Nuclear Services. Capenhurst Nuclear Services, operating as a tenant, was contracted for work associated with NDA's remaining liabilities at the Capenhurst site previously undertaken by Sellafield Ltd. The new contractual arrangements provided greater certainty in funding for the remaining activities of decommissioning and management of legacy wastes at Capenhurst.

### Dounreay Site Restoration Ltd

A.2.125. UKAEA Ltd was established in April 2008 and became the PBO of the site licensee, Dounreay Site Restoration Ltd (DSRL). UKAEA Ltd was later acquired by Babcock International Group in October 2009. The arrangements with UKAEA Ltd expired on 31 March 2012, at which point Babcock Dounreay Partnership Ltd took ownership of DSRL. Babcock Dounreay Partnership is a consortium comprising Babcock Nuclear Services Ltd, CH2M Hill International Nuclear Services Ltd and URS International Holdings (UK) Ltd.

### Magnox Ltd and Research Sites Restoration Ltd

A.2.126. A two-year competitive process to secure a PBO to take all 12 of the historic nuclear sites previously managed by Magnox Ltd and Research Sites Restoration Ltd (RSRL) into the final stages of decommissioning was completed in March 2014. A consortium named Cavendish Fluor Partnership, a specially created joint venture between Cavendish Nuclear and Fluor Corporation, was announced by NDA to be the Preferred Bidder. Following a successful transition, Cavendish Fluor Partnership will become a new PBO and take ownership via the transfer of shares of Magnox Ltd and RSRL on 1 September 2014.

## **Safety and Environmental Developments**

### **Environment Agency Nuclear Sector Plan and Annual Performance Reports**

A.2.127. The Environment Agency's Nuclear Sector Plan sets out environmental challenges facing the nuclear industry over the next few years, and how the nuclear industry in England and Wales can work with the Environment Agency to address

them. It encourages nuclear operators to consider environmental issues and to improve their environmental performance. It also commits the Environment Agency to continuously improve how it regulates the nuclear sites in England.

A.2.128. The Environment Agency published Version 3 of its Nuclear Sector Plan at the end of 2012 following discussions with industry (Ref. 54). Version 3 reflected continued progress against objectives since publication of the first plan in 2005, and new developments in the nuclear industry, particularly in decommissioning.

A.2.129. The Environment Agency's most recent Annual Performance Report for the nuclear sector was published in December 2013 (Ref. 55). This report reflected on the environmental performance of the nuclear industry in England and Wales during 2012. It compared the industry's measured performance against the target objectives that were set out in Version 2 of the Nuclear Sector Plan. The next Annual Performance Report will compare industry performance in 2013 against objectives and performance indicators set out in Version 3 of the Nuclear Sector Plan.

A.2.130. Overall, the environmental performance of the nuclear industry in England and Wales during 2012 was good, with improvements made in a number of areas. The table below provides a summary of how the nuclear industry in England and Wales performed against its eight main environmental objectives during the year, and since 2005 when this style of reporting started. More detailed information on two objectives: 'Minimise discharges to air and water' and 'Minimise and manage solid waste' is provided below.

The 'traffic lights' indicate the status of each objective as follows:

-  Poor performance in 2012
-  Areas where performance was adequate in 2012
-  Good performance in 2012
-  Positive trend in performance since 2005
-  Negative trend in performance since 2005

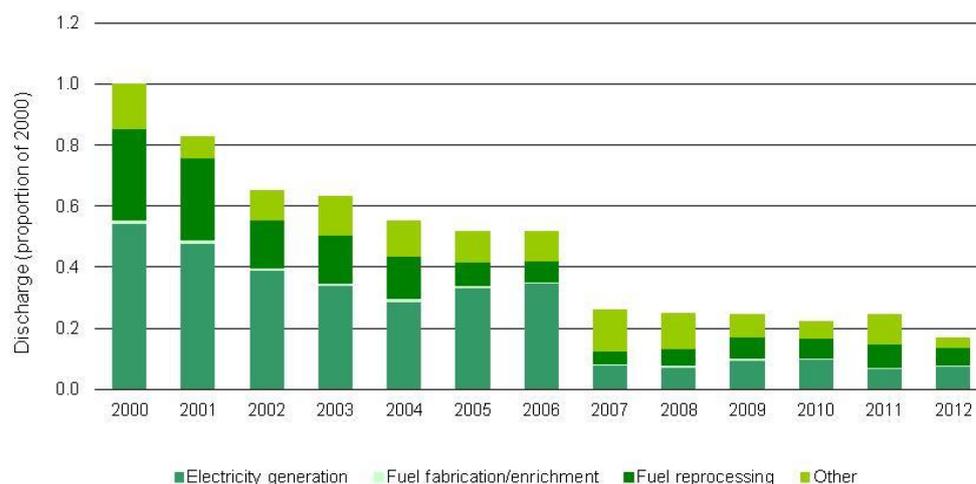
<b>Minimise the amount of natural resources used</b>		
In 2012, energy generation increased but fuel reprocessing decreased. However, there was no substantial change in energy use and only a slight increase in water use. In 2012, the nuclear industry in England and Wales used just under seven million megawatt hours of electricity (1% less than in 2011) and just over 14 million cubic metres of water (7% more than 2011). Energy use and also water use have fluctuated since 2005 and seen a net decline.		
<b>Recognise the impact of climate change</b>		
In 2012, the nuclear industry in England and Wales generated over 49 TWh of electricity, which, if produced by fossil fuels, would have released around 35 million tonnes of CO <sub>2</sub> . Greenhouse gas emissions (measured as CO <sub>2</sub> equivalent) from the nuclear industry as a whole remained at the same levels as 2011. This was despite an increase in the amount of electricity generation in 2012. However, some sites did substantially reduce their CO <sub>2</sub> emissions in 2012, such as Dungeness A.		
<b>Minimise discharges to air and water</b>		
Discharges to air and water remain low, with several sub-sectors of the nuclear industry in England and Wales already achieving their		

<p>2020 targets in the UK Discharge Strategy. Most emissions decreased in 2012 with only alpha discharges increasing (by around 20%), mainly as a result of discharges from the fuel reprocessing sub-sector. The reductions are mostly due to a decrease in fuel reprocessing in 2012 compared to 2011. Overall, discharges generally remain low in comparison to 2005 levels.</p>		
<b>Minimise and manage solid waste</b>		
<p>During 2012 the nuclear industry in England and Wales avoided sending 87% of its LLW to the national repository compared to 84% in 2011. Operators continue to recycle a very high percentage of their inert and non-hazardous wastes. Progress in the retrieval, conditioning and packaging of 'legacy waste' and other intermediate-level waste (ILW) has slightly increased, but it has remained below 30% of such wastes stored on site since 2005. However, ILW retrievals from storage vaults at Magnox sites, such as Bradwell and Berkeley, and subsequent conditioning and packaging, should see this figure rise in future years.</p>		
<b>Demonstrate sound environmental management and leadership</b>		
<p>Nuclear operators continue to maintain robust environmental management arrangements at their sites in England and Wales.</p>		
<b>Manage land quality and biodiversity</b>		
<p>The number of nuclear sites in England and Wales with land quality management plans remained constant. Biodiversity plans have been implemented at most nuclear sites in England and Wales, with a number of operators achieving biodiversity benchmarks.</p>		
<b>Improve or maintain a very high level of regulatory compliance</b>		
<p>The nuclear industry in England and Wales continues to maintain a high standard of regulatory compliance, with far fewer incidents than other regulated sectors. The total number of incidents and breaches increased in 2012, but the majority of these issues had no, or minor, environmental impact. There were no incidents or breaches with major or significant environmental impact. The increase in the number of breaches recorded since 2010 is partially the result of a change in the Environment Agency internal guidance on the recording of permit breaches.</p>		
<b>Achieve better regulation</b>		
<p>The Environment Agency continues to progress against each of its improvement goals. In 2012, the Environment Agency provided Site Environment Reviews for all nuclear sites in England and Wales to provide transparency in how it regulates the sites. The Environment Agency carried out a series of themed audits at nuclear sites in England and Wales on operator arrangements for 'out of scope' wastes and liquid effluent as well as publishing its new Monitoring Certification Scheme (MCERTS) standard on radioanalysis. The Environment Agency published new guidance on the criteria for setting limits on the discharge of radioactive waste from the nuclear sites it regulates. Verbal and/or written feedback to operators within two months of notification of an event has increased.</p>		

## Minimise discharges to air and water

A.2.131. Total radioactive discharges to air from the nuclear industry in England and Wales continue to fall. The overall trend since 2000 has been a significant reduction. A step-change reduction in discharges took place in 2007, which reflected the planned shut-down of Magnox power stations at Dungeness A and Sizewell A. More recently, the downward trend has continued primarily because some commercial operations within the medical and bioscience sector in the UK have stopped, and due to a smaller amount of fuel being reprocessed in 2012 compared to 2011.

### *Total Assessed Radioactive Discharges to Air*



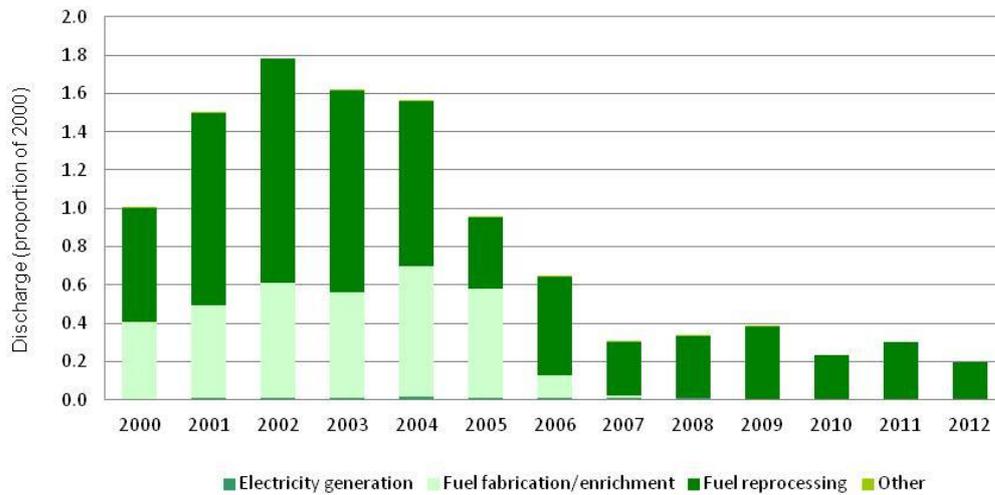
\*Discharge of each radioactive substance weighted by dose impact

#### Notes:

- i) This bar chart 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 health effects of different radionuclides and the likely concentration in the environment. The total is then compared to the 2000 total to show the trend in this indicator over time. The bar chart is therefore comparative and does not have any units; also it does not equate to actual impact.
- ii) The 'other' category includes the medical and bioscience, defence, research and waste management sub-sectors.

A.2.132. Radioactive discharges to water remain low and on target to meet the commitments set out in the UK Strategy for Radioactive Discharges. One of the outcomes of the UK strategy is to progressively and substantially reduce liquid radioactive discharges. This continues to be a major success story for the UK nuclear sector which, over the last 30 years, has achieved significant reductions in its discharges to water. Radioactive discharges from the nuclear industry in England and Wales are in line with, or reducing faster than, the strategy's projections.

### Trends in radioactive discharges to water



\*Discharge of each radioactive substance weighted by dose impact

#### Notes:

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

A.2.133. Discharges to water are dominated by the fuel reprocessing sub-sector. A key event that will contribute significantly to ensuring the UK strategy targets are achieved will be the completion of the Magnox Operating Plan which defines the key deliverables of the whole Magnox fuel cycle covering fuel manufacture, electricity generation, fuelling and defuelling of reactors, fuel transport and reprocessing of spent fuel at Sellafield. The reduction in discharges to water by the nuclear industry in England and Wales in 2012 compared to 2011 reflects a smaller amount of fuel reprocessing carried out in the year.

#### Minimise and Manage Solid Waste

A.2.134. During 2012 the nuclear industry in England and Wales generated 37,301m<sup>3</sup> of solid LLW, which represents a significant increase in the overall quantity of LLW generated and reflects progress in decommissioning and clean-up across many nuclear sites. Only 13% of this LLW was sentenced to the LLWR, due to the nuclear industry working effectively with LLW Repository Ltd to increase the rate of recycling and use alternative new disposal routes. The use of alternative disposal routes helps to ensure that the limited capacity within the national repository is targeted for the wastes that require the level of engineered protection that the LLWR offers.

A.2.135. The conditioning and packaging of HAW into a passively safe form in order to minimise risks to safety and the environment is an area of waste management requiring improvement in the UK. These are high-hazard wastes that, while being safely managed at the sites, are presently in a potentially mobile form not suitable for final disposal. The overall rate of progress within the nuclear industry in England and Wales has remained stable and has not advanced or improved significantly for some time. Since 2006, the proportion of the total volume of ILW that has been conditioned and packaged in England and Wales has remained under 30% of the wastes stored

on the sites. The nuclear industry and its regulators are keen to accelerate the rate of conditioning and packaging of these wastes and this will continue to be an important focus for future work.

## 3 Safety and Environmental Issues Relating to the Management of Spent Fuels and Radioactive Wastes at UK Nuclear Installations

### Management of Spent Fuels

#### New Developments and Progress

##### Spent Magnox Fuel

A.3.1. The era of electricity generation at power stations with Magnox reactors in the UK is drawing to a close. Reactor 1 at Wylfa was the only Magnox reactor still in its operational phase in the UK in 2014.

A.3.2. NDA and its SLCs have made significant progress with removal of spent fuel from the shut-down Magnox reactors in the last three years. Removal of all the spent fuel from a Magnox power station typically reduces the site's hazardous inventory by over 90%, enables decommissioning of reactor systems, allows the removal of spent fuel handling systems, and dependent on other relevant factors may reduce the requirements for an off-site emergency response capability.

A.3.3. The programme of fuel removal from the Magnox power stations, inter-site transport and reprocessing at Sellafield has been co-ordinated through the Magnox Operating Programme (MOP). The MOP was introduced in 2001 to optimise and oversee the spent fuel management activities required to bring an orderly end to electricity generation at the Magnox power stations and the associated fuel cycle.

A.3.4. All the UK's spent Magnox fuel is owned by NDA. The baseline management strategy is for all this fuel to be reprocessed at Sellafield, in line with the NDA strategy published in 2011. The MOP is the practical level programme to deliver the parts of that strategy that concern Magnox fuel, the latest version of which (MOP9) was published on 13 July 2012 (Ref. 56).

A.3.5. The following paragraphs describe the position of the Magnox power stations whose spent fuel management status has changed since the last UK Joint Convention report.

##### Calder Hall (Four Magnox Reactors)

A.3.6. Calder Hall ceased generating electricity in March 2003. The station's fuel route infrastructure was then modernised to enable efficient, timely and safe defuelling. Defuelling commenced on Reactor 4 initially in December 2011, with approximately 40% of elements from that reactor removed by April 2014. MOP9 showed completion of defuelling on all four reactors by no later than March 2019.

##### Chapelcross (Four Magnox Reactors)

A.3.7. The decision to permanently cease generation at Chapelcross took effect in June 2004. Following significant modifications to the fuel route, defuelling commenced in 2008. Defuelling of all four reactors was completed on 26 February 2013.

##### Dungeness A (Two Magnox Reactors)

A.3.8. Dungeness A operated at power for 40 years and ceased generation in December 2006. Following a revision of the station's safety case and major refurbishment of the fuel route, removal of all the spent fuel from the reactors was completed on 17 April 2012.

##### Oldbury (Two Magnox Reactors)

A.3.9. Oldbury Reactor 2 operated until 30 June 2011 and Reactor 1 operated until 29 February 2012. Defuelling is now underway and MOP9 showed removal of all fuel from the Oldbury site by no later than February 2017.

### Sizewell A (Two Magnox Reactors)

A.3.10. Sizewell A operated at power for 40 years and ceased generation on 31 December 2006. A Post-Operation and Defuelling Safety Case was developed between 2004 and 2006 to supersede the operational safety case. The station fuel route was then refurbished and defuelling was well advanced by the cut-off date for this report of April 2014, with completion expected for later in 2014.

### Wylfa (Two Magnox Reactors)

A.3.11. Wylfa Reactor 2 ceased its operational phase in April 2012, Reactor 1 will continue to operate until at least September 2014. The UK has ceased its production of new Magnox fuel, therefore the continued operation of Reactor 1 is being supported by the transfer of partially irradiated fuel out of Reactor 2. A possible extension to the operational life of Reactor 1 to December 2015 is subject to ONR granting its approval to a Periodic Review of Safety. MOP9 showed completion of defuelling at Wylfa by no later than July 2019.

### **Updates to UK Spent Fuel Strategies**

A.3.12. NDA reviewed its spent fuel strategy theme as part of its overall strategy review in 2011. NDA's spent fuel strategy prioritises the most appropriate management of Magnox and Oxide spent fuels, as these two types of fuel make up the vast majority of the UK's spent fuel inventory.

A.3.13. Where possible, NDA also seeks to take advantage of the technology used for managing Magnox and Oxide spent fuels to manage other types of spent fuels present in the UK at significantly lower volumes (for example DFR spent fuel from Dounreay is in a metallic form, enabling its management via the Magnox reprocessing facilities at Sellafield).

A.3.14. NDA closely monitors all aspects of the Oxide and Magnox spent fuel strategies and reviews the delivery of both strategies on at least an annual basis.

A.3.15. NDA is also developing contingency options to ensure that, in case of a shortfall in reprocessing capability, the remaining spent fuel can be stored safely and cost-effectively to the point of disposal. These contingency plans include measures such as:

- consolidation of wet stored fuel into the Fuel Handling Plant pond at Sellafield;
- extended dry storage of fuel within reactors; and
- alternative long-term management options for the relatively small volumes of spent fuel that may remain at the end of reprocessing operations.

### **Advanced Gas-cooled Reactor (AGR) Oxide Spent Fuel**

A.3.16. For Oxide spent fuels, NDA's preferred option is to deliver its responsibilities from historic contracts for the reprocessing of Light Water Reactor and AGR spent fuels as soon as reasonably practicable, and then cease operations at Sellafield's Thermal Oxide Reprocessing Plant (THORP) (Ref. 57). Any remaining AGR fuel, including all future arisings, will be placed into interim storage pending a decision on disposal to the UK's planned GDF. In support of this strategy, the NDA will continue to develop contingency options in the event that the long-term pond storage of AGR fuel is not sustainable or the availability of a disposal facility is delayed beyond the presently anticipated timescales.

A.3.17. Sellafield Ltd proposes to consolidate the storage of AGR fuel at Sellafield into a single water-filled pond, subject to regulatory requirements.

### **Sizewell B Spent PWR Fuel**

A.3.18. Spent civil Pressurised Water Reactor (PWR) fuel arises from the Sizewell B power station on the Suffolk coast.

A.3.19. The spent fuel, once discharged from the reactor core, is presently stored on site at Sizewell B in a water-cooled storage pond. The pond will be filled to capacity during 2015, which would impact on station operations during 2017 if no alternative storage option was available by that date. To mitigate this, a planning consent process and public consultation was initiated in 2009 for construction on the Sizewell B licensed site of an Independent Spent Fuel Storage Installation (ISFSI) – a dry store – sized to accommodate all anticipated spent fuel arisings from the site, including the spent fuel already in the pond.

A.3.20. The Dry Store is expected to be ready for full commissioning by December 2015. The site's fuel inventory will then be progressively switched to dry storage.

A.3.21. Commissioning of the Dry Store will secure the capacity to support an extension of the life of Sizewell B to approximately 2055, subject to the normal plant lifetime extension processes including regulatory permissions. Following the end-of-generation at Sizewell B, the Dry Store is planned to operate until fuel is retrieved beginning in circa 2080, and transported over a 20-year period to the planned GDF.

### **Dounreay Spent Fuels**

A.3.22. Radioactive materials and spent fuels arose from the UK's fast reactor research programme at Dounreay. These materials and fuels require safe and secure long-term management and are owned by NDA. This inventory includes:

- Dounreay Fast Reactor (DFR) breeder material;
- natural and depleted uranic material; and
- nuclear materials and 'exotic' fuels.

A.3.23. The 'exotic' fuels include the following sub-categories:

- unirradiated plutonium bearing fuels consisting of plutonium, mixed uranium and plutonium oxide and mixed uranium and plutonium carbide fuels;
- unirradiated high enriched uranium fuels consisting of uranium oxides, uranium metal, uranium alloy, uranium tetrafluoride, uranium hexafluoride and other miscellaneous enriched uranium fuels; and
- irradiated fuels, comprising oxide and carbide fuel consisting mainly of Prototype Fast Reactor (PFR) fuel and ex-Helios material that was irradiated in experimental work.

A.3.24. NDA has carefully considered the options for management of each of these radioactive materials and spent fuels, in light of the costs that would need to be met at Dounreay in order to achieve safe and secure storage at that site for the long term. NDA published a Credible Options paper for the management of the Dounreay exotic fuels in February 2012 (Ref. 58), followed by a Preferred Options paper in February 2013 (Ref. 59).

A.3.25. NDA's preferred option is to transfer the Dounreay exotic fuels to Sellafield for long-term management, that will be integrated with the larger Sellafield inventory. The baseline strategy for decommissioning the Dounreay site reflects this position.

A.3.26. Work is in progress to ensure that all the required on-site and off-site systems are available to treat, transport and store the Dounreay exotic fuels and safely implement the preferred option.

### **Dounreay Overseas Waste Substitution and Repatriation**

A.3.27. During the late 1980s and early 1990s spent fuel was reprocessed at Dounreay from a range of overseas customers, which included reactors in Belgium, Denmark, Germany, the Netherlands, Spain, France and Australia.

A.3.28. Reprocessing separated the spent fuel into reusable nuclear material and radioactive waste by-products. The re-usable nuclear material was returned to the overseas customers promptly, with a contractual requirement that the radioactive

waste by-products should also be returned to their state of origin within 25 years of reprocessing.

A.3.29. NDA, DECC and the Scottish Government have investigated the possibility of meeting this contractual commitment using a process of waste substitution. Waste substitution involves the actual reprocessing waste by-products being substituted by an equivalent amount of other waste, which may be sourced from elsewhere on the Dounreay site or from another site on the NDA estate. Waste substitution can provide logistical flexibility to NDA and the UK's foreign customers.

A.3.30. The Scottish Government and DECC undertook consultations on the Dounreay waste substitution proposals from 2010 to 2012.

A.3.31. Having considered the responses, in March 2012 the Scottish Government and DECC concluded that waste substitution was an acceptable practice that NDA could adopt in its plans to close out the historic Dounreay reprocessing contracts. Detailed plans and commercial agreements to implement this policy are presently being developed.

#### **Sellafield High Active Liquor Evaporation and Storage Plant Event**

A.3.32. ONR issued cautions to two Sellafield Ltd employees, following a formal regulatory investigation into a contamination event that occurred in December 2013. The investigation revealed that the workers had carried out unauthorised work in violation of Sellafield Ltd's approved safe systems of work, which could have resulted in the exposure of personnel to increased levels of radiation.

A.3.33. The incident occurred in the Highly Active Liquor Evaporation and Storage (HALES) facility. The workers involved were exposed to elevated levels of ionising radiation (though within prescribed limits) and released contamination into an area of the facility not specifically designed to prevent the spread of contamination. This presented a serious health risk to the individuals themselves and other personnel.

A.3.34. ONR concluded the incident was caused solely by the individuals concerned, who had full knowledge of the safety controls that should have been followed. The action was a direct violation of established, well-known and obvious risk control measures and arrangements for working with ionising radiation, implemented by Sellafield Ltd. ONR found no evidence that Sellafield Ltd's systems of work for controlling such activities were deficient. ONR therefore issued a formal caution to the two individuals for failure to discharge the duties on employees in the Health and Safety at Work etc Act 1974.

#### **Sellafield Waste Vitrification Plant Event**

A.3.35. On 27 November 2013, there was a partial loss of power to some facilities on the Sellafield site due to an on-site electrical distribution fault. As a consequence, the ventilation system in the Waste Vitrification Plant Line 3 shut down and radioactive material subsequently migrated from in-cell areas to the plant working areas. The event was investigated by ONR and the Environment Agency and, although no member of staff was contaminated or radioactive material released to the environment, both regulators considered that enforcement action was necessary.

A.3.36. ONR considered that the failure of Sellafield Ltd to have in place adequate containment arrangements on the Waste Vitrification Plant Line 3 warranted enforcement action for breaches of NIA65. ONR consequently issued an Improvement Notice on Sellafield Ltd, requiring the company to improve its arrangements with respect to physical containment barriers and the resilience of ventilation systems. The Environment Agency issued Sellafield Ltd with a warning letter for two breaches of its EPR10 permit.

### **New Evaporator for Highly Active Liquor at Sellafield**

A.3.37. The evaporators within the HALES plant at Sellafield have operated successfully in support of reprocessing activities since the 1950s but are approaching the end of their operational life. To support committed reprocessing and decommissioning activities a new evaporator is being constructed adjacent to the existing facilities. The project is currently in the build phase, with the planned start of operations in 2016.

A.3.38. During 2013, ONR served an Improvement Notice on Sellafield Ltd owing to concerns about the quality assurance arrangements for the project. Sellafield Ltd subsequently provided evidence to demonstrate that the required improvements had been put in place, enabling ONR to close-out the Notice.

### **Repatriation of Vitrified High-level Waste from Sellafield**

A.3.39. Sellafield historically carried out reprocessing of spent fuels for customers from other countries. This activity gave rise to an accumulation of HLW by-products on the site. Return of this waste to Sellafield Ltd's overseas customers is now a routine operation.

### **Sellafield Product and Residue Store**

A.3.40. Since the last UK Joint Convention report, the Sellafield Product and Residue Store (SPRS) has been successfully commissioned and has entered normal operations. SPRS provides a safe and secure storage environment for the plutonium-related products of reprocessing, including plutonium dioxide. SPRS is the latest addition to a range of inter-related facilities at Sellafield and incorporates some of the most advanced nuclear security features ever used in a building of its type.

## **Remaining Challenges**

### **Delivery of Magnox Operating Programme and Oxide Operating Programme**

A.3.41. MOP9 shows reprocessing of Magnox fuel at Sellafield being completed between 2017 and 2020, subject to a range of project risks.

A.3.42. Successful delivery of the MOP is dependent on the availability and adequate performance of plant and infrastructure that is technically complex, is reaching the end of its operational life and features numerous interdependencies. Potential therefore remains for technical developments or unplanned events to interrupt spent fuel transport or reprocessing that may result in delays to the completion of reprocessing in the UK.

A.3.43. Contingency arrangements, which could provide an alternative way forward in the unlikely event of a complete failure of reprocessing, have also been developed. If invoked, these contingencies may result in the wet storage of fuel at Sellafield being consolidated into the Fuel Handling Plant, an extended period of dry storage of spent fuel in reactors, or alternative management options for the relatively small volume of spent fuel that may remain when reprocessing ceases.

A.3.44. Sellafield Ltd and EDF Energy co-ordinate the national movement, storage and reprocessing of spent AGR fuel as part of a second holistic plan, known as the Oxide Operating Programme. Reprocessing of AGR fuel is managed as part of that plan, to support continued receipts of AGR fuel at Sellafield and support EDF's generation capability, and for Sellafield Ltd to achieve its oxide fuel-related contractual obligations. The current version of the plan shows AGR reprocessing continuing until 2018.

### **Plutonium Disposition**

A.3.45. On completion of the UK's planned spent fuel reprocessing operations, there will be around 140 tonnes of civil separated plutonium in storage. The requirement to store the plutonium safely and securely, and to meet international non-proliferation objectives, mean the UK Government has assigned a high priority to

developing a policy to implement a lifecycle solution to put the majority of this plutonium beyond reach.

A.3.46. NDA has carried out technical studies to support DECC's development of UK policy on the management of the country's civil plutonium legacy. In December 2011, the UK Government proposed a preliminary policy of processing the majority of the plutonium into Mixed-Oxide (MOX) fuel for use in civil nuclear power reactors, with any remaining plutonium that could not be converted into MOX being immobilised and treated as waste for disposal. The UK Government also stated that it was open to proposals for alternative strategies for plutonium management, if such proposals could offer better value for money.

A.3.47. The UK Government concluded that overseas-owned plutonium held in the UK as a result of historic contracts could be managed alongside UK plutonium, or title could be transferred to the UK subject to acceptable commercial terms being agreed. Given the developmental nature of long-term government policy, in the near term the plutonium is being stored safely and securely, with stocks consolidated at Sellafield.

A.3.48. In January 2014, NDA provided an update on its work (Ref. 60), including:

- a review of the 'reuse as MOX fuel' option;
- a position on alternative reuse proposals (in CANDU/PRISM reactors); and
- an assessment of direct disposal options.

A.3.49. NDA concluded that three reuse options were credible, ie reuse as MOX in light water reactors, reuse in CANDU EC6 reactors and reuse in the Hitachi-GE PRISM fast reactor.

A.3.50. NDA is continuing its work with reactor vendors, suppliers, utilities and the Government to consider each of these options with the aim of developing a competitive process and securing the best outcome.

### **Uranics**

A.3.51. NDA owns a range of materials containing uranium (termed 'uranics') arising from fuel cycle operations. A wide variety of uranics are being stored safely and securely on a number of NDA-owned sites. The Energy Act 2004 required NDA to develop a strategy to safely and securely manage uranics in the most practical and cost-effective way.

A.3.52. In 2014, NDA published a summary of its progress. Under its strategy management system, NDA is assessing high-level credible options for the management of uranics. These are: continued storage; recycle; or disposal. NDA's assessment considered these options against criteria such as; cost, safety, security, environment and socio-economics, as defined in NDA's value framework. Given the variety of different types of uranics, NDA anticipates that no single strategic option will be suitable for the entire uranics inventory.

## **Management of Radioactive Wastes**

### **New Developments and Progress**

#### **Integrated Waste Strategies**

A.3.53. The UK Government, regulators and NDA promote adoption of the waste management hierarchy and best waste management practices through the development of Integrated Waste Strategies.

A.3.54. The Environment Agency, through requirements attached to environmental permits on the sites in England, requires nuclear operators to manage their wastes in a properly integrated manner. Operators are required to demonstrate strategic planning for the management of all their wastes (both radioactive and non-

radioactive) in an integrated manner that addresses all relevant statutory, policy and regulatory requirements. The approach must take into account current and future waste arisings, including the management of radioactive material that will become waste in the future, and the radiological and non-radiological properties. Operators should thereby maintain a strategic oversight of how they intend to manage the generation and disposal of waste over the entire lifetime of the facility.

A.3.55. Nuclear site licensees on the sites owned by NDA are contractually required to produce an Integrated Waste Strategy to a Specification published by NDA. NDA published an updated Specification in March 2013, following extensive consultation with the regulators and industry (Ref. 61).

A.3.56. The updated Specification promotes a more open and transparent description of how waste is managed, to secure improvements in treatment and disposal routes and encourage more effective ways of working. The Specification emphasises the importance of the waste hierarchy, as supported by the European Waste Directive and UK government policy, and aims to increase levels of recycling and reuse, with disposal as the option of last resort.

A.3.57. The Specification also provides a benchmark of good practice that has proven useful to site licensees outside the NDA estate.

A.3.58. There has been a positive early response to the updated Specification from licensees. The UK regulators, licensees and NDA will jointly monitor the effectiveness of the Specification in facilitating the desired improvements in waste management practices. ONR has produced targeted guidance for its inspectors, to assist in the process of regulatory assessment and inspection of the robustness of licensees' Integrated Waste Strategies.

#### **Joint ONR, Environment Agency and SEPA Guidance on the Management of Higher Activity Wastes and Radioactive Waste Management Cases (RWMCs)**

A.3.59. ONR, the Environment Agency and SEPA jointly published guidance for nuclear site licensees on the management of HAW in February 2010. The guidance consisted of an overview with six detailed technical modules covering: the regulatory process; RWMCs; waste minimisation, characterisation and segregation; conditioning and disposability; and storage and managing information and records.

A.3.60. The regulators are in the process of reviewing the Joint Guidance to take account of feedback from industry following its initial practical use. Revised versions of the guidance documents will be published later in 2014.

#### **Regulatory Review of Geological Disposal Facility Generic Disposal System Safety Case (gDSSC)**

A.3.61. RWM published a gDSSC in early 2011 as part of its responsibilities to implement a solution for the geological disposal of HAW. The gDSSC was termed 'generic' because at the time of its publication no site had been selected for development of a GDF, therefore the safety case did not focus on the specific circumstances of any particular location. Instead, the gDSSC included generic environmental, operational and transport safety cases, considering a range of potential geological settings and disposal facility designs.

A.3.62. A safety case must be prepared that meets regulatory requirements before a permit or licence can be granted for construction of a GDF. RWM was not seeking a permit or licence at this stage, but sought advice from ONR and the Environment Agency. ONR and the Environment Agency concluded that the gDSSC provided confidence, to the degree appropriate at this early stage, that a safety case for a GDF in the UK could be made providing a suitable site is available. The regulatory review was published in December 2011 (Ref. 62).

### **Sellafield Highly-Active Liquor Stocks**

A.3.63. Highly-Active Liquor (HAL) is a HLW by-product derived from the reprocessing of spent Magnox fuel and spent Oxide fuel at Sellafield. HAL is safely managed within purpose-designed vessels within the High Active Liquor Evaporation and Storage (HALES) plant, then processed into a stable solid form in the Sellafield Vitrification plants.

A.3.64. Reduction of the hazardous inventory of stored HAL has been the subject of Specifications from Sellafield's safety regulator (firstly HSE, then ONR) since 2001. The two key aims of the Specifications are:

- to ensure HAL stocks at Sellafield are reduced to a reasonably practicable minimum; and
- to ensure the licensee continues to reduce hazards across the Sellafield site, associated with both the HAL and the spent fuels being held in storage ponds awaiting reprocessing.

A.3.65. The initial regulatory strategy was to specify a limit, which reduced over time, on the total quantity of HAL that could be stored in HALES.

A.3.66. HSE and ONR have periodically reviewed and updated the regulatory approach to Sellafield HAL stocks, to ensure the Specification reflects modern operational practices and enables the above two objectives to be secured on an ongoing basis.

A.3.67. In 2011, ONR made two revisions to the specification (Ref. 63):

- The original specification limit on the overall stored volume of HAL was replaced by a new limit on the mass of uranium in the unprocessed fuel from which the stored HAL was generated. While the overall volume limit had proven effective in driving a reduction in the HAL inventory, it had unintended impacts on some operational practices in HALES. The new format of limit better reflected the HAL's true hazard and was an improvement in terms of overall safety when compared to the previous volume limit.
- ONR also revised the Specified long-term steady-state limit to enable reprocessing and vitrification to continue at optimum rates, therefore minimising the accumulation of spent fuel held in ponds and enabling the conversion of HAL into a vitrified form suitable for long-term storage.

A.3.68. A proposal to build new Highly-Active Storage Tanks at Sellafield has been terminated following a review of the implications of the decision to bring reprocessing to an orderly close.

A.3.69. ONR continues to closely monitor the performance of Sellafield Ltd in managing the HAL stocks and to keep the fitness-for-purpose of the HAL Specification under regular review.

### **ONR and Environment Agency Inspections of Sellafield Ltd's Arrangements for the Management of Solid Radioactive Wastes**

A.3.70. In 2010 and 2011, joint nuclear safety and environment regulatory team inspections were carried out on facilities for management of solid wastes at Sellafield. The inspections undertaken were:

- Plutonium-Contaminated Material (PCM);
- LLW;
- ILW; and
- overall solid waste strategy.

A.3.71. These inspections formed part of an overarching regulatory intervention programme at Sellafield on the management and storage of solid radioactive wastes. The inspections found that Sellafield Ltd had adequately met all relevant legal requirements, but there were a number of areas for improvement. Following the inspections, the regulators reviewed evidence submitted by Sellafield Ltd to address the recommendations of a previous relevant inspection in 2006 and closed out all but one recommendation, relating to waste management records.

A.3.72. Sellafield Ltd has made good progress in addressing the 2010/11 inspection findings, closing out five of the recommendations that related to: waste inventory; waste management training; asset care; waste management strategy; and on-site transport of wastes. A recommendation on waste management records is still open, however Sellafield Ltd is making progress with the development of an ILW records management strategy and are expected to be able to close out the recommendation during 2014.

#### **Isolation of Leak Paths in Sellafield First Generation Magnox Storage Pond**

A.3.73. Sellafield Ltd has completed the work reported in the fourth UK Joint Convention report to isolate some significant leak paths in the first generation Magnox storage pond civil structure. The teams had to work in a radiologically challenging environment and demonstrated that the repairs and isolations were effective and implemented safely.

#### **Windscale AGR Core and Pressure Vessel Removal**

A.3.74. Work on the Windscale AGR decommissioning project has progressed in line with the expectations detailed in the fourth UK Joint Convention report. The principal radiological hazards associated with the historic Windscale AGR have been removed from the facility, which has now entered an extended period of care and maintenance.

#### **Ductile Cast Iron Containers**

A.3.75. Magnox Ltd has further developed its strategy for the management of HAW on its shut-down power stations using Ductile Cast Iron Containers (DCICs) for interim on-site storage prior to disposal in the UK's proposed GDF. The process of demonstrating the disposability of HAW within DCICs has been prolonged and difficult, although recently Magnox Ltd has progressed the resolution of key technical issues, such as impact performance, gas generation and fire performance.

A.3.76. ONR and the Environment Agency have agreed to the conditioning of HAW in a small number of DCICs at two Magnox Ltd sites in England (Bradwell and Berkeley), to allow Magnox Ltd to gain experience and data in support of its strategy.

A.3.77. Magnox Ltd obtained a Conceptual Letter of Compliance (LoC) from RWM in July 2011 for packaging in DCICs of the majority of the types of HAW expected to arise during power station care and maintenance preparations. The LoC process contains stages of assessment and is designed to provide confidence that the conditioned waste will meet the envisaged acceptance criteria of the planned GDF.

A.3.78. Although Magnox Ltd has yet to secure any Interim or Final Stage LoCs, work is progressing and RWM assessments are nearing completion for the lead waste streams. The regulators are continuing to engage with both Magnox Ltd and RWM on matters relating to long-term interim storage and demonstration of disposability of DCICs.

A.3.79. EDF has conditioned and packaged spent ILW ion exchange resin into DCICs for interim storage at Sizewell B. This may become the final disposal packaging depending on progress of the required LoCs from RWM. Before progressing this management strategy EDF had to demonstrate the resins could be retrieved from the DCICs, if required, as a contingency arrangement.

### **Prosecution of Sellafield Ltd for Incorrect Consignment of LLW**

A.3.80. An incident involving wrongful consignment of LLW from Sellafield Ltd to the Lillyhall landfill site in Cumbria, a facility not authorised to receive such material, was reported in the last UK Joint Convention report. At the time of the Fourth Joint Convention Review Meeting the event was under investigation by the UK regulators.

A.3.81. The Environment Agency and ONR have since jointly prosecuted Sellafield Ltd for the event. The prosecution took place in June 2013 and involved breaches of Sellafield Ltd's EPR10 Environmental Permit and the Transport Regulations. Sellafield Ltd was fined £700,000 and ordered to pay £72,635 in costs at Carlisle Crown Court. The regulators' decision to prosecute Sellafield Ltd reflected their joint expectation that the company, as operator of a major nuclear site, must meet the required high standards for protection of people and the environment.

A.3.82. Subsequently, Sellafield Ltd appealed against the fine imposed by the Crown Court. In January 2014, the Court of Appeal rejected Sellafield Ltd's plea that the fine was manifestly excessive and upheld the fine. The Court noted that the nature of the company's activities carried potentially grave risks and the public rightly expected strict compliance with the standards set at national and international level.

### **Increased Diversity of Routes for LLW Disposal**

A.3.83. Since 2007, UK Government policy has been that certain types of LLW from the nuclear industry can be disposed of at suitably permitted landfill sites. This approach enables the limited capacity of the LLWR to be prioritised for disposal of those wastes that require the level of engineered protection the LLWR offers.

A.3.84. The Environment Agency has since permitted three landfill operators to accept LLW or VLLW from the nuclear industry in England for disposal. These sites are: a non-hazardous household and asbestos landfill site in Cumbria; a hazardous waste landfill site in Northamptonshire; and a non-hazardous and asbestos waste site in Lancashire. The availability of these sites for disposal of radioactive wastes from the nuclear industry since 2011 has allowed a significant diversion of radioactive waste away from disposal to the limited capacity of the LLWR.

### **Management of Radioactive Sources**

A.3.85. Overall, there is effective and robust management of radioactive sources in the UK. Compliance of source holders with the requirements of relevant legislation, including the EC HASS directive and IRR99, is being assured through the oversight of ONR and the UK environmental regulators.

A.3.86. Most HASS are held and used under permit or registration (i.e. authorisations), obtained from the relevant environmental agency (the Environment Agency, SEPA, NRW or NIEA in the different nations of the UK). The system of proactive authorisations provides stringent conditions on the use, storage, movements, security and ultimate disposal of HASS and provides for robust regulatory oversight and control. A large number of permits/registrations, of the order of many thousands, are extant. Compliance with the conditions of these authorisations is routinely confirmed through inspection activities by the environmental regulators.

A.3.87. Fixed HASS kept or used by licensees on nuclear licensed sites are regulated by ONR within the framework for nuclear safety and security, provided principally through NIA65 and IRR99. The general safety of HASS has been assured through routine site inspection activities, and some targeted inspections to specifically assess site compliance against IRR99 and requirements for source management. There have been no notable incidents, such as loss of control or over-exposures, with sources on nuclear sites over the period covered by this report. ONR is maintaining robust records of HASS on nuclear licensed sites and this information is readily available to inform inspection and other regulatory activities.

A.3.88. Further details of the UK legislative framework relevant to the management of radioactive sources are provided in paragraphs E.53 to E.60. A fuller description of the UK's approach to the management of disused sources is provided in Section J.

#### **Calder Landfill Extension Segregated Area**

A.3.89. The Calder Landfill Extension Segregated Area is an engineered landfill on the Sellafield site used to dispose of high-volume VLLW, which mainly consists of soil and rubble from demolition and construction projects on the site with a small amount of organic waste. This site is now fully permitted by the Environment Agency and should provide capacity for the expected arisings until 2026.

#### **Dounreay LLW Disposal Facility**

A.3.90. A facility for authorised disposal of solid LLW on the Dounreay licensed site was closed in 2005. All arisings of LLW at Dounreay since that date have been placed in interim storage on the site. In 2009, the SLC, DSRL, received planning permission from Highland Council for a new near-surface disposal facility for solid LLW, local to the site but outside the licensed nuclear site boundary. Construction of the first vault began in December 2011 and was completed by spring 2014.

A.3.91. In November 2010, SEPA received an updated application under RSA93 from DSRL for an authorisation to dispose of solid LLW in the proposed new disposal facilities. SEPA undertook a formal determination process that involved a review and assessment of the application against all applicable legislation, policy and guidance. Following this determination process, SEPA issued a disposal authorisation in January 2013.

A.3.92. The new facility is expected to receive its first conditioned LLW for disposal in the summer of 2014, subject to SEPA's agreement that the required operational management systems are in place. This aligns with the commissioning schedule for a new LLW Encapsulation Plant located on the licensed site, which will be used to condition and package the LLW prior to its disposal.

#### **De-Conversion of Uranium Hexafluoride Tails at Capenhurst**

A.3.93. Due to a number of future uncertainties and a need to continue operating its UK enrichment sites for the foreseeable future, URENCO Ltd decided to develop its own facility for managing UF<sub>6</sub> tails and created a dedicated subsidiary – URENCO Chem Plants Ltd (UCP) to achieve this.

A.3.94. UCP will operate a UF<sub>6</sub> Tails De-conversion Plant, to de-convert Uranium Hexafluoride to Uranium Oxide (U<sub>3</sub>O<sub>8</sub>). The plant requires supporting facilities to: receive full Type 48 cylinders of UF<sub>6</sub>; store the resultant U<sub>3</sub>O<sub>8</sub>; wash and recertify the used Type 48 cylinders; maintain and decontaminate the facilities; and treat the solid and liquid arisings to recover uranium from effluent streams. Together these facilities comprise the UCP Tails Management Facility.

A.3.95. Construction of the UCP Tails Management Facility commenced in January 2012 and is now well advanced. Operations are scheduled to begin in 2016.

## **Challenges**

#### **Revised ONR Regulatory Strategy at Sellafield**

A.3.96. Sellafield ranks as one of Europe's largest industrial complexes. Given the large radioactive waste inventory on the site and the age and fragility of many of the facilities, the possible consequences of a serious accident would be extremely damaging for Cumbria and the rest of the UK, with long-term repercussions potentially extending to Europe. While there has been some success over past years, projects to deliver hazard and risk reduction on the site have generally not progressed adequately.

A.3.97. While responsibility for hazard and risk reduction rests with Sellafield Ltd, ONR has revised its regulatory strategy for the site in order to address the lack of

progress with the projects intended to deliver hazard reduction. The new strategy has five strands:

- Prioritisation – ensuring all relevant stakeholders share the same list of priorities for delivery in terms of hazard and risk reduction at Sellafield.
- Removal of barriers to progress – minimising unnecessary bureaucracy and working practices on site and streamlining processes to enable delivery.
- Avoidance of distractions and diversions – providing a focus on the key areas needing improvement rather than low-level improvements which can significantly add to the workload.
- Incentivisation – creation of an environment that encourages positive behaviours in terms of hazard and risk reduction.
- Fit-for-purpose solutions – avoidance of overly complex designs and processes and favour simplicity and practicality.

A.3.98. Once approved by the ONR Board, the Sellafield Programme management team engaged with key stakeholders to publicise the strategy and held a high-level strategic workshop involving Sellafield Limited, NDA, the Environment Agency and DECC. Membership of this group was subsequently extended to include the Shareholder Executive and became known as the 'G6'.

A.3.99. It was readily apparent that there was clear alignment between stakeholders, with a common purpose identified – to 'accelerate the hazard and risk reduction at Sellafield'. The 5 strategic themes proposed in the ONR strategy were extended to ensure effective use of resources and communications, with the common purpose signed up to by all parties.

A.3.100. As well as engaging at a strategic level, the G6 created a tactical subgroup made up from representatives of each organisation, which identified a number of key projects as priorities for achieving hazard and risk reduction as well as serving as case studies to demonstrate new ways of working.

A.3.101. Some of the projects under the auspices of the G6 have already led to the remediation of hazardous material from legacy facilities to more robust buildings. Hence, the collaborative approach taken by the G6 is having a positive impact in reducing hazard and risk at some of the highest profile facilities at Sellafield.

### **Waste Graphite**

A.3.102. In January 2014, NDA published a strategic position paper on the Management of Waste Graphite along with two supporting strategic options papers that were consistent with the NDA's strategy (Refs. 64, 65 and 66). The position paper summarised a number of tasks to better understand the challenges of managing radioactive graphite.

A.3.103. Operational graphite wastes included in the strategic study are:

- Magnox fuel sleeves at Hunterston A;
- AGR fuel sleeves at Sellafield; and
- Berkeley Fuel Element Debris (an example of mixed waste).

A.3.104. In terms of waste graphite from reactor decommissioning, the strategic study focused on Magnox reactors in the NDA estate, but also took account of graphite from the AGRs owned by EDF and research reactors at RSRL and DSRL.

A.3.105. NDA's work has demonstrated, through identification and evaluation of a number of alternative options, that the management of graphite waste by geological disposal provides a robust baseline strategy suitable for planning purposes. The extended period of quiescence that reactors are scheduled to undergo in decommissioning implies there is sufficient time for alternative options to develop,

such that any future decisions on the management of radioactive graphite waste will be appropriately informed. In addition, NDA has identified factors that would drive a review of this strategy, for example a change in site restoration logic.

A.3.106. NDA has also continued to support the Scottish Government in strategy implementation work, based on the principle of near-surface near-site, long-term management of graphite wastes.

### **Regulatory Inspections of Fuel Storage Ponds in England**

A.3.107. In 2012/13 the Environment Agency, supported by ONR, led themed inspections of spent fuel ponds on nuclear licensed sites in England to benchmark environmental aspects of those facilities and their management against good practice, informed by international guidance.

A.3.108. The inspections highlighted that in the majority of cases for each environmental aspect studied there was general alignment with good practice, albeit several of the fuel ponds feature inherent limitations due to their design and/or ageing effects, which reflected the length of time they had been in operation.

A.3.109. Good progress had been made to improve technical standards for managing pond water quality and implementing documented management systems. Innovations being applied as part of continuous environmental improvement were also worthy of note. However, the themed inspections highlighted that the application of good practice is not uniform on a national level, nor does it necessarily reflect the design age of the specific fuel pond. Recommendations were made to address these matters in order to improve overall practices and the industry's progress in implementing the identified improvements is being monitored.

### **Sellafield Beach Monitoring**

A.3.110. The Environment Agency requires Sellafield Ltd to monitor local beaches for small radioactive objects and particles. Beach monitoring for particles at Sellafield has been carried out since the 1980s. Following successful trials using vehicle-mounted radiation detection equipment in 2007, the programme was extended during 2011 to include seabed grab sampling.

A.3.111. Beach and subsea monitoring has continued broadly in line with the declared programme, although is vulnerable to extreme weather events. Find rates are largely unchanged.

A.3.112. The Environment Agency commissioned the Health Protection Agency (now Public Health England) to provide data on the potential health implications for the public in April 2011 (Refs. 67 and 68). This advice was updated in 2012 as a result of the use of an improved monitoring system (Refs. 69 and 70). Data gathered to date indicates that risks are very low and the Health Protection Agency's previous advice that no special precautionary actions are required to limit access to or use of the beaches remains valid.

A.3.113. Future plans for this work, results obtained, and implications are routine matters considered in open forum at the West Cumbria Sites Stakeholder Group and reported on its website (see Annex L4).

### **Dounreay Beach Monitoring**

A.3.114. Monitoring of a number of publicly accessible beaches near Dounreay is carried out routinely to check for the presence of fragments of irradiated fuel.

A.3.115. Between 2009 and 2013, fuel fragments were detected only on the Dounreay foreshore and Sandside beach. From 2008 to 2012, DSRL carried out a programme of monitoring of the seabed off the Dounreay foreshore in an attempt to identify and recover irradiated nuclear fuel fragments before they were mobilised onto beaches. This programme aimed to cover 60 hectares of the seabed and was completed with some areas being covered more than once, resulting in total coverage of 90 hectares and the recovery of 2,184 fragments of irradiated fuel. The

data generated from both the beach monitoring and the offshore recovery programme has been provided to the independent Particles Recovery Advisory Group (Dounreay) and the site regulators. Further details can be found on the SEPA website.

A.3.116. Analysis of all the monitoring and recovery work carried out to date allowed the Advisory Group and regulators to determine future requirements for beach monitoring. On the granting of a new site authorisation for the disposal of radioactive wastes, SEPA has indicated that the beach monitoring programme will concentrate on the two beaches most affected – Sandside and the Dounreay foreshore. Two additional beaches, one to the west and one to east of the site, will additionally be monitored twice a year to ensure that the current understanding of the extent of potentially mobile irradiated nuclear fuel fragments remains valid.

### **Review of HAW Interim Storage Arrangements**

A.3.117. As nuclear clean-up in the UK progresses, increased volumes of packaged HAW will need to be held within interim storage facilities awaiting availability of the GDF. In response to reviews of the UK interim storage arrangements for HAW undertaken by NDA and CoRWM in 2009, NDA set up a cross-industry Integrated Project Team (IPT). The IPT was made responsible for delivering industry guidance on storage arrangements for packaged HAW. The IPT addressed key issues such as: waste package performance; store longevity; monitoring and inspection regimes; and store maintenance and refurbishment.

A.3.118. The guidance was published in November 2012 (Ref. 71 and 72) having been developed by representatives from all the NDA's site licence companies, RWM, EDF, the MoD, AWE and supply chain organisations through NDA's Direct Research Portfolio. The regulators and CoRWM observed the development of the guidance and attended workshops.

A.3.119. The advised approach to achieving robust interim storage of HAW was based on the following key steps:

- Retrieval of HAW from historic storage facilities, followed by waste conditioning and packaging. Ideally, the manner of conditioning and packaging should be compatible with the intended final disposal route. Where necessary (eg to eliminate uncertainties in the waste properties), conditioning and packaging can be approached in a number of steps.
- Identify the key issues and risks associated with storage of the packaged wastes and ensure mitigative measures are in place to address those issues and risks.
- Understand the key strategic decision points and their impact on the interim storage programme, including availability of the proposed GDF and store lifetimes.
- Ensuring waste transport is an integral part of the interim storage programme.
- Adoption of a flexible approach to waste management that can accommodate various disposal timeframes, waste volumes and packaging concepts.

### **Radioactive Items Detected at UK Borders**

A.3.120. Programme Cyclamen is a joint initiative between the UK Borders Agency and the Home Office. Its purpose is to detect, deter and intercept the covert importation of radioactive materials into the UK that are intended for criminal or terrorist activities. Programme Cyclamen consists of fixed portals installed at selected points of entry into the UK, complemented by a fleet of mobile radiation detection units (MRDUs) that can be flexibly deployed on an intelligence-led basis. The UK

Border Agency has also funded the installation of a Cyclamen detection system at the Coquelles terminal in France.

A.3.121. Screening for the presence of radioactive materials is now carried out as a matter of routine for significant volumes of imported sea and rail traffic, including containers, freight, vehicles, and passengers. If an alarm is triggered, handheld devices can be used to further investigate the source of radioactivity and type of radiation present.

A.3.122. While the key driver for Programme Cyclamen has been a matter of national security, the UK has experienced a significant number of events featuring the discovery at UK borders of radioactive material within metallic items, including consumer goods. The majority of cases have concerned steel items featuring the presence of Co-60 that the consignor was not aware of. Typical doses to UK border workers from handling these packages are a few  $\mu\text{Sv}$ , with postulated doses of below 1mSv/y if the items had been distributed into the UK public domain (Ref. 73), albeit a small number of events have involved items with more significant levels of radioactivity.

A.3.123. Wherever practicable, the UK has returned the discovered contaminated items to the consignor. In some cases, onward distribution in the UK has been allowed to proceed, where the discovered radioactivity was below the exemption levels prescribed in UK environmental legislation. In cases where neither of these approaches was feasible, the UK authorities have faced the challenge of managing the contaminated items as radioactive wastes, in order to secure their safe disposal in a manner that protects human health and the environment.

## 4 Feedback from the Fourth Joint Convention Review Meeting

A.4.1. Following the Fourth Joint Convention Review Meeting held in Vienna in May 2012, the President's Report, Summary Report the UK's Fourth National Report and the country group Rapporteur's Report identified several challenges faced by the UK and other Contracting Parties.

A.4.2. The UK Country Group Rapporteur summarised planned measures to improve safety that were identified during the UK presentation. Where appropriate, progress on each of these matters has been summarised within this report. The key issues, as identified by the Rapporteur, are summarised below.

### Rapporteur's Report – Planned UK Measures

#### Construction of an Independent Spent Fuel Storage Installation at Sizewell B

- EDF has commenced construction of the ISFSI, commissioning of which is expected to begin in 2015. Once the ISFSI is operational, EDF intends to place the entirety of Sizewell B's inventory of spent fuel into dry storage, including fuel from the station's historic operations presently held in a pre-existing pond on the site. EDF intends the ISFSI will operate until such time as a GDF is available to facilitate disposal of the spent Sizewell B fuel. Further details are provided in paragraphs A.3.18 to A.3.21.

#### Implementation of Strategy for Radioactive Discharges

- The UK's extant Strategy for Radioactive Discharges was published in 2009 (Ref. 74) and covers the period to 2030. The strategy describes how the UK implements the agreements reached at the 1998 OSPAR ministerial meeting, and subsequent OSPAR meetings on radioactive substances, particularly the Radioactive Substances Strategy (RSS). The Convention requires discharges of radioactive substances to the North East Atlantic to be subject to progressive and substantial reduction, such that by 2020 concentrations of artificial radioactive substances in the marine environment are close to zero in comparison to historical levels.

UK discharges are dominated by arisings from fuel reprocessing at Sellafield. Since 2000, there have been considerable reductions in the discharges arising from reprocessing, including diversion of the technetium-99 isotope into a waste stream for vitrification.

Discharges to air and water remain low when compared with historic levels, with several sub-sectors of the nuclear industry in England and Wales already achieving their 2020 targets.

If reprocessing performance rates continue at recent averages, reprocessing in the UK will be completed by around 2020. NDA is keeping under review delivery of the MOP, including potential implications should reprocessing need to continue for an extended period. Preliminary analysis indicates that the dissolution of fuel up to 2020 is unlikely to result in discharges to the environment that are outside the obligations set out in the UK Strategy for Radioactive Discharges.

A commitment was given in 2009 to review the strategy about every five years. The scope of the first such review will be agreed during 2015.

#### Completion of the Magnox Operating Plan by 2017

- With the exception of Reactor 1 at Wylfa (which is scheduled to operate until September 2014) all the UK's Magnox reactors had ceased their operational life by the cut-off date for this report of April 2014. Significant progress has been made with removal of spent fuel from the shut-down Magnox reactors, with

defuelling currently in progress at Calder Hall and Oldbury. The latest version of MOP shows reprocessing of Magnox fuel at Sellafield being completed sometime between 2017 and 2020, dependent on a possible extension in the life of Wylfa Reactor 1 until December 2015 and the impact of project risks. Further details are provided in paragraphs A.3.41 to A.3.43 and Annex L1.

**Implement Actions from the Fukushima Lessons Learnt Reports**

- The UK carefully considered implications from the Fukushima accident for its nuclear industry, documented the findings in a suite of published reports and has closely monitored progress in implementing the identified actions. These include the Chief Inspector’s report (September 2011), Stress Tests for UK nuclear power plant (December 2011), Stress Tests for UK non-power generating nuclear plants (May 2012) and National Action Plan (December 2012). Further details are provided in paragraphs A.2.70 to A.2.83.

The National Action Plan included a commitment that the UK nuclear industry would implement the most significant improvements arising from lessons learnt from Fukushima by the end of 2014. Many practical enhancements have been made and no major improvements are outstanding. However, some relevant projects require an ongoing focus due to their long-term nature that, by necessity, will take several years to deliver in their entirety. Updates have been provided in ONR Chief Nuclear Inspector’s reports and ONR Annual Reports.

ONR will continue to monitor and assess the progress made by the UK industry on the longer-term Fukushima-related projects until it is satisfied that all significant lessons learnt have been adequately discharged and will, if necessary, use its regulatory powers to ensure that all reasonably practicable improvements are implemented.

A.4.3. The President of the 2012 review meeting identified nine topics of mutual interest to Contracting Parties and encouraged Contracting Parties to address these in their reports to the Fifth Joint Convention Review Meeting. The table below indicates how the UK has addressed these topics.

**President’s Report**

**Interface between safety and security in spent fuel management**

- The purpose of the Nuclear Industries Security Regulations 2003 is to ensure effective security protection of:
  - licensed nuclear sites;
  - nuclear material held on other nuclear premises or in the course of transport;
  - construction of new nuclear sites adjoining existing operating nuclear sites;
  - sensitive nuclear information; and
  - uranium enrichment equipment/software held by the civil nuclear industry.

These regulations are enforced by the Civil Nuclear Security (CNS) Programme of ONR.

Creation of ONR amalgamated the regulation of nuclear safety and the regulation of nuclear security into a single organisation. In order to facilitate a collaborative approach across the two disciplines, ONR’s CNS programme reviewed its technical security guidance to industry with the purpose of promoting a goal-setting and performance-measurement approach to security regulation, aligned with the established philosophies applied to safety regulation.

ONR’s regulatory business is subject to an integrated change programme, the purpose of which is to synergise safety and security regulation between

industry and the regulator. A key driver is the Strategic Defence and Security Review, which identified the need to deliver security and resilience of infrastructure, including nuclear facilities, against attack, damage or destruction.

The UK annual report on the state of security in the nuclear industry has been amalgamated into the ONR annual report.

An area where collaboration between safety and security has been most apparent is the joint review of computer-based systems important to nuclear safety. While ONR's specialist safety inspectors identify and categorise these systems in terms of their contribution to maintaining adequate levels of risk, ONR's security inspectors ensure the relevant arrangements are robust against cyber attack, manipulation, falsification and sabotage.

#### **Post-Fukushima impacts to spent fuel storage facilities**

- The implications of lessons learnt from the Fukushima accident for the UK's spent fuel storage facilities have been closely analysed as an integral part of the industry-wide initiatives described in paragraphs A.2.70 to A.2.83. Practical measures for spent fuel storage facilities have included:
  - improved understanding and reasonably practicable improvements to the robustness of cooling ponds to beyond design basis failures involving external hazards;
  - mitigation of the potential for floodwater entry into buildings;
  - increased stocks of essential supplies, including cooling water;
  - increased redundancy in electrical supplies to essential equipment including provision of standalone generator systems; and
  - enhancements to arrangements for dry storage of fuel to increase their resilience to water entry.

#### **Communication with the general public**

- The UK Government is committed to the principles of openness and transparency as part of an effective and prosperous democracy and has made major contributions to several top-level international forums and initiatives on these topics, such as the Open Government Partnership.

The UK recognises that effective communications with the public are fundamentally important in general terms and in particular to support the reputation and credibility of the UK nuclear industry and those who regulate it. The UK approach features several pieces of legislation that require nuclear operators, NDA and regulators to provide the public with information on particular aspects of their activities. Aspects of relevance to the Joint Convention are explained under the appropriate Articles in this report and include:

- The Energy Act 2004 places extensive obligations on NDA to consult the public with regard to its strategy and undertakings;
- EPR10 and RSA93 require the UK's environmental regulators to publish data on their activities and undertake formal consultations on major regulatory decisions;
- The Energy Act 2013 requires ONR to publish strategic level data on its regulatory activities;
- EIADRR requires public consultation prior to ONR granting consent for decommissioning projects at nuclear power stations;
- REPIIR deals with information that should be provided to affected members of the public in the unlikely event of a nuclear emergency.

Furthermore, the Freedom of Information Act 2000, the Environment Information Regulations 2004, the Freedom of Information (Scotland) Act 2002 and the Environmental Information (Scotland) Regulations 2004, provide members of the public with the right to request information from public sector

organisations (subject to the requirements of national security and commercial sensitivity), including all the regulators of the UK nuclear industry and NDA.

### **Funding for spent fuel and radioactive waste management**

- The producers and owners of radioactive waste are responsible for bearing the cost of managing and disposing of the wastes their activities generate.

NDA is responsible for managing the effective and efficient clean-up of the majority of the UK civil nuclear legacy. DECC and HM Treasury set NDA's budget, which is a combination of direct finance from government and income generated from commercial activities on the sites NDA owns. NDA has greatly improved the state of knowledge of the liabilities on its sites, in order to improve the robustness of its short-term plans and better describe the remaining uncertainties over the longer term.

Restructuring of British Energy in 2005 created a new independent funding mechanism for the UK's AGR power stations and Sizewell B: the Nuclear Liabilities Fund (NLF). The current owner of those sites, EDF, is obliged to make a schedule of regular payments into the NLF. The NLF then disburses its funds back to EDF in a controlled manner, for use solely in discharging the qualifying liabilities.

The Energy Act 2008 required the operators of proposed new nuclear power stations to have approval from the Secretary of State for Energy and Climate Change for a Funded Decommissioning Programme (FDP) before commencing nuclear-related construction. The operator must comply with the FDP thereafter. The FDP ensures that the operator makes secure arrangements to meet the full costs of decommissioning and their full share of waste management and disposal costs. Any failure to comply with an approved FDP would be a criminal offence.

The independent Nuclear Liabilities Financing Assurance Board (NLFAB) provides impartial scrutiny and advice to the Secretary of State on the suitability of FDPs submitted by prospective operators of new nuclear power stations. In addition to advising on the approval or otherwise of submitted FDPs, the NLFAB also provides advice to the Secretary of State from regular reviews and ongoing scrutiny of the associated funding arrangements. Further details can be found in paragraphs B.49 to B.57.

### **Resolution of spent fuel management policy and scheme**

- The UK policy for the management of spent fuel is described in paragraphs B.3 to B.11.

Successful delivery of this policy is dependent in the first instance on completion of the Magnox Operating Programme by NDA and its SLCs, which is intended to secure safe defuelling of the UK's Magnox power stations and reprocessing of all the UK's Magnox spent fuel by around 2020.

The UK's seven AGR power stations, and the single existing civil PWR power station, utilise fuels that have enhanced long-term physical and chemical stability when compared with Magnox fuel – this underpins the feasibility of a broader range of management options for spent AGR and PWR fuels, which may or may not include reprocessing.

The 2008 White Paper, *'Meeting the Energy Challenge'* stated that any new nuclear power stations that might be built in England and Wales should proceed on the basis that the resulting spent fuel will not be reprocessed and that plans for, and financing of, radioactive waste management should proceed on that basis. Technical underpinning of the disposability of the spent fuel expected to arise from new power stations is being examined as part of the GDA process.

### **Human resources development against shortage of man power**

- Skill gaps have been projected for the UK nuclear industry. The UK Government is working closely with Cogent, the National Skills Academy for Nuclear (NSA Nuclear) and industry to ensure the UK has a clear, jointly shared understanding of the key skills priorities for the nuclear sector and how those priorities can be met.

NSA Nuclear was set up in January 2008 specifically to develop the capability of the UK nuclear workforce. By working with existing training providers across the UK, it now provides more than 1,000 apprenticeships and 150 foundation degrees in the sector.

In addition, NDA has obligations under the Energy Act 2004 to ensure a suitable skills base is available to support the UK's key radioactive waste management, spent fuel management and decommissioning programme.

NDA fulfils its skills obligation through its People Strategy, which was refreshed in 2014. NDA takes a proactive approach to ensure its SLCs have resource and skills strategies at the site level that align with delivery of NDA's mission.

To date, 11 initiatives have been developed and implemented by NDA, working with partners and stakeholders. Examples include: the Nuclear Skills Passport; Standard Resource Code definitions; the Dalton Institute Cumbrian Facility; the National Skills Academy for Nuclear; a national graduate scheme; and community apprenticeships in the supply chain. Future initiatives, including a Nuclear College and the development of a Nuclear Simulation Model, are at the planning stage.

### **Prevention of orphan sources and robust management of contaminated scrap metals**

- The European Council Directive on Radioactive High-Activity Sealed Sources (HASS) and Orphan Sources (2003/122/Euratom; EU HASS) came into force in December 2003. The purpose of this Directive was to prevent exposure of workers and the public to ionising radiation arising from inadequate control of HASS and orphan sources. The minimum obligations resulting from this Directive supplemented those of the Basic Safety Standard Directive 96/29/Euratom.

2003/12/Euratom was implemented in the UK through High Activity Sealed Radioactive Sources and Orphan Sources Regulations 2005 (Statutory Instrument No. 2686) in October 2005.

The UK regulations established a system for the authorisation of practices involving HASS. The holders of HASS must keep formal records of all HASS in their possession and register the HASS with the appropriate enforcing authority. Additionally, HASS users are required to notify the relevant enforcing authority whenever they come into possession of new HASS, transfer HASS to another user, transfer HASS back to a manufacturer, or transfer HASS to a Recognised Installation for long-term storage. They are also required to provide records to the relevant enforcing authority at periodic intervals of not greater than 12 months.

In order to prevent the irresponsible disposal of HASS, the HASS Regulations have strengthened the requirements for holders of HASS in the UK to have financial controls in place in order to underwrite the safe future management and disposal of disused HASS. Financial provision, or an acceptable alternative (for example, a secured agreement to return the HASS to its supplier), must be made to meet the costs of disposal of any HASS acquired, including measures to cover the eventuality of the holder becoming insolvent or going out of business. Government has provided guidance to the UK regulators on the

nature of the arrangements that holders of HASS should make in order to meet the financial provision requirement.

Further details of the UK legislative framework relevant to sources are provided in paragraphs E.53 to E.60, a fuller description of the UK's current approach to the management of disused sources is provided in Section J.

#### **Management of research reactors safety**

- Following the decision of Imperial College to decommission its CONSORT reactor, all the UK's research reactors relevant to the Joint Convention have ceased their operational lives.

#### **Utilisation of IAEA safety review services such as IRRS**

- The UK has received three IRRS missions, the latest of which covered radioactive waste management and ran from 29 September to 9 October 2013. The IAEA has agreed to a proposal from the UK for an Expert Mission to take place later in 2014 to consider the progress made in meeting the recommendations raised in 2013. Further details are provided in paragraphs A.2.84 to A.2.89.

A.4.4. The Summary Report to the Fourth Joint Convention Review Meeting identified four specific topics to be included in the reports of Contracting Parties to the Fifth Review Meeting:

### **Summary Report**

#### **Management of Disused Sealed Sources**

- The UK's legislative framework that guarantees the control of HASS is outlined against a relevant headline from the President's Report above and described in detail in paragraphs E.53 to E.60. The UK's overall position in managing disused sealed sources is described in Section J.

#### **Safety Implications of Very Long Storage Periods and Delayed Disposal of Spent Fuel and Radioactive Wastes**

- The UK Government, devolved administrations, regulators and industry all recognise that it will be many years before radioactive HAW and spent fuels can be disposed of within the UK.

Therefore, a robust regime of interim storage is a crucial part of the long-term management strategy. It is a fundamental requirement of those storing HAW and spent fuel in the UK that their storage arrangements should be demonstrably safe and secure for the anticipated storage period, ensuring protection of people and the environment. Such arrangements may assume a single store to cover the entire period, or may provide for replacement or refurbishments of stores at appropriate intervals.

Specific industry guidance has been developed on interim storage of HAW. The guidance covers the key issues of: waste package performance; store longevity; monitoring and inspection regimes; and store maintenance and refurbishment.

Central to the sustainability of safe and secure management of HAW and spent fuel in the UK is the concept of passive safety. The UK regulators expect that HAW should be stored in a form suitable for eventual disposal, with minimum reliance on active safety systems to deliver adequate risk management.

Wherever HAW is stored in a raw unconditioned form, it should be contained in a manner that avoids deterioration and allows retrieval for eventual processing and disposal, whilst maintaining standards of safety and environmental protection that are as close as reasonably practicable to those for stored conditioned wastes.

### **International Co-operation in Finding Solutions for the Long-Term Management and Disposal of Different Types of Radioactive Wastes and/or Spent Fuels**

- International collaboration is an important aspect of the UK's work on geological disposal, with the aim of ensuring the UK makes best use of the existing knowledge and experience of overseas organisations, delivers its needs-based programme in a cost-effective manner and builds confidence in the programme. The UK is represented on relevant committees of the IAEA and NEA, through which it has the opportunity to contribute to the development of international work programmes and to initiate specific activities as required.

RWM is an active participant in a number of international groups, including the International Association for Environmentally Safe Disposal of Radioactive Material (EDRAM), the Club of Agencies (a group of European radioactive waste management organisations set up to exchange information on all aspects of radioactive waste management) and is a member of the Executive of the European Union's Implementing Geological Disposal of Radioactive Waste Technology Platform.

The NDA and RWM have a range of bilateral agreements with overseas organisations. These agreements ease the process of co-operating with other organisations by facilitating liaison and indicate the mutual respect each has for the other's capabilities and standard of work. RWM makes regular use of a number of these relationships to provide benefits such as: international benchmarking; training opportunities; and access to information which may otherwise not be available.

### **Progress on Lessons Learnt from the Fukushima Accident, in Particular Regarding Strategies for Spent Fuel Management**

- The UK's progress on lessons learnt from the Fukushima accident is summarised against relevant headlines from the Rapporteur's Report and President's Report, above, and described in detail in paragraphs A.2.70 to A.2.83.

# Section B

## Policies and Practices

### Article 32 Reporting

**1. In accordance with the provisions of Article 30, each Contracting Party shall submit a national report to each review meeting of Contracting Parties. This report shall address the measures taken to implement each of the obligations of the Convention. For each Contracting Party the report shall also address its:**

- (i) spent fuel management policy;**
- (ii) spent fuel management practices;**
- (iii) radioactive waste management policy;**
- (iv) radioactive waste management practices;**
- (v) criteria used to define and categorise radioactive waste.**

B.1. Under this Article, the only significant change to the UK's means of complying with the Joint Convention since the fourth UK report relates to an overhaul of the criteria by which materials and wastes with a low radioactive content fall within the regime of radioactive substances regulation. Details of this change were given in paragraphs A.2.57 to A.2.60.

B.2. A summary of UK policies and practices for the management of spent fuels and radioactive wastes is given below.

#### **Article 32.1(i) – Spent Fuel Management Policy**

B.3. In the UK the question of whether spent fuel should be reprocessed, or alternative spent fuel management options be adopted, is a question of judgment for the owners of the spent fuel subject to meeting all appropriate regulatory requirements. The UK Government believes that spent fuel should not be categorised as a radioactive waste so long as the option of reprocessing remains open and a practicable future use for the fuel is foreseen.

B.4. The predominant spent fuel types in the UK are Magnox fuel and Oxide fuel.

B.5. The UK's first generation of nuclear power stations relied upon Magnox fuel, which consists of clad metallic uranium and over extended time periods suffers corrosion that can degrade the fuel's integrity. Consequently, reprocessing facilitates the safest and most secure long-term management and future disposal options for spent Magnox fuel. Accordingly, the UK's baseline plan is for the totality of its inventory of spent Magnox fuel to be reprocessed at Sellafield.

B.6. The UK's seven AGR power stations, and the single existing civil PWR power station, use fuels that have enhanced long-term physical and chemical stability when compared with Magnox fuel – this underpins the feasibility of a broader range of management options for spent AGR and PWR fuels, which may or may not include reprocessing.

B.7. The 2008 White Paper, 'Meeting the Energy Challenge' stated that any new nuclear power stations that might be built in England and Wales should proceed on the basis that the resulting spent fuel will not be reprocessed and that plans for, and financing of, radioactive waste management should proceed on that basis.

B.8. 'Meeting the Energy Challenge' set out the Government's conclusions in relation to the management of radioactive waste produced by new nuclear power stations as follows:

"Having reviewed the arguments and evidence put forward, the Government believes that it is technically possible to dispose of new higher activity

radioactive waste in a geological disposal facility and that this would be a viable solution and the right approach for managing waste from any new nuclear power stations. The Government considers that it would be technically possible and desirable to dispose of both new and legacy waste in the same geological disposal facilities and that this should be explored through the Managing Radioactive Waste Safely programme. The Government considers that waste can and should be stored in safe and secure interim storage facilities until a geological facility becomes available.”

B.9. Disposability at the UK’s planned GDF of the radioactive wastes and spent fuels expected to arise from the designs of new PWRs proposed for sites in England has been assessed by NDA and overseen by ONR and the Environment Agency as a part of the GDA process. NDA’s assessments concluded that, compared with the challenges associated with disposal of the radioactive wastes and spent fuels that have already arisen from the UK’s pre-existing nuclear programmes, the new reactor designs will not give rise to any new technical issues. NDA further concluded that, given a disposal site with suitable characteristics, the radioactive wastes and spent fuels from the potential PWR reactor designs are expected to be disposable at a GDF.

B.10. NDA is planning to assess the disposability of the radioactive wastes and spent fuels expected to arise from the ABWR design later in 2014.

B.11. The UK Government’s policy position is that, before development consents for new nuclear power stations are granted, the UK Government will need to be satisfied that effective arrangements exist or will exist to manage and dispose of the fuels and wastes they will produce. In 2011, the UK Government set out in the National Policy Statement for Nuclear Power Generation the reasons why it was satisfied that such arrangements will exist. The UK Government considered these conclusions during production of its 2014 White Paper ‘Implementing Geological Disposal’ and was satisfied they still apply.

### **Article 32.1(ii) – Spent Fuel Management Practices**

B.12. During the era when the UK’s 10 Magnox power stations were in their operational phase, spent Magnox fuel was routinely removed from reactors, stored on the respective power station site for a minimum of 90 days, then transported to Sellafield for reprocessing. At nine of the Magnox sites this initial storage period took place in a water-filled cooling pond, but at Wylfa spent fuel was placed in a dry store.

B.13. Berkeley became the first UK Magnox power station to reach the end of its operational life when it ceased power generation in 1989. In recent years, the emphasis for management of spent Magnox fuel has evolved, from servicing the needs of an operational fleet to the defuelling of reactors entering into decommissioning. As of 31 April 2014 just one Magnox reactor remained in service – Reactor 1 at Wylfa.

B.14. Spent AGR fuel is initially buffer dry stored, then placed under water in the power station’s cooling pond for a period of at least 100 days. The spent fuel is then transported to Sellafield. EDF has contracts in place for the long-term management of spent AGR fuel covering the operating lives of all the AGR power stations it owns.

B.15. EDF retains title and ultimate responsibility for managing the quantity of AGR spent fuel (and associated materials of the fuel) which was loaded into its AGR power stations prior to completion of the British Energy restructuring process (referred to as the ‘Historic Fuel Quantity’). The British Energy Restructuring Effective Date (RED) was midnight on 14 January 2005. The title and ultimate responsibility for all the fuel loaded into the AGR reactors after the RED is with NDA. A contractual payment is made at the time of fuel load, to transfer the title and associated responsibilities for managing the spent fuel to NDA.

B.16. The total historic Fuel Quantity from the UK AGRs is 6,218t uranium and is managed at Sellafield under the terms of the historic Fuel Contracts. Of this historic fuel, circa 5,018t is committed to reprocessing contracts. The spent AGR fuel in excess of this contracted quantity will be stored at Sellafield pending a decision on its long-term management. The historic Fuel Contracts cover the period to 2086; activities beyond this contracted period will be the responsibility of EDF. The baseline plan for the spent fuel placed into long-term storage and the by-products from reprocessing is disposal to the proposed UK GDF.

B.17. In the UK, spent civil PWR fuel arises only from the Sizewell B PWR power station, which has been operational since 1995. Following discharge from the reactor core, the spent fuel is presently stored at Sizewell B in a water-filled storage pond. The pond was constructed with sufficient capacity to store the spent fuel from station operations up to 2015. For accounting purposes, Sizewell B has an expected operational lifetime of 40 years and an assumed closure date of 2035. In the event no additional spent fuel storage capacity was made available, there would be an impact on the operations of Sizewell B when the station is scheduled to undergo a major refuelling outage in 2017.

B.18. To address the potential shortfall in spent fuel storage capacity, EDF decided to construct an ISFSI Dry Store on the Sizewell B licensed site. The store is intended to accommodate all the spent fuel arising from the site, including that already in wet storage in the station pond. The estimated total spent fuel arising from 40 years' operation at Sizewell B is 1,049t uranium.

B.19. The ISFSI will hold complete PWR fuel assemblies within metal flasks that will maintain an inert gas atmosphere around the spent fuel assemblies. The ISFSI design has minimised the reliance on active safety systems, with decay heat from the fuel dissipated through the external surface of the flask and cooling of the building achieved by natural convection.

B.20. Construction of the ISFSI is scheduled for completion by 2015. EDF's intention is to then switch all the station's spent fuel to dry storage by 2045. Thereafter, the store will operate until the spent fuel can be disposed of to the UK GDF – for planning purposes EDF has estimated that disposal will begin in 2080.

### **Article 32.1(iii) – Radioactive Waste Management Policy**

B.21. The following is a summary of the key points of UK policy for the management of radioactive wastes.

#### **General Radioactive Waste Management Policy**

B.22. The UK Government's policy towards the management of radioactive wastes has the same basic principles as apply more generally to environmental policy and, in particular, sustainable development. More specifically, radioactive wastes should be managed in a manner that protects the public, workforce and environment.

B.23. Within this approach, the UK Government continues to develop further policies and a regulatory framework which ensure that:

- radioactive wastes are not unnecessarily created, in accordance with the waste hierarchy;
- the radioactive wastes that are created are safely and appropriately managed, and
- treated radioactive wastes are safely disposed of at appropriate times in appropriate ways.

B.24. Within that framework, the producers and owners of radioactive waste are responsible for developing their own strategies for the radioactive wastes they create, ensuring that:

- nuclear operators do not create waste management problems which cannot be resolved using current techniques, or techniques which could be derived from current lines of development;
- where it is practical and cost-effective to do so, nuclear operators characterise and segregate radioactive wastes on the basis of physical and chemical properties, and store it in accordance with the principles of passive safety; and
- nuclear operators undertake strategic planning, including the development of programmes for the disposal of waste accumulated at their sites within an appropriate timescale, including wastes from the decommissioning of redundant plants and facilities.

B.25. The producers and owners of radioactive waste are responsible for bearing the cost of managing and disposing of the wastes their activities generate.

B.26. The report 'Policy for the Long Term Management of Solid Low level Radioactive Waste in the United Kingdom' (Ref. 31) was issued to address an impending shortfall in LLW disposal capacity, arising as a result of decommissioning of nuclear facilities and limited capacity of the LLWR. It also introduced a risk-based approach to the use of a range of potential alternative disposal options.

### **Scottish Government HAW Policy**

B.27. Radioactive waste management policy is a devolved matter. In Scotland, the Scottish Government is committed to ensuring radioactive wastes are managed responsibly and in consultation with the Scottish public. The Scottish Government published its policy on HAW in January 2011 (Ref. 25), based on the following key points:

- Long-term management of HAW should take place in near-surface facilities.
- These facilities should be located as near as possible to the site where the waste was produced (the proximity principle).
- Developers will need to demonstrate how the facilities will be monitored and how waste packages, or waste, could be retrieved.

B.28. All long-term waste management options will be subject to robust regulatory requirements. The Scottish Government is developing a strategy to support the implementation of its policy.

B.29. The Scottish Government supports CoRWM's recommendations for a robust programme of interim storage of HAW, endorses the UK-wide LLW policy published in March 2007 (Ref. 31) and supports associated research and development.

### **Policy for the Management of Low-Level Waste**

B.30. The UK Government published a policy for the management of solid LLW was published by the UK Government in March 2007 (Ref. 31). The policy outlined the following priorities for managing solid LLW:

- allowing greater flexibility in managing the wide range of LLW that already exists and will arise in the future;
- maintaining a focus on safety, with arrangements supported by the independent UK regulators;
- seeking to first minimise the amount of LLW created before looking at disposal options, through avoiding generation, minimising the amount of radioactive substances used, recycling and reuse;
- publication of 'UK Strategy for the Management of Solid Low Level Radioactive Waste from the Nuclear Industry' in August 2010 (Ref. 30). This strategy provided a framework within which management decisions

can be taken flexibly to ensure safe, environmentally acceptable and cost-effective solutions. The strategy sought to prioritise the capacity of the national LLW Repository in West Cumbria for those wastes that required the level of engineered protection the LLWR offers. In addition to facilitating significant savings in NDA's liabilities, the strategy was considered to be flexible enough to accommodate the potential LLW arising from new nuclear power stations;

- publication of 'Strategy for the Management of Solid Low Level Radioactive Waste from the Non-Nuclear Industry in the United Kingdom (Part 1 – Anthropogenic radionuclides)' in March 2012 (Ref. 48). The strategy provided information on this specialised type of waste, to inform decisions on planning applications and respond to stakeholder concerns. It clarified the respective roles of waste producers, environment agencies, planning authorities and NDA to enable each organisation to make decisions that properly recognise the responsibilities of others. The strategy also ensured that the UK waste producers were aware of the regulatory expectations applicable to LLW, particularly the need for waste management plans and the waste hierarchy including waste minimisation at source; and
- the UK Government and devolved administrations published Part 2 of the strategy for LLW from the non-nuclear industry in July 2014 (Ref. 12) following completion of a consultation in May 2014. This strategy covered NORM and was based on:
  - reform of the regulatory framework to ensure it is clear, coherent and effective;
  - enabling the development of a robust and efficient market for NORM waste management services; and
  - supporting efforts by waste producers and the waste management supply chain to generate better data and information about current and future NORM waste arisings.

### **Policy on Discharges of Aerial and Liquid Radioactive Wastes**

B.31. In July 2009, the UK Government and devolved administrations published the revised UK Strategy for Radioactive Discharges which covers the period up to 2030 (Ref. 74).

B.32. The 2009 strategy built on and widened the scope of the previous 2002 strategy, bringing all information on radioactive discharges into one place. The strategy applies to both the nuclear and non-nuclear sectors and includes aerial as well as liquid discharges from operational and decommissioning activities. It sets out the progress made on reducing discharges and emissions to the environment; it describes, at the sectoral level, the outcomes expected and by when, and sets a strategic framework for addressing radioactive discharges over the next 20 years. Progressive reduction of discharges is a central goal of the way in which radioactive discharges are controlled. The UK Government interprets 'progressive reduction' as a clear reduction over a number of years or a statistically significant difference between one period of years and a subsequent period to indicate a reduction. This approach allows for normal plant fluctuations, variations in nuclear reactor operations and the amount of reprocessing undertaken.

B.33. A commitment was given in 2009 to review the strategy about every five years. The scope of the first such review will be agreed during 2015.

B.34. The regulations pertinent to radioactive waste discharges and disposals require optimisation, through application of Best Available Technologies (BATs) in England and Wales or Best Practicable Means (BPMs) in Scotland and Northern

Ireland. Application of BAT replaced use of the Best Practicable Environmental Option (BPEO) and BPM in England and Wales under statutory guidance from the UK Government to the Environment Agency (Ref. 75). BAT is broadly equivalent to BPM. Application of BAT is consistent with environment protection regimes in other countries and with the terminology used for environmental regulation of the non-nuclear industry.

B.35. The Environment Agency has published guidance that sets out the principles and framework for undertaking studies on optimisation and the identification of BAT (Ref. 76). SEPA has issued similar guidance on BPM (Ref. 77) and its role in ensuring that ionising radiation exposures to members of the public are 'as low as reasonably achievable' (ALARA).

### **Policy on Management of the Radioactive Wastes that arise from Decommissioning**

B.36. Government policy on decommissioning is set out in the Energy Act 2004, which also created NDA. Key points of the policy are noted below.

#### **Objective of Decommissioning**

B.37. The key objective of decommissioning is to progressively reduce the hazard that a redundant facility poses. Decommissioning should be carried out as soon as reasonably practicable following the cessation of a plant's operational life, taking all relevant factors into account.

#### **Decommissioning Strategies**

B.38. Each UK nuclear operator is expected to produce and maintain a decommissioning strategy and plan for each site it is responsible for. Such strategies and plans should take into account the views of stakeholders (including relevant local authorities and the public). Strategies should consider all 'relevant factors', presenting them in a transparent way and demonstrating in an objective way how each has been reflected in the adopted approach. Examples of 'relevant factors' are listed in UK government policy and include:

- ensuring worker and public safety;
- maintaining site security;
- minimising the generation of radioactive wastes;
- effective and safe management of the radioactive wastes that are created;
- minimising environmental impacts including reusing or recycling materials whenever practicable;
- maintaining adequate site stewardship;
- using resources effectively, efficiently and economically;
- providing adequate funding; and
- maintaining access to an adequate skills and knowledge base.

B.39. The future intended use of the site is a significant factor in determining the scope and end goal for decommissioning.

B.40. Decommissioning strategies may harness the general benefits of radioactive decay while the problems to which it may give rise in certain areas are avoided. They should seek to avoid the creation of radioactive wastes in forms that may reduce the number of options for safe and effective long-term waste management.

B.41. Some decommissioning tasks can lead to a need for short-term increases in discharges of some radionuclides. In such circumstances, the site operator will need to demonstrate to the relevant environmental regulator that the adopted strategy represents an optimal approach and reflects the application of BAT or BPM principles to ensure public doses are kept ALARA.

B.42. Operators are expected to review their strategies periodically, and in response to any significant change in circumstances. An up-to-date decommissioning strategy is an established regulatory expectation of a robust Periodic Review of Safety.

B.43. The operators of sites owned by NDA are required through their contracts with NDA to produce and maintain detailed plans to a prescribed format that covers the whole site lifecycle, including decommissioning. These plans are reviewed regularly and summaries of the extant plans are made available on NDA's website.

#### **Funding of Decommissioning**

B.44. The UK Government expects all nuclear operators to take the steps necessary to ensure that they have sufficient financial provision to fund the decommissioning work required on the sites they are responsible for.

B.45. In addition to its responsibilities relating to the nuclear liabilities on the sites it owns, NDA also acts as DECC's agent in scrutinising plans, strategies and costs produced by EDF in respect of liabilities arising within the AGR fleet and Sizewell B.

B.46. The UK Government's restructuring of British Energy in 2005 created a new independent funding mechanism, the Nuclear Liabilities Fund. EDF is obliged to make a schedule of regular payments into the NLF. The NLF then disburses its funds back to EDF in a controlled manner for use solely in discharging the liabilities associated with the AGRs or Sizewell B. Checks have been put in place to ensure EDF can only use the NLF monies for this intended purpose. The UK Government stands behind the NLF; NDA's role is to ensure that funds are disbursed appropriately and that EDF's strategy aligns with that of the rest of the civil nuclear sector, which is owned by NDA and funded by the UK Government.

B.47. NDA also scrutinises decommissioning plans and cost estimates by new nuclear power plant developers submitted to DECC as part of their Funded Decommissioning Programmes (FDPs) (the funding arrangements are scrutinised by the NLFAB) and advises the Secretary of State on the robustness of these plans.

#### **Designing new Nuclear Facilities to Take Account of Decommissioning**

B.48. It is an established expectation of ONR's SAPs and the Environment Agency's REPs that the design of new nuclear facilities should accommodate the need to decommission the plant at the end of its operational life.

#### **Waste and Decommissioning Financing Arrangements for New Nuclear Power Stations**

B.49. The Energy Act 2008 required the operators of proposed new nuclear power stations to have approval from the Secretary of State for Energy and Climate Change for an FDP before commencing nuclear-related construction. The operator must comply with the FDP thereafter. The FDP ensures that the operator makes secure arrangements to meet the full costs of decommissioning and their full share of waste management and disposal costs. Any failure to comply with an approved FDP would be a criminal offence.

B.50. The Energy Act 2008 made provision for the Secretary of State to publish guidance about the preparation, content, modification and implementation of an FDP. The Secretary of State is required to publish guidance about the factors which it may be appropriate to consider in deciding whether or not to:

- approve a programme;
- approve a programme with Modifications or subject to conditions; or
- make a proposed Modification to a programme or the conditions subject to which it is approved.

B.51. DECC published the FDP guidance in December 2011. The guidance stated that the objective of the FDP regime is to: "ensure that operators make prudent

provision for: The full costs of decommissioning their installations, and; Their full share of the costs of safely and securely managing and disposing of their waste, and that in doing so the risk of recourse to public funds is remote. This objective applies to the whole FDP regime.”

B.52. The guidance envisaged that FDPs would be divided into two parts:

- the Decommissioning and Waste Management Plan, which assists operators in setting out and costing the steps involved in decommissioning a new nuclear power station and managing and disposing of hazardous waste and spent fuel in a way which the Secretary of State for Energy and Climate Change may approve; and
- the Funding Arrangements Plan, which assists operators in setting out acceptable financing proposals to meet the costs identified. It sets out information on the factors by which the Secretary of State would expect to assess the funding proposals submitted by operators as part of an FDP for approval under the provisions in the Energy Act 2008.

B.53. The independent NLFAB provides impartial scrutiny and advice to the Secretary of State for Energy and Climate Change on the suitability of FDPs submitted by prospective operators of new nuclear power stations. In addition to advising on the approval or otherwise of submitted FDPs, the NLFAB also provides advice to the Secretary of State from regular reviews and ongoing scrutiny of the associated funding arrangements.

B.54. The Nuclear Decommissioning and Waste Handling (Finance and Fees) Regulations 2011 came into force in April 2011 and include:

- fees for approving an FDP;
- reporting and information requirements; and
- dis-application of the modification regime set out in the Energy Act 2008 in certain instances.

B.55. These regulations were complemented by the Nuclear Decommissioning and Waste Handling (Designated Technical Matters) Order 2010, to ensure a clear understanding of designated technical matters. The Order came into effect in November 2010.

B.56. Following a consultation the UK Government published the Waste Transfer Pricing Methodology in December 2011. The methodology set out how the Waste Transfer Price will be determined and provided the basis for more detailed provisions in the Waste Contract to be agreed between the UK Government and operators.

B.57. The first submission of an FDP to the Secretary of State was made by NNB Generation Company Ltd in March 2012, for the Hinkley Point C power station in Somerset. Work continues to finalise the FDP, at which point NLFAB will complete its advice to the Secretary of State who will decide whether to approve the FDP and, if so, whether any modifications are required. Once the decision has been made the FDP, NLFAB advice, and all supporting documents will be published.

### **[Article 32.1\(iv\) – Radioactive Waste Management Practices](#)**

B.58. Radioactive waste management practices have not changed substantially since the last report. The following is a short summary of practices. Further information, including the definitions and categorisations of radioactive waste in the UK, is presented in Annex L.2.

#### **Very Low Level Waste**

B.59. VLLW covers wastes with very low concentrations of radioactivity, the policy on which was updated in March 2007. Low-volume VLLW can be safely disposed of, to unspecified destinations and high-volume VLLW to specified landfill sites. Controls

on disposal of high volume VLLW, after removal from the premises at which it originates, will be necessary in a manner specified by the environmental regulators. The 2013 UKRWI indicates that at 1 April 2013 the volume of VLLW in stock was about 1,170m<sup>3</sup>, of which 1,080m<sup>3</sup> was held at Sellafield. All VLLW was in temporary storage awaiting disposal to landfill.

### **New Ways of Working at the LLWR**

B.60. The 'UK Strategy for the Management of Solid Low Level Radioactive Waste from the Nuclear Industry' was prepared by NDA in response to government policy on the management of solid LLW. The aim is to provide a high-level framework within which LLW management decisions can be taken flexibly to ensure safe, environmentally acceptable and cost-effective management solutions. The UK strategy will be reviewed and re-issued in August 2015 following a consultation that is planned to start in January 2015.

B.61. Central to the strategy is the implementation of the waste hierarchy in the management of LLW, which supports the provision of continued capability and capacity for managing LLW in the UK. Three strategic themes have been particularly important in the development and implementation of the strategy:

- application of the waste hierarchy;
- best use of existing LLW management assets; and
- development of new fit-for-purpose waste management routes.

B.62. The Government has encouraged all those who generate radioactive wastes to use a broader range of options for managing LLW, rather than focusing wholly on disposal.

B.63. The UK's only traditional disposal option for LLW was the LLWR. Between 1959 and 1995 about 800,000m<sup>3</sup> of waste was disposed of in a series of clay-lined shallow trenches and covered with soil. Since the late 1980s waste disposed of at LLWR has been placed in metallic ISO containers, any voidage inside the containers is eliminated by filling with cement at LLWR and the containers are then placed in engineered concrete-lined near-surface vaults. At 1 April 2013, the containers occupied 182,000m<sup>3</sup> of vault space. A small proportion of the waste containers within Vault 8 and all the containers within Vault 9 are not yet classed as disposed due to issues surrounding the LLWR Environmental Safety Case and EPR10 Permit that are described in paragraphs A.2.95 to A.2.103. Consignments to the LLWR over the past 10 years have totalled about 91,000m<sup>3</sup>.

B.64. Having recognised that the UK nuclear industry will generate significantly more LLW than the potential disposal capacity at LLWR, the Government and NDA transformed the site's SLC, LLW Repository Ltd, into a waste service provider to the nuclear industry with the ability to exploit new or improved alternative waste management routes.

B.65. Consequently LLW Repository Ltd is now able to offer a broad range of waste management services either directly or via framework agreements which include:

- metallic waste treatment;
- combustible waste treatment;
- super-compaction;
- VLLW disposal;
- improved packaging processes;
- waste characterisation service; and
- transport service.

B.66. The 2013 UKRWI indicated that at 1 April 2013 the volume of un-disposed LLW accumulated across the UK was about 66,700m<sup>3</sup>. About 32,800m<sup>3</sup> was waste

that had been packaged and stored in Vaults 8 and 9 at the LLWR. Other notable holdings were at Dounreay (14,400m<sup>3</sup>), Winfrith (4,400m<sup>3</sup>) and Sellafield (3,450m<sup>3</sup>).

B.67. At Dounreay, LLW was being stored pending the planned opening of a new disposal facility local to the site in 2014. At other sites, most LLW in stock at 1 April 2013 was in temporary storage awaiting either reuse, recycling, incineration, or disposal to landfill.

B.68. Other wastes were being held for characterisation, processing and/or repackaging, before being consigned to LLW Repository Ltd. Once consigned these wastes may be stored at the LLWR awaiting future disposal in Vault 9, or may undergo treatment by specialist providers engaged via LLW Repository Ltd's framework agreements.

B.69. A small fraction of LLW identified in the 2013 UKRWI, about 755m<sup>3</sup>, was acknowledged to be unsuitable for consignment to the LLWR or disposal to landfill because the wastes did not meet LLW Repository Ltd's extant acceptance criteria, which incorporate limits on chemical content in addition to radiological properties. Some of these wastes are oils that are to be incinerated. Some will require the development of new treatment techniques in order to meet LLW Repository Ltd's acceptance criteria, or as a last resort will need to be managed as HAW.

#### **LLWR Environmental Safety Case and Permit**

B.70. In accordance with a condition in its environmental permit, LLW Repository Ltd provided the Environment Agency with an updated ESC by May 2011. Between May 2011 and October 2013, the Environment Agency undertook a detailed technical review of the ESC, which is currently being documented and due for publication in late 2014.

B.71. By October 2013, the Environment Agency was content that LLW Repository Ltd had adequately addressed all of their additional information requirements, such that it had sufficient information to conclude its review and support a permit decision. On that basis LLW Repository Ltd subsequently submitted an application to vary its permit to allow continued disposals of LLW at the repository. The Environment Agency is currently determining this application and aims to issue a decision during 2015. Any decision is subject to a (Euratom) Article 37 opinion on the possible environmental impacts on other European Union Member States.

B.72. Key technical issues considered as part of the review of the ESC included: coastal erosion; container condition and waste settlement; higher activity particles / higher activity items / sealed sources; non-radiological impacts; radiological capacity; engineering; optimisation; and the management of uncertainty.

#### **Dounreay LLW Disposal Facility**

B.73. Dounreay Site Restoration Ltd has developed a new facility local to the Dounreay nuclear licensed site for the disposal of solid LLW. SEPA has a range of responsibilities in relation to this facility which cover planning, construction, operational, and post-closure phases. SEPA assessed the Environmental Safety Case for the Dounreay LLW disposal facility using dedicated guidance (Ref. 78).

#### **Metal LLW Recycling**

B.74. Through the LLW Repository Ltd commercial frameworks or direct contracts with other nuclear licensed sites, the Studsvik Metal Recycling Facility (MRF), in Lillyhall, West Cumbria, manages metallic LLW against the requirements of the waste hierarchy using size reduction and shot blasting to reduce the volume of waste and recover valuable metals. Studsvik also arranges transfrontier shipments of metal wastes to its melting facility at Nyköping in Sweden.

B.75. Tradebe Inutec offers UK LLW generators a range of sort and segregation services for metallic and combustible waste via its facility based on the licensed site

at Winfrith; and can arrange transfrontier shipments of compatible metallic wastes to the smelter at Siempelkamp in Germany.

B.76. LLW Repository Ltd has additional framework agreements for the treatment of metallic wastes in place with Energy Solutions to allow access to the Bear Creek facility in the USA and with Doosan Babcock for large item size reduction at their facility in the UK.

#### **Combustible LLW Treatment**

B.77. Within the UK incineration is a mature waste treatment technology and has been permitted for several years for treating suitable LLW. The process typically reduces waste volumes by up to 98% by burning combustible solid and liquid wastes, breaking down the reactive compounds and organics to create a stable homogeneous waste form (ash) for disposal.

B.78. Several commercial incinerators are presently available to the UK nuclear industry as well as a facility in Sweden and one in the USA. These facilities have significant differences in the quantity, type of radioactivity and physical nature of the waste that they can accept. They are available to waste generators through the LLW Repository Ltd commercial frameworks or by using direct contracts.

#### **Intermediate-Level Waste**

B.79. ILW currently arises from a range of practices in the UK which include: reprocessing of spent fuel; operations and maintenance of radioactive plant; and decommissioning. An additional historical legacy of ILW that arose from the 1950s onwards is stored, pending retrieval and conditioning into a disposable form. The major components of current arisings of ILW are metals and organic materials, with smaller quantities of cement, graphite, glass and ceramics. As more facilities enter the decommissioning phase, the quantities of metal, concrete and graphite will increase. Until a long-term HAW management solution is available, ILW will be conditioned into a passively-safe form and stored in interim stores, potentially for several decades. Sellafield holds by far the single largest inventory of ILW in the UK. NDA has sought to consolidate some of the ILW from sites across its estate into a smaller number of locations.

B.80. The concept of passive safety is intended to secure a long-term reduction in risks without the need for complex safety systems (administrative and engineered), whilst also avoiding the detriments involved in repackaging. Waste conditioning is therefore carried out, as far as practicable, in ways that anticipate the requirements for future long-term management such as disposal at a GDF. Current arisings from reprocessing of spent fuel are conditioned promptly prior to interim storage.

B.81. The 2013 UKRWI indicates that at 1 April 2013 the volume of ILW in stock was about 95,600m<sup>3</sup>, of which 28,100m<sup>3</sup> had been treated to achieve passive safety (compared with 94,300m<sup>3</sup> and 24,500m<sup>3</sup> in 2010). All this waste is stored and conditioned on sites licensed under NIA65.

#### **Radioactive Waste Management Cases and Letters of Compliance**

B.82. Guidance for the management of HAW that was issued jointly by the UK regulators advises licensees to produce an RWMC for each significant waste type found on its site, which should demonstrate how short-term and longer-term safety and environmental issues associated with the waste are addressed. The RWMC should also provide a reasoned judgement on whether the proposed waste form will meet the anticipated conditions for acceptance of the operator of the intended disposal site.

B.83. The UK regulators recognise NDA's RWM as the appropriate body to advise licensees on the packaging and conditioning of HAW that is destined for the planned GDF. RWM provides this advice through the Letter of Compliance assessment process. In undertaking its assessment, RWM assesses waste packaging proposals

against safety, environmental and security assessments for transportation and geological disposal.

B.84. The outcome of RWM assessment is a report on the disposability of the waste, which the licensee can use in support of its RWMC. Where the proposed waste form is found to be compliant with the geological disposal packaging standards and safety cases, RWM will issue a Letter of Compliance. The Letter of Compliance thenceforth becomes a part of the licensee's safety case submitted to ONR – ONR then seeks advice from the relevant environmental regulator prior to granting permission for waste conditioning to take place.

### **High-Level Waste**

B.85. HLW is heat-generating waste that has accumulated since the early 1950s at Sellafield as a by-product from reprocessing of spent nuclear fuel. HLW is concentrated and stored in engineered containment prior to undergoing a process of vitrification to make it physically stable. Vitrification involves the encapsulation of HLW in liquid glass, which is poured into robust stainless steel containers to undergo cooling and solidification. The vitrified HLW is then stored in environmentally controlled, safe and secure conditions, pending either return to the country of origin or the availability of long-term management arrangements in the UK. Current government policy is that the UK's vitrified HLW should be stored for at least 50 years to benefit from radioactive decay and simplify the subsequent long-term management steps.

B.86. The 2013 UKRWI indicates that at 1 April 2013, there was 1,770m<sup>3</sup> of HLW in storage, of which 931m<sup>3</sup> was in fluid form and 844m<sup>3</sup> was vitrified (compared to 1,620m<sup>3</sup> in stock at 1 April 2010, of which 850m<sup>3</sup> was in fluid form and 766m<sup>3</sup> vitrified).

B.87. In 2010, the UK carried out the first shipments to return vitrified HLW by-products from reprocessing of spent fuels to overseas clients. Such shipments are now routine.

### **Development of a HAW Management Strategy**

B.88. CoRWM considered a broad range of options for the long-term management of HAW and, in 2006, recommended geological disposal supported by safe and secure interim waste storage arrangements and a programme of underpinning research.

B.89. The Scottish Government published its Policy Statement and Post-Adoption Strategic Environmental Assessment Statement for HAW in January 2011, based on the long-term management of HAW in near-surface facilities.

B.90. The Government made NDA responsible for implementing a GDF for HAW in the 2008 White Paper 'Managing Radioactive Waste Safely: a Framework for Implementing Geological Disposal'. The waste destined for the planned GDF arises from a number of waste producers across the UK.

B.91. NDA's overarching strategy is to convert the HAW inventory into a form that can be safely and securely stored for many decades. At the appropriate time, the stored waste in England and Wales will be transported to and disposed of in the GDF. Stored waste in Scotland will be managed in line with Scottish government policy for HAW.

B.92. Overseas-owned HAW that has arisen from reprocessing of spent fuel at Sellafield and Dounreay will be returned to foreign customers under existing contracts and in accordance with government policy. The first such shipment was returned in early 2010 and regular returns are scheduled over the next few years.

B.93. Development of a GDF is clearly an important part of the long-term strategy for managing HAW in England and Wales. The availability of a GDF is significant for

decommissioning schedules, although the plans for safe and secure interim storage are capable of accommodating changes to the delivery timescale of the GDF.

### **Article 32.1(v) – Criteria Used to Define and Categorise Radioactive Waste**

#### **Definition of radioactive waste**

B.94. Definitions of radioactive waste in UK legislation are specific to the purposes of each piece of legislation. The classification system uses broad categories according to the waste's heat-generating capacity and radioactive content. The definitions are given in full in Annex L.2.

B.95. The only significant change to the UK's definitions of radioactive waste since the last UK Joint Convention report relates to an overhaul of the exemptions from regulatory controls for materials and wastes featuring very low levels of radioactivity. The impact of this change was described in paragraphs A.2.57 to A.2.60.

# Section C

## Article 3 Scope of Application

1. This Convention shall apply to the safety of spent fuel management when the spent fuel results from the operation of civilian nuclear reactors. Spent fuel held at reprocessing facilities, as part of a reprocessing activity, is not covered in the scope of this Convention unless the Contracting Party declares reprocessing to be part of spent fuel management.
2. This Convention shall also apply to the safety of radioactive waste management when the radioactive waste results from civilian applications. However, this Convention shall not apply to waste that contains only naturally occurring radioactive materials and that does not originate from the nuclear fuel cycle, unless it constitutes a disused sealed source or it is declared as radioactive waste for the purposes of this Convention by the Contracting Party.
3. This Convention shall not apply to the safety of management of spent fuel or radioactive waste within military or defence programmes, unless declared as spent fuel or radioactive waste for the purposes of this Convention by the Contracting Party. However, this Convention shall apply to the safety of management of spent fuel and radioactive waste from military or defence programmes if and when such materials are transferred permanently to and managed within exclusively civilian programmes.
4. This Convention shall also apply to discharges as provided for in Articles 4, 7, 11, 14, 24 and 26.

C.1. The UK's arrangements to comply with this Article have not changed since the fourth UK Joint Convention report in 2011.

C.2. In September 1997, during the diplomatic conference to adopt the Joint Convention, the UK supported a declaration to the effect that the UK will report on the reprocessing of spent fuel as an integral part of spent fuel management under the terms of the Joint Convention, on a voluntary basis. France and Japan also supported the declaration and joined the UK in inviting all the other Contracting Parties that carry out the reprocessing of spent fuel to do the same.

C.3. Taking into account that declaration, this report has addressed the Government's approach to:

- safety of spent fuel management, when the spent fuel results from the operation of civilian nuclear reactors – including the storage of spent fuel where that takes place as part of a reprocessing activity;
- safety of radioactive waste management, when the radioactive waste results from civilian applications – primarily focused on the radioactive wastes that originate from the nuclear fuel cycle and disused sealed sources; and
- discharges of radioactive materials to the environment – provided for in Articles 4, 7, 11, 14, 24 and 26 of the Joint Convention.

C.4. This report does not address the safety of spent fuel or radioactive wastes within the UK's defence programmes, except when such materials have been transferred permanently to and managed within exclusively civilian programmes, as identified in Article 3(3) of the Joint Convention.

# Section D

## Inventories and Lists

### Article 32, paragraph 2

**This report shall also include:**

- a list of the spent fuel management facilities subject to this Convention, their location, main purpose and essential features;
- an inventory of spent fuel that is subject to this Convention and that is being held in storage and of that which has been disposed of. This inventory shall contain a description of the material and, if available, give information on its mass and its total activity;
- a list of the radioactive waste management facilities subject to this Convention, their location, main purpose and essential features;
- an inventory of radioactive waste that is subject to this Convention that:
  - is being held in storage at radioactive waste management and nuclear fuel cycle facilities;
  - has been disposed of; or
  - has resulted from past practices.
- This inventory shall contain a description of the material and other appropriate information available, such as volume or mass, activity and specific radionuclides;
- a list of nuclear facilities in the process of being decommissioned and the status of decommissioning activities at those facilities.

D.1. The UK's arrangements to comply with this Article have not changed since the fourth UK Joint Convention report in 2011.

D.2. The inventories and lists required by Article 32.2 for the UK are in the following parts of this report.

- Spent Fuel Management Facilities: Annex L.1.
- Inventory of Spent Fuel: Paragraphs L.1.39 to L.1.41. No spent fuel has been disposed of in the UK to date.
- Radioactive Waste Management Facilities: Annex L.2.
- Inventory of Radioactive Waste: Tables L.2.1 to L.2.3 summarise the inventory of radioactive waste held in storage and disposed of in the UK. The full inventory is published every three years, with the latest version being the 2013UKRWI.
- Decommissioning facilities: Section A.3 and the tables subsequent to paragraph L.2.106.

D.3. The UK also holds quantities of uranic materials as the result of reprocessing or enrichment operations. These are not considered to be waste materials since they can potentially be reused in the nuclear fuel cycle. They are generally in the form of uranium oxide or uranium hexafluoride (known as 'hex tails'). The quantities involved are published in the UKRWI.

# Section E

## Legislative and Regulatory System

### Article 18 Implementing Measures

**Each Contracting Party shall take, within the framework of its national law, the legislative, regulatory and administrative measures and other steps necessary for implementing its obligations under this Convention.**

E.1. Under this Article, the UK has taken steps to modernise and improve some of its arrangements relevant to compliance with the Joint Convention since the fourth UK report.

E.2. The principal pieces of legislation covering the safety of workers and the general public at nuclear licensed sites are the Health and Safety at Work etc Act 1974 (HSWA74) (Ref. 79), the Energy Act 2013 (Ref. 15) and their associated relevant statutory provisions. One source of relevant statutory provisions is NIA65 (Ref. 80), which addresses the licensing function for nuclear sites administered by ONR.

E.3. NIA65 grants ONR the power to attach such conditions to a site licence it thinks fit with respect to the handling, treatment and disposal of 'nuclear matter'. The term 'nuclear matter' includes radioactive wastes and spent fuels.

E.4. The storage of radioactive wastes falls within the definition of 'operations' in Licence Condition 1 of NIA65. Consequently, the requirements of all the 36 standard licence conditions apply to the storage of radioactive wastes on licensed nuclear sites.

E.5. On matters affecting the management of radioactive wastes on nuclear licensed sites, ONR takes account of the interests of the relevant environmental regulator – either the Environment Agency in England, SEPA, or NRW.

E.6. The environmental legislation – RSA93 in Scotland (Ref. 8) and EPR10 in England and Wales (Ref. 9) – requires that a licensee must obtain a permit or authorisation from its environmental regulator whenever it intends to:

- discharge radioactive gases to the environment;
- discharge radioactive liquids to the environment;
- transfer radioactive waste to another site, for the purpose of waste processing or waste storage; or
- consign radioactive waste to a final disposal facility (eg an incinerator or solid waste repository), from which there is no intention to retrieve the waste.

E.7. Due to the coverage of NIA65, nuclear licensees are exempt from the requirements found in environmental legislation to obtain a permit or authorisation from the relevant environmental regulator to accumulate radioactive waste and/or keep and use radioactive material, with the exception of off-site use of mobile radioactive apparatus (EPR10 Schedule 23 and RSA93 Section 8(1)). The environmental regulators consequently have no statutory powers over the storage of radioactive waste on nuclear licensed sites, until the licensee seeks permission to dispose of the waste or transfer it elsewhere.

E.8. On sites that are not licensed under NIA65, the powers granted to the environment agencies under RSA93 or EPR10 extend to the storage of radioactive wastes as well as disposals, whilst HSE is the enforcing authority for the Ionising Radiation Regulations 1999 (IRR99) (Ref. 81) which deal with radiological protection.

E.9. The Energy Act 2004 (Ref. 82) established NDA as a non-departmental public body. NDA subsequently took ownership of almost half the licensed nuclear sites in the UK, previously owned by British Nuclear Fuels Ltd and the UKAEA. NDA has subsequently contracted a range of SLCs to safely manage its assets and liabilities on the sites it owns. Creation of NDA did not change the UK regulatory framework; ONR and the environment agencies continued to regulate the nuclear licensed sites that fell under NDA ownership.

E.10. The UK regulators routinely interact with both NDA and NDA's contractors. As part of these interactions, the regulators ensure that NDA and the SLCs continue to understand and act on their respective responsibilities for safety and environmental protection in the course of decommissioning, management of radioactive waste and management of spent fuel.

E.11. NDA has developed guidance which explains the respective roles of NDA and the SLCs for safety and environmental protection at nuclear licensed sites (Ref. 83). This guidance includes the legal obligations on SLCs as holders of nuclear site licences and environmental permits, emphasising that the SLCs have primary responsibility for safety as the organisations in day-to-day control of the sites.

E.12. NDA is currently reviewing, updating and re-issuing this guidance and expects to have an updated version available by November 2014.

E.13. ONR has produced guidance to explain the legal obligations of licensees with respect to health and safety legislation (Ref. 84). ONR's guidance describes the organisational capability required by SLCs to meet regulatory expectations, as well as the relationship between SLCs and their parent companies, in particular the requirement for SLCs to be in day-to-day control of their sites. Annex 2 of the guidance covers the role and duties of NDA with respect to health and safety regulation.

E.14. At the time of the Energy Act 2004, the extant environmental legislation across the whole of the UK was RSA93. The Energy Act 2004 amended RSA93 to allow nuclear licensed sites to transfer authorisations from one person to another, subject to a statutory consultation process. This avoided the need for an SLC to apply for a new authorisation whenever a nuclear licensed site had its management contract changed by NDA.

E.15. The Energy Act 2004 also introduced a requirement into RSA93 for the environmental regulators to undertake periodic reviews of the limits and conditions imposed onto nuclear operators in their authorisations.

E.16. The amendments to RSA93 were reflected in EPR10 when EPR10 came into force in England and Wales. EPR10 therefore requires periodic reviews of environmental permits and provides the Environment Agency and NRW with powers to transfer environmental permits between operators in both the nuclear and non-nuclear sectors. RSA93 remained in force in Scotland and Northern Ireland, and continued to grant the same powers to SEPA and NIEA.

## Article 19 Legislative and Regulatory Framework Governing the Safety of Spent Fuel and Radioactive Waste Management

1. Each Contracting Party shall establish and maintain a legislative and regulatory framework to govern the safety of spent fuel and radioactive waste management.
2. This legislative and regulatory framework shall provide for:
  - the establishment of applicable national safety requirements and regulations for radiation safety;
  - a system of licensing of spent fuel and radioactive waste management activities;
  - a system of prohibition of the operation of a spent fuel or radioactive waste management facility without a licence;
  - a system of appropriate institutional control, regulatory inspection and documentation and reporting;
  - the enforcement of applicable regulations and of the terms of the licences;
  - a clear allocation of responsibilities of the bodies involved in the different steps of spent fuel and of radioactive waste management.
3. When considering whether to regulate radioactive materials as radioactive waste, Contracting Parties shall take due account of the objectives of this Convention.

E.17. Under this Article, the UK has modernised and improved some aspects of the way it demonstrates compliance with the Joint Convention since the fourth UK report.

E.18. The following section describes the UK's nuclear safety legislative and regulatory framework applicable to spent fuel, reprocessing and radioactive waste management facilities as defined by the Joint Convention. Its content has been informed by relevant IAEA requirements. The framework is structured in a generally non-prescriptive way, based largely on requirements that need to be met 'so far as is reasonably practicable' (SFAIRP) and using concepts such as 'best practicable means' (BPM). The UK has a full suite of primary and secondary legislation that meets international legal requirements and expectations.

### Article 19.2(i) – National Safety Requirements and Regulations for Radiation Safety

E.19. For this report, the term 'radiation safety' is interpreted as nuclear safety, environmental protection and radiation protection. As a result, in the UK there are two principal strands to the legislative and regulatory framework relevant to the Joint Convention. The first strand addresses nuclear safety and radiation protection and is derived from HSWA74 and Energy Act 2013 together with the provisions relevant to each of these Acts (including NIA65 and IRR99). The second strand addresses environmental protection and is derived from either EPR10 (in England and Wales) or RSA93 (in Scotland and Northern Ireland).

E.20. Other relevant legislative routes are:

- Requirements relating to environmental impact assessments are, with some exceptions, implemented through planning legislation (one significant exception relates to the Environmental Impact Assessment for Decommissioning Reactors Regulations (EIADRR) for decommissioning nuclear power stations).
- The safety of road, rail and inland waterway transport of spent fuel and radioactive waste comes from the Carriage of Dangerous Goods Regulations 2009.
- Transfrontier shipments are covered in UK law by The Transfrontier Shipment of Radioactive Waste and Spent Fuel Regulations 2008.

E.21. Other than the introduction of the Energy Act 2013, much of the legislation is unchanged since the UK's fourth Joint Convention report. The following provides a brief summary of each key piece of legislation.

### **Energy Act 2013**

E.22. On 1 April 2014 the ONR-related provisions of the Energy Act 2013 came into force. As a result, ONR ceased being an agency of the Health and Safety Executive to become a statutory organisation in its own right. ONR is now classified as a public corporation.

E.23. Before 1 April 2014 ONR carried out some of its activities, such as the regulation of civil radioactive materials transport, on behalf of other government departments subject to inter-departmental agreements. As a result of the Energy Act 2013 ONR's purposes were described in a single piece of legislation, improving ONR's ability to be a demonstrably independent regulator.

E.24. ONR's key purposes are:

- ensuring licensees protect persons against risks of harm arising from ionising radiations from GB nuclear sites;
- ensuring licensees protect people from risks to health and safety from work activities on British sites, including risks from the storage of dangerous substances;
- ensuring the security of civil nuclear premises, the equipment used there, and sensitive information;
- ensuring UK compliance with international safeguards obligations; and
- protecting against risks relating to the civil transport of radioactive material in Great Britain by road, rail, or inland waterways.

E.25. To achieve these purposes ONR has appointed Inspectors who are suitably qualified to carry out the functions of ONR, most of whom were previously Inspectors with HSE's Nuclear Directorate. Those Inspectors are given diverse powers and authorities to regulate the nuclear industry, ranging from verbal persuasion to prosecutions for a failure to comply with the requirements of the law.

### **Health and Safety at Work etc Act 1974**

E.26. Under HSWA74, a general duty is placed on all employers to ensure, so far as is reasonably practicable, the health and safety at work of their employees and also of persons not in their employment who may be affected by their work activities.

### **Nuclear Installations Act 1965, as Amended**

E.27. Under NIA65, as amended, no non-Crown site can be used for the purpose of installing or operating a nuclear installation unless a nuclear site licence is in force. This licence is issued by ONR. Only a corporate body, such as a registered company or a public body, can hold a licence and the licence is not transferable.

E.28. Sections 1, 3 to 6, 22 and 24A of NIA65 are relevant statutory provisions of the Energy Act 2013. The Act allows conditions in the interests of safety or radioactive waste management to be attached to licences granted under the Act. This power is delegated to ONR's Chief Nuclear Inspector.

### **Environment Act 1995**

E.29. The Environment Act 1995 (EA95) (Ref. 85) provides the regulatory framework for environmental protection. It established the Environment Agency and SEPA as regulators together with their funding arrangements. EA95 also provided for the transfer of functions to the Environment Agency and SEPA, including powers and duties in relation to radioactive substances regulation.

E.30. On 1 April 2013, the UK revised its framework for the regulation of the environmental protection performance in Wales. The functions of the Countryside Council for Wales together with the Welsh operations of the Environment Agency and Forestry Commission were combined into a new body, known as Natural Resources Wales or NRW.

### **Radioactive Substances Act 1993**

E.31. RSA93 was originally pertinent to environmental protection across the entire UK nuclear industry. Since EPR10 came into force in England and Wales, the application of RSA93 has been restricted to Scotland and Northern Ireland. RSA93 requires an authorisation from the relevant regulator (SEPA or NIEA) prior to the disposal of radioactive wastes.

E.32. RSA93 also requires registration for the keeping and use of radioactive material (other than by nuclear site licensees) and authorisation for the accumulation of radioactive waste (other than on nuclear licensed sites). RSA93 empowers the appropriate environment agency to attach limits and conditions to any authorisation it issues.

E.33. The Energy Act 2004 amended RSA93 to allow nuclear licensed sites to transfer authorisations from one person to another following a statutory consultation process. This avoided the need for a new application to be made for authorisation under RSA93 when a site's management contract was changed by NDA and harmonised radioactive substances regulation with other areas of environmental regulation.

E.34. Nuclear site licensees are exempted from the requirements of RSA93 relating to the keeping and use of radioactive materials and accumulation of radioactive waste. These aspects are addressed by the licence conditions attached to each nuclear site licence and enforced by ONR.

E.35. The application of RSA93 to materials and wastes featuring low levels of radioactivity has been revised since the fourth UK Joint Convention report, by an overhaul of the exemption regime explained in paragraphs A.2.57 to A.2.60.

### **Environmental Permitting (England and Wales) Regulations 2010**

E.36. EPR10 came into force in April 2010 and replaced RSA93 in England and Wales. EPR10 incorporates radioactive substances regulation with other regulatory functions, such as the management of non-radioactive wastes, to provide industry, regulators and stakeholders with a single overarching permitting and compliance system.

E.37. EPR10 did not introduce any major changes in the scope or standards applied to radioactive substances regulation, except provision of a new power to the Environment Agency to allow staged regulation of geological disposal facilities.

E.38. EPR10 requires prior authorisation, in the form of an environmental permit, to dispose of radioactive wastes. It also requires an operator to hold an environmental permit for the keeping and use of radioactive material (other than by nuclear site licensees) and for the accumulation of radioactive wastes (other than on nuclear licensed sites).

E.39. EPR10 empowers the Environment Agency and NRW to attach limits and conditions to any environmental permit that they issue. It also provides powers to the Environment Agency and NRW to enable transfer and partial transfer of permits between operators. Under EPR10, the developer of a GDF would require an environmental permit before starting intrusive site investigation, such as drilling boreholes, at any candidate site.

E.40. The application of EPR10 to materials and wastes featuring low levels of radioactivity has been revised since the fourth UK Joint Convention report, by the overhaul of the UK exemption regime explained in paragraphs A.2.57 to A.2.60.

### **Regulatory Reform (Scotland) Act 2014**

E.41. The Regulatory Reform (Scotland) Act was passed by the Scottish Parliament on 16 January 2014. The Act enabled the regulation of environmental activities, which were defined in terms of activities capable of causing, or liable to cause, environmental harm. The Act therefore shifted the focus of the Scottish regulatory framework from pollution control to environmental harm.

E.42. The Act allowed for the implementation of a simpler, proportionate and single integrated regulatory framework enabling integration of the permissioning arrangements of SEPA's four main regimes of: water; waste; radioactive waste; and pollution prevention and control. Over the next couple of years, the requirements of RSA93 will be incorporated into the new regulatory framework.

### **Environmental Protection Act 1990**

E.43. Part IIA of the Environmental Protection Act 1990 (EPA90) (Ref. 86) set up a system for the regulation of contaminated land in England, Wales and Scotland. The regime provides a framework for identification and remediation of contaminated land. Part IIA defines contaminated land as land that poses unacceptable risks through its current use.

E.44. In 2006 in England and Wales, and 2007 in Scotland, the Part IIA regime was extended to apply to land contaminated with radioactivity resulting from uses of radioactive materials. It only applies in circumstances where the radioactivity is the result of a past practice or work activity, or the after-effects of a radiological emergency. This includes substances containing artificial radionuclides or processed natural radionuclides. Radioactivity originating from nuclear sites was excluded from these regulations. However, the liability for any harm that such radioactivity might cause is covered by NIA65.

### **Nuclear Installations Regulations 1971**

E.45. The Nuclear Installations Regulations 1971 (Ref. 87) identify those spent fuel and radioactive waste management installations for which a nuclear site licence is required. These are installations designed or adapted for:

- the processing of irradiated nuclear fuel other than processing carried out solely for the purpose of chemical or isotopic assay or metallographic investigation of such nuclear fuel; and
- the storage of irradiated nuclear fuel, or bulk quantities equal to or exceeding 100 times the levels set out in Schedule 2 of REPPiR, other than storage incidental to carriage or incidental to the purposes of chemical or isotopic assay or metallographic investigation of such nuclear fuel.

### **Ionising Radiations Regulations 1999**

E.46. The nuclear site licensing regime is complemented by IRR99 (Ref. 81) that provide for the protection of all workers and members of the public, whether on licensed sites or elsewhere, from ionising radiations.

E.47. IRR99 implements aspects of the Basic Safety Standards (BSS) Directive, including radiation dose limits for employees and members of the public for all activities involving ionising radiation.

E.48. IRR99 also implements EU Directive 90/641/Euratom on the protection of outside workers exposed to the risk of ionising radiation during their activities in

controlled areas. 'Outside workers' are defined as persons who undertake activities in radiation controlled areas designated by an employer other than their own.

E.49. Information on the practical application of IRR99 can be found in Section F.

### **Justification of Practices Involving Ionising Radiation Regulations 2004**

E.50. In August 2004, the Justification of Practices Involving Ionising Radiation Regulations 2004 (Ref. 88) came into force. These regulations provide for the justification of new classes or types of practice and the review of existing classes or types of practice where there is new and important evidence regarding their consequences or effectiveness.

### **Radiation (Emergency Preparedness and Public Information) Regulations 2001**

E.51. REPIR 2001 (Ref. 89) implemented the Articles on intervention in cases of radiation emergency in the BSS Directive. It also partly implements EU Directive 89/618/Euratom (Ref. 90) on informing the general public about health protection measures to be applied and steps to be taken in the event of an emergency. A radiation emergency is defined as a reasonably foreseeable event that is likely to result in any member of the public receiving an effective dose of 5mSv during the year immediately following the emergency.

E.52. Since the last UK Joint Convention report ONR has changed its policy for the determination of the Detailed Emergency Planning Areas around nuclear sites as required by REPIR. The background to this change in policy was described in paragraphs A.2.63 and A.2.64.

### **High Activity Sealed Sources and Orphan Sources Regulations 2005**

E.53. The EU Directive on Radioactive High Activity Sealed Sources (HASS) and Orphan Sources (2003/122/Euratom; EU HASS) (Ref. 92) came into force in December 2003. The purpose of this Directive was to prevent exposure of workers and the public to ionising radiation arising from inadequate control of HASS and orphan sources. The minimum obligations resulting from this Directive supplemented those of the BSS EU Directive 96/29/Euratom.

E.54. EU Directive 2003/122/Euratom was implemented in the UK through HASS and Orphan Sources Regulations 2005 (Statutory Instrument No. 2686) in October 2005 (Ref. 92).

E.55. The UK regulations established a regulatory system for the authorisation of practices involving HASS and modified the environmental legislation that applied across the entire UK at the time, RSA93. Subsequently, RSA93 was superseded by EPR10 in England and Wales and the HASS Regulations were introduced into EPR10. This did not involve any change in the nature or scope of the regulations, other than requiring an operator to hold an environmental permit as the form of authorisation. RSA93 together with the HASS Regulations continued to apply in Scotland and Northern Ireland.

E.56. The relevant enforcing authorities in the UK are at present: the Environment Agency in England and Wales (with NRW scheduled to take over in Wales in 2015); SEPA, and; NIEA for the following categories of HASS:

- All HASS located anywhere other than on nuclear licensed sites;
- mobile HASS located on nuclear licensed sites; and
- HASS owned by tenants based on nuclear licensed sites.

E.57. EPR10 did not provide any regulatory powers regarding the registration of fixed HASS located on nuclear licensed sites. To address this, ONR issued a Specification under Nuclear Site Licence Condition 25(4) to require the relevant

licensees to provide information to ONR to demonstrate compliance with the HASS legislation.

E.58. The holders of HASS must keep formal records of all HASS in their possession and register the HASS with the appropriate enforcing authority. Additionally, HASS users are required to notify the relevant enforcing authority whenever they come into possession of new HASS; transfer HASS to another user; transfer HASS back to a manufacturer; or transfer HASS to a Recognised Installation for long-term storage. They are also required to provide records to the relevant enforcing authority at periodic intervals no greater than 12 months.

E.59. Users of HASS must provide information and training to their staff in order to inform them of the precautionary measures required when dealing with HASS, including appropriate procedures for handling orphan sources (ie the unexpected discovery of sources not previously accounted for). They must also carry out periodic leak tests, based on international standards, to confirm that the integrity of their HASS containment remains sound. In addition, financial provision must be made to cover the cost of managing disused sources safely, including the eventuality of the holder becoming insolvent or going out of business.

E.60. The EU Directive requires Member States to identify Recognised Installations for the long-term storage of disused HASS, ie HASS that have reached the end of their useful lives and are no longer intended to be used for the practice for which they were originally registered. The UK regulatory bodies involved in HASS enforcement have worked together to identify suitable facilities in the UK for the long-term storage of disused HASS.

### **Management of Health and Safety at Work Regulations 1999**

E.61. The Management of Health and Safety at Work Regulations 1999 (MHSW99) (Ref. 93) include requirements on employers, and hence nuclear site licensees, to:

- make assessments of the health and safety risks of their activities;
- make, give effect to and record the appropriate health and safety arrangements;
- ensure that their employees are provided with appropriate health surveillance;
- appoint an adequate number of competent persons to assist them in complying with health and safety legislation;
- establish and give effect to procedures to be followed in the event of serious or imminent danger arising;
- provide employees with information concerning the:
  - (a) risks to their health and safety;
  - (b) preventive and protective measures;
  - (c) procedures necessary in the event of serious or imminent danger; and
  - (d) persons nominated to implement evacuation procedures;
- co-operate with other employers to enable statutory health and safety obligations to be met, including the provision of health and safety information; and
- ensure that employees, taking into account their capabilities, have adequate health and safety training which is repeated periodically as appropriate.

E.62. The requirements of MHSW99 are very wide-ranging and over-arching in nature. Where these requirements overlap with other health and safety regulations, a

demonstration of compliance with the more specific regulations, such as NIA65 or IRR99, is normally sufficient to achieve compliance with MHSW99.

### **Health and Safety (Fees) Regulations**

E.63. The Health and Safety (Fees) Regulations (Ref. 94) provide for the charging of fees for a proportion of the work of HSE and ONR in relation to assessing proposals for any new nuclear installation. This includes all matters relating to the installation's construction, commissioning, operation and decommissioning, that require assessment by ONR prior to the issue of a nuclear site licence under NIA65.

E.64. Of relevance to radiological protection, HSE has operated a Fee for Intervention (FFI) cost recovery scheme since 1 October 2012. Under the Health and Safety (Fees) Regulations 2012, those who commit a material breach of health and safety law are liable for recovery of HSE's related costs, including inspection, investigation and the process of taking enforcement action.

### **Radioactive Contaminated Land Regulations**

E.65. The Radioactive Contaminated Land (Modification of Enactments) (England) (Amendment) Regulations 2007 (Ref. 95) modified EPA90 in England so that it applies to radioactivity originating from nuclear sites. Similar arrangements or parallel regulations have been applied by the devolved administrations in Scotland (Ref. 96), Wales (Ref. 97) and Northern Ireland (Ref. 98).

### **Nuclear Reactors (Environmental Impact Assessment for Decommissioning) Regulations**

E.66. The Nuclear Reactors (Environmental Impact Assessment for Decommissioning) Regulations were introduced in 1999 (Ref. 99) and amended in 2006 (Ref. 100). The regulations require an environmental impact assessment for decommissioning nuclear power stations and nuclear reactors.

E.67. These regulations address the requirements of EU Directive 85/337/EEC (Ref. 101) (as amended by EU Directives 97/11/EC (Ref. 102), 2003/35/EC (Ref. 103) and 2009/31/EC (Ref. 104)) on the assessment of the effects of certain public and private projects on the environment.

E.68. Since the last UK Joint Convention report, the initial EU Directive 85/337/EEC and its three subsequent amendments have been codified by EU Directive 2011/92/EU of 13 December 2011 (Ref. 105). EU Directive 2011/92/EU was itself amended by EU Directive 2014/52/EU (Ref. 106) in 2014.

E.69. Before decommissioning or dismantling of a nuclear power station or nuclear reactor exceeding a defined threshold for continuous thermal load can take place, the relevant licensee must apply to ONR for a formal consent, undertake an Environmental Impact Assessment (EIA) and provide an environmental statement. Schedule 1 of the regulations specifies the information to be included in the environmental statement.

E.70. Following the granting of regulatory consent, the project must proceed in accordance with the conditions of the consent. Conditions of consent typically require the licensee to prepare and implement an Environmental Management Plan (EMP).

E.71. If a licensee wishes to subsequently change or extend the decommissioning project, Regulation 13 requires the licensee to consider the potential effect on the environment of the amended approach. If a proposed change or extension has potential for a significant adverse environmental impact, the licensee must apply to ONR for a determination as to whether an EIA covering the change or extension is required. The change or extension cannot be implemented until ONR makes the determination.

## Other Relevant Legislative Frameworks

### Planning / Environmental Assessment Regulation

E.72. Under the Localism Act 2011, the Infrastructure Planning Commission (IPC) was abolished and the functions of the IPC transferred to the Planning Inspectorate on 1 April 2012. The National Infrastructure Directorate within the Planning Inspectorate now examines proposals for Nationally Significant Infrastructure Projects (NSIPs) and makes recommendations to the relevant Secretary of State, who makes the decision on whether to grant or to refuse development consent. National Policy Statements provide the policy framework for decisions made under these new arrangements.

E.73. Proposals for new nuclear power stations are considered to be NSIPs, in response to which the Planning Inspectorate's recommendations are made to the Secretary of State for Energy and Climate Change. The policy basis on which such applications are considered, including the assessment of environmental impacts that may result from the construction, operation and decommissioning of a new nuclear power station, is set out in the 2011 Nuclear National Policy Statement.

E.74. All proposals for projects that are subject to the European EIA Directive, including new nuclear power stations, must be accompanied by an Environmental Statement from the applicant describing the aspects of the environment likely to be significantly affected by the project. The Secretary of State will make a decision following consultation with the Environment Agency and other relevant regulators.

E.75. The 2014 White Paper 'Implementing Geological Disposal' outlined the UK Government's intention to recognise the establishment of a GDF as an NSIP in England.

### Transport of Radioactive Materials

E.76. ONR has carried out regulation of the transport of radioactive materials and wastes by road, rail and inland waterways within the UK since October 2011; regulation of the transport of radioactive materials and wastes by sea has remained the responsibility of the Department of Transport (through the Maritime and Coastguard Agency).

E.77. The UK's regulatory framework for the transport of radioactive materials reflects the following international codes, treaties and domestic regulations:

- International:
  - International Atomic Energy Agency  
TS-R-1 Regulations for the Safe Transport of Radioactive Material  
2009 Edition
  - United Nations Economic Commission for Europe  
European Agreement concerning the International Carriage of  
Dangerous Goods by Road (ADR) 2013 Edition
  - Intergovernmental Organisation for International Carriage by Rail  
Regulations concerning the International Carriage of Dangerous  
Goods by Rail (RID) 2013 Edition
  - International Maritime Organization  
International Maritime Dangerous Goods (IMDG) Code Amendment  
36-12
- Road:
  - Great Britain only  
The Energy Act 2013 (2013 c. 32)

The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009 (SI 2009 No. 1348)

The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment (Amendment) Regulations 2011 (SI 2011 No. 1885)

The Energy Act 2013 (Office for Nuclear Regulation) (Consequential Amendments, Transitional Provisions and Savings) Order 2014 (SI 2014 No. 469)

Northern Ireland only

The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations (Northern Ireland) 2010, SR 2010 No 160

The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment (Amendment) Regulations (Northern Ireland) 2011, No 365

- Rail:

Great Britain only

The Energy Act 2013 (2013 c. 32)

The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009 (SI 2009 No. 1348)

The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment (Amendment) Regulations 2011 (SI 2011 No. 1885)

The Energy Act 2013 (Office for Nuclear Regulation) (Consequential Amendments, Transitional Provisions and Savings) Order 2014 (SI 2014 No. 469)

- Sea:

British registered ships and all other ships while in UK territorial waters:

The Merchant Shipping Act 1995 (1995 c. 21)

The Merchant Shipping (Dangerous Goods and Marine Pollutants) Regulations 1997 (SI 1997 No. 2367)

Merchant Shipping Notice MSN 1835 (M) The Carriage of Dangerous Goods and Marine Pollutants in Packaged Form: Amendment 36-12 to the International Maritime Dangerous Goods (IMDG) Code

- Air:

The Air Navigation Order 2009 (SI 2009 No. 3015)

The Air Navigation (Dangerous Goods) Regulations 2002 (SI 2002 No. 2786)

The Air Navigation (Dangerous Goods) (Amendment) Regulations 2012 (SI 2012 No. 3054)

E.78. These regulations change in odd numbered years for road and rail through the EU Directives. The Sea and Air regulations flow from the relevant UN bodies – the International Maritime Organisation (IMO) and the International Civil Aviation Authority (ICAO) – and are amended as and when deemed appropriate by these bodies. The applicable UK regulations follow the international regulations.

### **Transfrontier Shipments of Radioactive Waste and Spent Fuel**

E.79. EU Directive 2006/117/Euratom ('the Shipments Directive') (Ref. 107) provides the regulatory framework for supervision and control of shipments of radioactive waste and spent fuel into, out of, or through EU Member States. The Directive was transposed into UK law by the Transfrontier Shipment of Radioactive Waste and Spent Fuel Regulations 2008 (Ref. 108), which came into force in December 2008.

E.80. In March 2008, via a publication in the European Journal, the European Commission established a standard document for the supervision and control of shipments of radioactive wastes and spent fuel (Ref. 109).

### **European Directive on the Management of Spent Fuel and Radioactive Waste**

E.81. EU Directive 2011/70/Euratom (Ref. 110) established an EC framework for the responsible and safe management of spent fuel and radioactive waste and was adopted by the Council of the European Union on 19 July 2011.

E.82. The Directive aims to ensure a high level of safety, avoiding the imposition of undue burdens on future generations and enhancing transparency. The Directive is compatible with the principles and requirements of the Joint Convention and makes some of them legally binding under EU law. The Directive supplements the basic standards in the Euratom Treaty as regards the safety of spent fuel and radioactive waste without prejudice to the BSS Directive.

E.83. The Directive:

- reaffirms the ultimate responsibility of Member States for the management of the spent fuel and radioactive waste generated in them, including the establishment and maintenance of national policies and frameworks (legislative, regulatory and organisational) securing the needed resources and transparency of information;
- allows Member States to define their own nuclear fuel cycle policy. Storage of radioactive waste, including long-term storage, is recognised as an interim solution but not as an alternative to disposal. To this end, Member States are required to establish, implement and maintain national programmes for the management of spent fuel and radioactive wastes from the point of generation to the point of disposal;
- requires Member States to ensure that information on the management of spent fuel and radioactive wastes is made available to workers and the public, with the public given opportunities to participate in relevant decision-making processes;
- requires Member States to periodically, at least every 10 years, invite international peer reviews of their national framework, competent regulatory authority and national programme to ensure high safety standards, with the outcomes of peer reviews reported to the European Commission and other Member States. Member States are required to regularly review and update their national programmes, taking into account technical and scientific progress as appropriate, as well as recommendations, lessons learnt and good practices from peer reviews.

E.84. The Directive came into force on 23 August 2011 and its provisions were transposed in the UK by the deadline of 23 August 2013 using primarily NIA65 and the Nuclear Site Licence Conditions made under it, together with the relevant provisions of EPR10 (England and Wales) and RSA93 (Scotland and Northern Ireland).

### **European Directive on Nuclear Safety**

E.85. EU Directive 2009/71/Euratom (Ref. 111) was amended on 8 July 2014. The transposition date for the amended Directive is in 2017.

E.86. The previous version of the Directive was consistent with the UK's extant regime of nuclear regulation. In order to ensure several detailed provisions were fully transposed into UK legislation, small amendments were made in 2011 to Licence

Conditions 17 and 36 from NIA65. The UK is not yet in a position to state categorically that its regulatory regime is consistent with the Directive as amended, though it is expected that no major changes to the UK regime will be needed to demonstrate full transposition in due course.

### **Groundwater Daughter Directive 2006**

E.87. The requirements on discharges of radioactive substances under EC Directive 2006/118/EC (Ref. 112) on the protection of groundwater against pollution and deterioration are implemented through EPR10 in England and Wales and RSA93 in Scotland and Northern Ireland.

### **Legislation Specific to Northern Ireland**

E.88. There are no major nuclear installations in Northern Ireland, which has its own regulatory framework that mirrors that in the rest of the UK. In addition to RSA93, the relevant statutory provisions for the province include:

- The Health and Safety at Work (Northern Ireland) Order 1978 (Ref. 113);
- The Ionising Radiation Regulations (Northern Ireland) 2000 (Ref. 114);
- The Radiation (Emergency Preparedness and Public Information Regulation) (Northern Ireland) 2001 (Ref. 115);
- The Radioactive Contaminated Land Regulations (Northern Ireland) 2006 (Ref. 116); and
- The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment (Northern Ireland) Regulations 2010 (Ref. 117).

E.89. The Department of the Environment, Northern Ireland has made legislation (The Radioactive Substances (Basic Safety Standards) Regulations (Northern Ireland) 2003) (Ref. 118), under powers conferred by the European Communities Act 1972, to meet the obligations imposed by the BSS Directive.

### **Article 19.2(ii) – Licensing Spent Fuel and Radioactive Waste Management Activities**

E.90. The licensing of spent fuel and radioactive waste management activities for the purposes of the Joint Convention relates to four distinct applications of UK law, each of which is considered below:

- ‘Nuclear Installations’ are granted nuclear site licences by ONR’s Chief Nuclear Inspector, under powers delegated by the Energy Act 2013 and NIA65. A nuclear site licence is a legal requirement for all spent fuel storage and reprocessing activities, in addition to any accumulation of a ‘bulk quantity’ of radioactive materials or radioactive wastes.
- An accumulation of radioactive waste below the threshold to be defined as a ‘bulk quantity’ does not require a nuclear site licence. In those instances, an environmental permit or authorisation is required from the relevant environmental regulator.
- Disposal of radioactive waste from any site, including the transfer of waste between sites, requires an environmental permit or authorisation from the relevant environmental regulator.
- For most sites, planning consent will also be required from the relevant local planning authority before any new activity involving the management of spent fuel or radioactive waste can take place.

E.91. Apart from the introduction of the Energy Act 2013, there has been little change in the applicable parts of the UK legal framework since the fourth UK Joint Convention report.

### **Nuclear Site Licensing**

E.92. Under NIA65, no non-Crown site may be used for the purpose of installing or operating a nuclear installation unless a licence has been granted by ONR's Chief Nuclear Inspector. Such sites include those for spent fuel and radioactive waste as prescribed in NIA65 and the Nuclear Installations Regulations 1971.

E.93. The form and structure of the site licence is the same for all nuclear installations. The licence is granted to the user of the site for the purpose of installing and operating an installation to undertake licensable activities. Schedules attached to it provide:

- a definition of the site (with reference to a site map);
- a description of the licensable aspects of the installation or a definition of the licensable processes; and
- a series of 36 standard LCs (Ref. 119).

E.94. Once granted, the nuclear site licence is the principal and immediate method for ONR to grant the required permissions for a licensee's operations. LCs define issues relevant to nuclear safety and radioactive waste management to which a licensee should pay attention to ensure safe operation of the site. While some conditions impose specific duties, others require the licensee to devise and implement 'adequate arrangements' in particular areas. The areas covered include: ensuring the safety of plant; controlling operations; control and supervision; emergency arrangements; and management of radioactive wastes. Breach of an LC is an offence under NIA65.

E.95. LC1 prescribes that a licensee's arrangements must be described in writing. LC6 requires the licensee to make records in order to demonstrate compliance. Each licensee can develop the detail of its arrangements in a manner that best suits its particular business, but at all times must demonstrate that safety is being managed adequately. ONR's inspectors regularly inspect the arrangements and their implementation.

E.96. The Chief Nuclear Inspector's powers under a nuclear site licence are described further under Article 19.2(v).

E.97. A significant proportion of ONR's business involves the granting of formal permissions for the activities of licensees. This is achieved by use of written licence instruments (such as Consents and Approvals). Such activities involve the licensee producing a documented safety case that demonstrates the proposed activity is adequately safe.

E.98. ONR's inspectors assess the adequacy of the submitted safety case and may be assisted by external expertise. When the Inspector is satisfied, ONR will produce a report supporting the reasons why permission should be given to the licensee to proceed. ONR has arrangements in place to ensure that the authorising Consents and Approvals are signed and issued at a defined management level after internal peer review.

E.99. The licensing regime is described in more detail in the publication 'Licensing of Nuclear Installations' (Ref. 84).

E.100. The nuclear installation licensing system applies throughout the lifetime of a civil nuclear site, including installation, commissioning, operation and decommissioning. A licensee can only be relieved of its responsibility for a site under NIA65 if either: a licence for the site is issued to another body; or ONR is satisfied

that there has ceased to be any danger from ionising radiations from anything on the site.

### **Appeals process**

E.101. Nuclear site licensees have the right of appeal to an employment tribunal in respect of Improvement and Prohibition Notices issued to them under the Energy Act 2013. In addition to this, a licensee or licence applicant who is dissatisfied with a particular regulatory decision may raise concerns with the relevant ONR inspector and ONR senior management. Should issues not be resolved at this level, they may request a 'decision review' to be undertaken by the ONR Chief Executive Officer.

E.102. Within UK law, a judicial review can challenge regulatory decisions, but this applies only to a review of process and not to the decision itself.

E.103. In relation to the construction of new installations, applicants who are refused planning permission by a local planning authority, or who are granted permission subject to conditions that they find unacceptable, may appeal to the Secretary of State.

E.104. Additionally, NIA65 provides for ONR to: “consider any representation which is (a) made to it by any organisation representing persons who have duties on a site in respect of which a nuclear site license is in force, and (b) relates to the exercise by the authority of any of its powers under this section in relation to the site”.

E.105. There has been very limited experience of this provision being exercised and it only allows appeal to ONR. There is no other provision in NIA65 for the granting of a legal instrument or for regulatory decisions by ONR to be formally challenged, reflecting the robustly independent nature of the UK regulatory regime.

### **Criteria for Nuclear Site De-licensing**

E.106. In 2008, HSE's Nuclear Directorate published a policy statement and supporting guidance for its Inspectors (Refs 120 and 121) to provide a basis for regulatory judgements on the de-licensing of a nuclear licensed site. De-licensing in this context means the ending of a licensee's period of responsibility under NIA65.

E.107. NIA65 requires that de-licensing can only occur after ONR gives notice in writing to the licensee that, in its opinion, there has ceased to be any danger from ionising radiation from anything on the site or, as the case may be, on any part of the site.

E.108. The policy statement concluded that, after termination of licensable activities on a site and following decontamination and clean up, an acceptable level of residual risk from any radiological hazard remaining on site should be in line with HSE's views on broadly acceptable risks and the concept of reducing risks as low as reasonably practicable (ALARP).

E.109. ONR considers that an additional risk of death to an individual of one in a million per year, is 'broadly acceptable' to society in line with the HSE tolerability of risk framework (Refs 122 and 123). Applying this to nuclear licensed sites, any residual radioactivity above natural background, which is satisfactorily demonstrated to pose a risk of less than one-in-a-million per year, would be deemed 'broadly acceptable'. For practical purposes, ONR currently uses this criterion as a threshold for removal of a site from regulatory control under NIA65, ie allows the site to be de-licensed.

E.110. ONR is currently reviewing its approach to de-licensing to ensure that it remains appropriate and proportionate.

### **Application of very low risk and ‘no danger’ to radioactive discharges**

E.111. Legislation such as EPR10, RSA93, the allowable exemptions to the legislation, and the BSS Directive that set standards for the protection of human health, may be used to inform decisions on what constitutes ‘no danger’.

E.112. Under EPR10, the UK Government has issued statutory guidance to the Environment Agency that states: “Where the prospective dose to the most exposed group of members of the public from discharges from a site at its current discharge limits is below 0.01mSv/year the Environment Agency should not seek to reduce further the discharge limits that are in place, provided that the holder of the authorisation...applies and continues to apply BAT.”

E.113. In Scotland and Northern Ireland, in line with current policy, SEPA and NIEA do not seek further reductions in discharges to comply with RSA93 where exposures of members of the public are optimised and less than 0.02mSv/yr.

E.114. Annex 1 of the BSS Directive allows Member States to exempt a practice where appropriate, and without further consideration, if doses to members of the public are of the order of 0.01mSv or less per year. This dose limit broadly equates to the 1 in a million per year ‘no danger’ criterion. To place the residual risks into a broader context, it should be noted that the average risk of death in the UK from naturally occurring radioactivity is estimated to be around 1 in 10,000 per year as the average background dose in the UK is around 2mSv/yr.

E.115. In September 2011, following a review of the historic UK exemption orders that originally existed under RSA93, the UK Government introduced amendments to the exemption regime for radioactive substances. The new approach provides consistent expectations based on risk and linked to the European Standards, delivered through the present-day framework of environmental legislation (RSA93 in Scotland and Northern Ireland, EPR10 in England and Wales). In England and Wales the changes to the EPR10 exemption regime were introduced through the Environmental Permitting (England and Wales) (Amendment) Regulations 2011.

### **Authorisation of the accumulation of radioactive waste**

E.116. Prior authorisation, under EPR10 in England and Wales or RSA93 in Scotland and Northern Ireland, is required for the keeping and use of radioactive material and for the accumulation of radioactive waste. These requirements do not apply on licensed nuclear sites, as similar provisions are derived from the licence conditions attached to the nuclear site licences enforced by ONR. ONR consults the appropriate environmental regulator whenever it sets such conditions.

E.117. Statutory consultation arrangements apply in Scotland and Northern Ireland under RSA93. Under EPR2010 in England and Wales, ONR the Environment Agency and NRW have non-statutory Working Together Agreements that set out consultation arrangements.

### **Radioactive waste disposal**

E.118. No person may dispose of radioactive waste except in accordance with an environmental permit under EPR10 or an authorisation under RSA93, except where the waste has sufficiently low levels of radioactivity to be excluded or exempted from EPR10 or RSA93. Exempted activities are typically not subject to the full requirements of the regulations, although may have some qualifying conditions attached (eg disposal of a limited volume, or alongside a specified volume of non-radioactive waste).

E.119. The regulatory bodies are the Environment Agency (for sites in England), NRW, SEPA and NIEA (noting that only a very limited amount of radioactive waste disposal, generated at non-nuclear facilities, occurs in Northern Ireland).

E.120. Many features of RSA93 originated from the earlier Radioactive Substances Act 1960, with later modernisation (eg better public access to information and wider enforcement powers) made by EPA90.

E.121. Environmental permits and authorisations for disposal of radioactive waste include schedules, which typically address: limits and conditions; improvement conditions; and additional information requirements. Under EPR10, environmental permits allow the transfer of radioactive wastes between any two sites where the two site operators hold environmental permits to accumulate or dispose of the relevant type of waste. However, the environment agencies can specify particular disposal destinations in environmental permits or authorisations if necessary.

E.122. For environmental permits or authorisations for the disposal of radioactive wastes from nuclear licensed sites, ONR is a statutory consultee.

### **General limitations and conditions**

E.123. The environment agencies set conditions that state that operators are required not only to comply with numerical limits on the levels of activity that may be discharged, but also to use BATs under EPR10 (England and Wales) or BPMs under RSA93 (Scotland and Northern Ireland) to minimise the amount of radioactivity discharged. Operators are required to use BAT or BPM to minimise the volume and activity of:

- radioactive waste produced, which will require ultimate disposal under the environmental permit or authorisation;
- radioactive waste disposed of to the environment; and
- radioactive waste disposed of by transfer to other premises.

E.124. These conditions provide the main basis for ensuring that the exposures of members of the public accord with the International Commission on Radiological Protection (ICRP) principle of ensuring exposures are ALARA. They also encourage a holistic approach to radioactive waste management, exert a downward pressure on discharges, are consistent with the objectives of the UK National Strategy for Radioactive Discharges, and help to ensure that BAT under EPR10 or BPM under RSA93 is implemented.

E.125. The environmental regulators may also set conditions, including those relating to measurement and assessment of discharges, record keeping and provision of information to the agencies.

E.126. The environmental regulators can set limits and conditions that apply exclusively to an individual disposal route. Disposal limits set by the agencies take into account a number of factors, including: radiological impact on humans and the environment; safety; operational need; socio-economic and cost implications; legal requirements; government policy; and international commitments. For the setting of limits and conditions on radioactive discharges from nuclear licensed sites, ONR is a statutory consultee.

E.127. The annual limits on discharges of radionuclides to the environment that are included in environmental permits or authorisations are not set at a level corresponding to the boundary between acceptable and unacceptable radiological impact. They result in estimated doses well below the annual dose limit (1mSv/year) set out in IRR99 for exposure of members of the public to artificial radiation, excluding medical exposure. Even if discharges from each of the sites were made at 100% of the limits included in environmental permits or authorisations, the radiological impact on the most exposed members of the public would still be within the annual dose limit.

E.128. In setting limits, the environment agencies aim to apply downward pressure on discharges. The expected levels of discharge and the discharge limits which it is appropriate for the environment agencies to set, are radionuclide-specific and site-

specific. The limits reflect the design and operational history of each site, as well as the planned future operations.

#### **Improvement and additional information requirements**

E.129. An environmental permit or authorisation may include requirements on the operator to carry out a programme of investigations and improvements. This may include a requirement for the operator to benchmark its own performance against industry good practice.

#### **Ministerial powers**

E.130. Under EPR10, the Secretaries of State for Energy and Climate Change, and Health, hold joint powers to call in applications for environmental permits for their own determination, in which case a local inquiry may be held. The Secretaries of State can also issue Directions to the Environment Agency.

E.131. The Welsh Ministers have similar powers of call in under EPR10 in respect of applications for environmental permits in Wales and can issue Directions to NRW.

E.132. In Scotland, Scottish Ministers hold powers under RSA93. These include powers to direct applications for authorisation to the Scottish Ministers for their determination under Section 24 of RSA93. Scottish Ministers may also cause a local inquiry to be held in relation to any application made under RSA93.

### Article 19.2(iii) – Prohibition of Operation without a Licence

E.133. The UK legislative framework prohibits the operation of spent fuel or radioactive waste management facilities without a licence as described in Table E.1 below:

<b>Table E.1 Provisions for prohibition of the operation of spent fuel or radioactive waste management facilities without a licence</b>			
Activity	Legislation	Enforcing Authority	Type of licence
Construction, commissioning, operation and decommissioning of spent fuel or radioactive waste management facilities required as a result of nuclear industry activities, including accumulation, cannot take place on a non-Crown site without a nuclear site licence	EA13 & NIA65	ONR	Nuclear Site Licence
The keeping and use of radioactive material (other than on licensed nuclear sites)	EPR10 (E & W) RSA93 (S & NI)	Environment Agency (E) NRW (W) SEPA (S) NIEA (NI)	Permit Permit Registration Registration
Accumulation of radioactive waste (other than on licensed nuclear sites)	EPR10 (E & W) RSA93 (S & NI)	Environment Agency (E) NRW (W) SEPA (S) NIEA (NI)	Permit Permit Registration Registration
Disposal of radioactive waste	EPR10 (E & W) RSA93 (S & NI)	Environment Agency (E) NRW (W) SEPA (S) NIEA (NI)	Permit Permit Registration Registration
Installations for: <ul style="list-style-type: none"> <li>processing of spent fuel or high level radioactive waste</li> <li>final disposal of spent fuel or radioactive waste</li> <li>storage of spent fuel or radioactive waste in a different site than the production site</li> </ul>	T & CP (EIA)(E & W) Regulations Town and Country Planning (Scotland) Act 1997/ and provisions of the Planning etc (Scotland) Act 2006 EIA(Scotland) Regulations 1999 Planning(EIA) Regulations(NI) 1999	Local Planning Authority	Planning Consent
Decommissioning of a reactor of sufficiently high thermal load	EIADRR99	ONR	Consent
<p>(E) = England: (W) = Wales, (S) = Scotland, (NI) = Northern Ireland  EIA = Environmental Impact Assessment, T &amp; CP = Town and Country Planning  EIADR99 = Nuclear Reactors (Environmental Impact Assessment for Decommissioning Regulations 1999 (amended in 2006)  Note that most of the activities for which a nuclear site licence is required will also be the subject of other regulatory requirements. Such activities will therefore appear on several rows in the table above.</p>			

## Article 19.2(iv) – Institutional Control, Regulatory Inspection, and Documentation and Reporting

### **Institutional control**

E.134. Under the requirements of NIA65, the ‘period of responsibility’ of a licensee for a site handling, treating or storing spent fuel or radioactive waste under a nuclear site licence begins with the granting of the licence and ends with whichever of the following dates is the earlier:

- the date when ONR gives notice in writing to the licensee that in the opinion of ONR there has ceased to be any danger from ionising radiations from anything on the site; or
- the date when a new nuclear site licence is granted, either to the same licensee or another organisation.

E.135. The legislation provides for a continuous period of institutional control of a licensed nuclear site, whether it is operated by a single organisation for the whole of its life or if responsibility is transferred between a succession of operators, until ONR considers there to no longer be any danger from ionising radiations on the site.

### Regulatory inspection

#### **Office for Nuclear Regulation**

E.136. ONR is the nuclear safety regulator for all sites subject to a nuclear site licence in the UK. ONR develops detailed intervention plans for each of the UK licensed nuclear sites, which reflect ONR’s overall strategic priorities. ONR has provided dedicated guidance to its Inspectors to assist them in formulating intervention plans. The plans ensure regular checks on compliance with all licence condition requirements and targets regulatory activity on identified key issues to optimise the use of ONR resources to influence levels of safety.

E.137. ONR liaises with fellow regulators at the site level when formulating intervention plans. Regulation of the management of radioactive wastes on nuclear licensed sites requires close liaison between ONR and the environment agencies, due to common interests and the need to regulate in a co-ordinated manner.

E.138. Relevant factors in setting ONR’s priorities may include:

- the characteristics, hazards, risks and timescales associated with any activities involving radioactive wastes and spent fuel on the site;
- the state of maturity and complexity of the licensee’s arrangements to manage spent fuel and radioactive wastes; and
- ONR’s level of confidence in the licensee’s track record of compliance with all applicable legal requirements, based on evidence from previous inspections and assessments.

E.139. Each major nuclear licensed site has a nominated ONR Site Inspector. Large multi-plant sites have more than one Site Inspector, eg the Sellafield site. ONR also has Specialist Inspectors who carry out detailed assessments of particular technical aspects of licensees’ safety cases and assist in the delivery of Site Intervention Plans. Usually, the Site Inspector will be a licensee’s first point of contact, but for a large modification such as the construction of a new plant or introduction of a new process, the Site Inspector may delegate regulatory responsibility to a nominated Project Inspector. The Project Inspector will then co-ordinate the review and assessment of the applicable safety cases by ONR’s Specialist Inspectors.

E.140. Nominated Site Inspectors normally lead any necessary ONR investigations of incidents.

E.141. In addition to inspection and assessment work for specific sites, ONR carries out generic work to support and underpin its regulatory activities. This work includes the development of regulatory strategy, the production of standards and guidance for inspectors, the development of business management systems and international co-operation.

### **Environment Agency, Natural Resources Wales and Scottish Environment Protection Agency**

E.142. The environmental regulators carry out site inspections and formal reviews of the limits and conditions in environmental permits under EPR10 and in RSA93 authorisations. This ensures operators are complying with the requirements of the relevant permits/authorisations and that these remain appropriate and up to date. Periodic reviews are a formal requirement under EPR10 and RSA93 as amended by the Energy Act 2004. The Environment Agency has implemented this requirement through annual reviews of environmental permits.

E.143. When required, team inspections or audits may be carried out on a particular plant or to investigate particular aspects. Joint inspections are sometimes carried out with ONR and other regulators from within the UK and overseas. Site inspections are also carried out to investigate incidents.

### **Documentation and reporting**

E.144. Regulatory requirements for documentation and reporting are contained in:

- ONR's standard nuclear site licence conditions (Ref. 119); and
- the conditions for radioactive waste disposal from nuclear sites set out by the Environment Agency and NRW in Section 3 of environmental permits. SEPA applies similar conditions in Schedule 2 of its authorisations.

### **Article 19.2(v) – Enforcement of Applicable Regulations and of the Terms of the Licences**

E.145. Both safety and environmental law in the UK are based on the concept that dutyholders should do all that they reasonably can to minimise risks to humans and the environment. These concepts are embodied in law by terms like: so far as reasonably practicable or SFAIRP; best available techniques or BAT; best practicable means or BPM; and as low as reasonably achievable or ALARA. The following paragraphs summarise the practical aspects of enforcement.

### **Office for Nuclear Regulation**

E.146. The Energy Act 2013 prescribes those breaches of legislation that constitute offences which ONR will enforce. With respect to the Joint Convention it is an offence for a dutyholder, "to contravene any health and safety regulations... or any requirement or prohibition imposed under any such regulations (including any requirement or prohibition to which he is subject by virtue of the terms of or any condition or restriction attached to any licence, approval, exemption or other authority issued, given or granted under the regulations)".

E.147. HSWA74 and the Energy Act 2013 enable ONR to appoint Inspectors and give those Inspectors regulatory powers to enforce the applicable regulations. HSE has published its Enforcement Policy (Ref. 124), which is implemented through the Enforcement Management Model (EMM) (Ref. 125). ONR has produced guidance to its own Inspectors on use of the EMM in ONR (Ref. 126) and has its own Enforcement Policy Statement (Ref. 127). ONR will take action if it considers the law has been broken, dependent on circumstances such as the licensee's safety record and the scale of risk to which people or the environment were exposed. Enforcement action may range from a verbal discussion with the operator, to formal enforcement

notices or, in serious cases, prosecution. ONR has considerable enforcement powers, some originating from HSWA74, the Energy Act 2013, via conditions attached to nuclear site licences and other relevant statutory provisions such as IRR99. For example, under HSWA74 and the Energy Act 2013, ONR Inspectors can issue Improvement Notices, Prohibition Notices and instigate prosecutions under criminal law.

E.148. ONR consults the relevant environment agency during any consideration of formal enforcement action on the management of radioactive wastes. In some circumstances, a licensee may breach the requirements of UK law applicable to both safety and environmental protection in a single event. In such cases, ONR and the relevant environment agency may undertake co-ordinated enforcement action, such as the prosecution of Sellafield Ltd described in paragraphs A.3.80 to A.3.82.

E.149. In England and Wales, ONR's Inspectors may initiate prosecutions for breach of the relevant provisions. In Scotland, the matter is referred to the Procurator Fiscal for prosecution. In such cases, legislation prescribes the maximum penalties. For example, a breach of a nuclear site licence condition may result in imprisonment for up to two years, an unlimited fine, or both.

### **Environmental Regulators**

E.150. The environment agencies have enforcement powers for the disposal of radioactive wastes on or off a licensed nuclear site. For nuclear licensed sites, the environment agencies may issue either an environmental permit or authorisation if, after consultation, they are satisfied with the applicant's proposals. Before granting an environmental permit or authorisation, the environment agencies undertake rigorous checks to ensure that either BAT or BPM are in place to protect human health and the environment and ensure resultant doses are ALARA.

E.151. The UK and Welsh Governments have decided that the Environment Agency and NRW should ensure that BAT is applied in place of BPM and BPEO in England and Wales. The UK and Welsh Governments believe that BAT will deliver an environmental protection regime for radioactive discharges that is more consistent with similar regimes applied in other countries. BPM continues to apply in Scotland and Northern Ireland.

E.152. Environmental permits and authorisations comprise standard conditions and a set of schedules that set out disposal routes to be used, and set limits on the quantities of waste that may be disposed of within set time periods. The environmental permits or authorisations may include a schedule for improvements and/or additional information to be supplied within specified time limits.

E.153. When the environment agencies have reasonable cause to believe that there has been a breach of the conditions or limits set in an authorisation or environmental permit, they have powers under EA95 to investigate.

E.154. The Environment Agency and NRW have powers under EPR10 in England and Wales to issue Enforcement Notices and Suspension Notices. SEPA and NIEA have powers under RSA93 in Scotland and Northern Ireland to issue Enforcement Notices and Prohibition Notices. The enforcement powers under EPR10 and RSA93 are consistent.

E.155. Decisions on regulatory action, including the issuing of Enforcement Notices, Suspension Notices or Prohibition Notices, are only taken after very careful consideration of the implications. Regulatory action will be proportionate and can range from verbal discussion to prosecution (in England and Wales the Environment Agency and NRW themselves can undertake prosecution, whereas in Scotland SEPA recommends prosecution to the Procurator Fiscal).

E.156. Variation of the conditions or limits in an environmental permit or authorisation is another course of action open to the environment agencies.

## **Food Standards Agency**

E.157. The Food Standards Agency is a consultee to the Environment Agency and NRW through consultation arrangements made under EPR10 and is a statutory consultee to SEPA for the granting of new or revised authorisations under RSA93. If the Food Standards Agency believed that a current or proposed authorisation would result in an unacceptable risk to consumers, it would request the relevant Health Minister to direct the relevant environmental regulator to vary or revoke the environmental permit or authorisation.

## **Northern Ireland**

E.158. EA95 does not apply in Northern Ireland. The Chief Radiochemical Inspector of NIEA administers RSA93 and Inspectors' enforcement powers are equivalent to those for SEPA.

## **Enforcement of Planning Law**

E.159. The Town and Country Planning Act 1990 (for England and Wales) and Town and Country Planning (Scotland) Act 1997 enable planning authorities to remedy any harm to amenity or other interest which may result from unauthorised development. The decision to take enforcement action and the nature of that action is dependent on the particular circumstances and is a matter for the planning authority's discretion. The authority's main enforcement powers are:

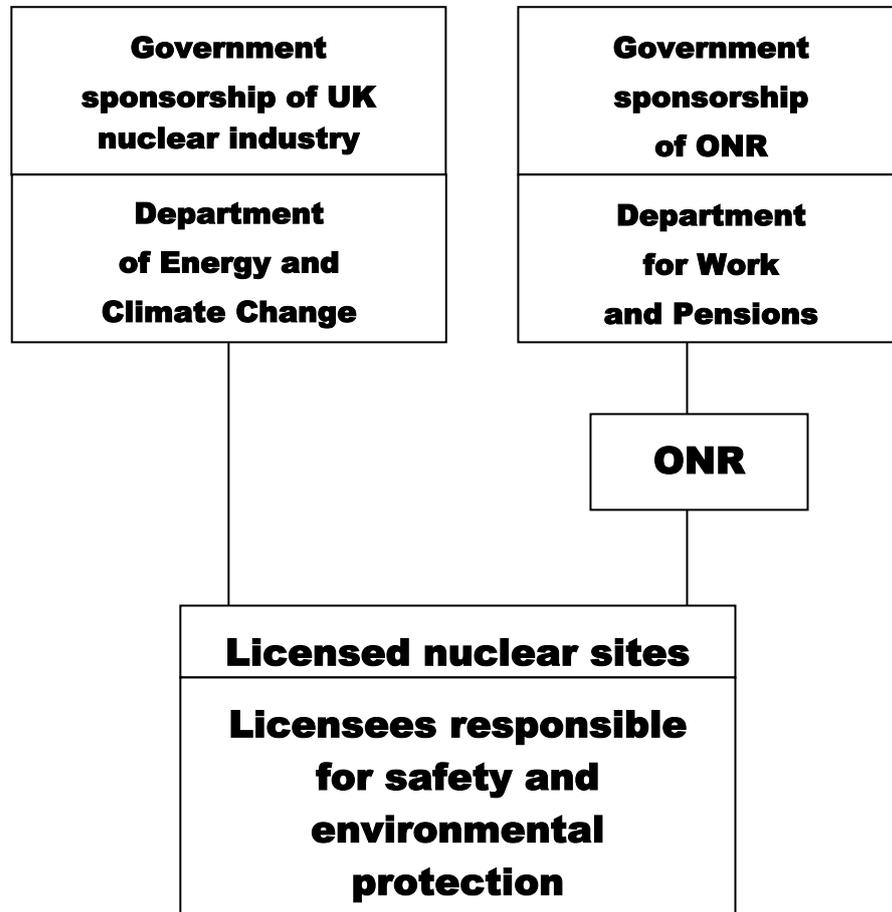
- to issue an Enforcement Notice;
- to serve a stop notice which can prohibit, almost immediately, any activity to which the accompanying Enforcement Notice relates; and
- to serve a breach of condition notice if there is a failure to comply with a condition imposed when planning permission is granted.

E.160. After an Enforcement Notice has become effective, or at any time after a stop notice has been served, it is a criminal offence not to comply with an Enforcement Notice's requirements or to contravene the prohibition in a stop notice. In Scotland, the procedures relating to planning enforcement differ slightly and are described in circular 10/2009 (Ref. 128).

[Article 19.2 \(vi\) – Responsibilities of Bodies Involved in Spent Fuel and Radioactive Waste Management](#)

E.161. Figures E.1 and E.2 illustrate the responsibilities of the various bodies in the UK and how they interact.

**Figure E.1 Responsibilities for the safety of spent fuel, reprocessing and radioactive waste management at nuclear licensed sites**



**Government responsibilities**

E.162. The DECC website sets out in summary the distribution of responsibility and accountability among Ministers, independent bodies and the devolved administrations, including:

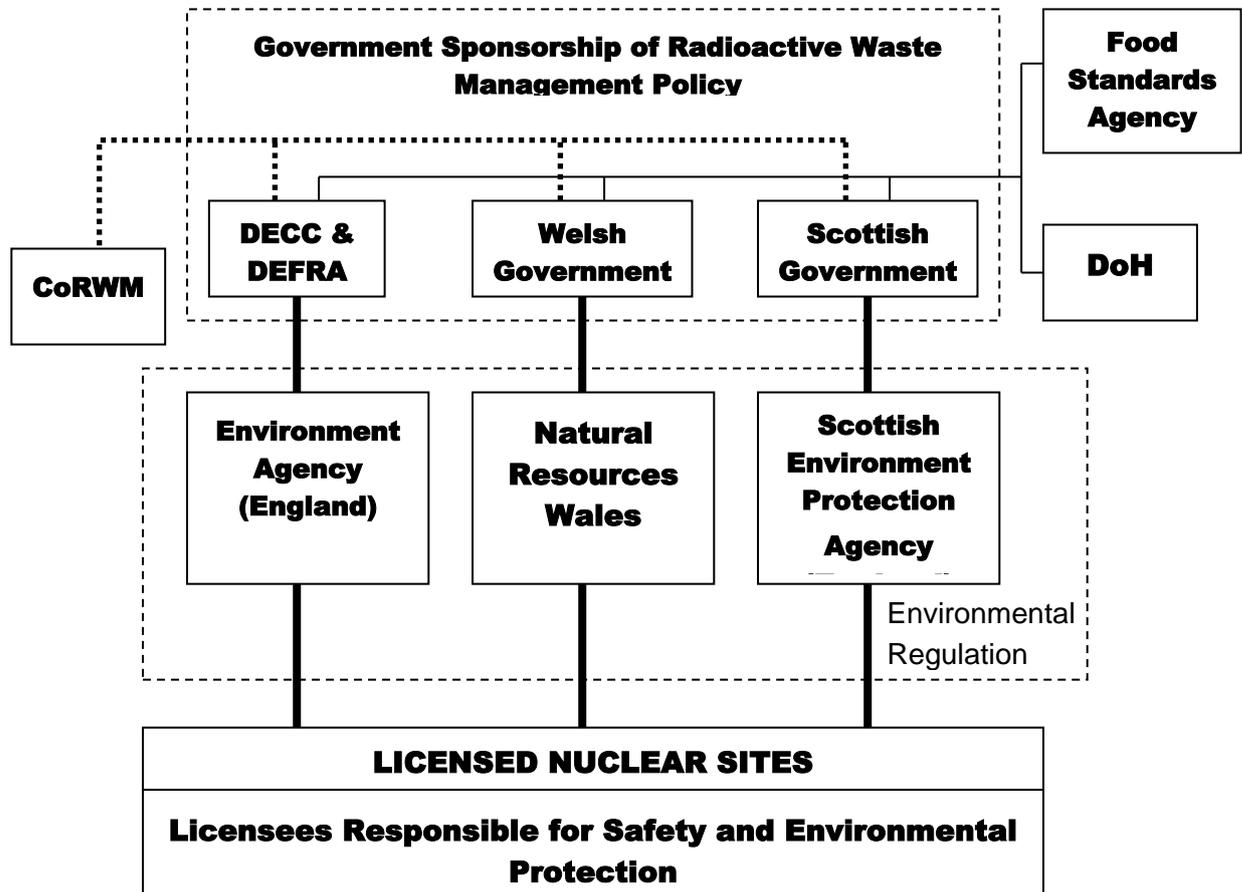
- safety regulation at civil nuclear sites;
- nuclear emergency planning and response to a nuclear emergency or incident;
- safe storage, use, discharge and disposal of radioactive materials; and
- international work on nuclear safety.

E.163. Sponsorship of the civil nuclear industry and accountability to Parliament for civil nuclear safety in Great Britain and radioactive waste policy in England rests with the Secretary of State for Energy and Climate Change.

E.164. Matters of radioactive waste management policy are devolved to the Scottish Government, the Welsh Government and the Northern Ireland Government in their respective regions of the UK. However, the Secretary of State for Energy and Climate Change remains accountable for the safe management of radioactive wastes kept or stored at licensed nuclear sites in England, Wales and Scotland.

E.165. The Secretary of State for Work and Pensions is responsible for the sponsorship of ONR, and accountable to Parliament for radiation protection matters as well as general health and safety at work issues throughout Great Britain. The Department for Work and Pensions developed a Framework Document (Ref. 129) to describe the framework ONR has operated within from 1 April 2014.

**Figure E.2 Responsibilities for the environmental effects of spent fuel, reprocessing and radioactive waste management**



E.166. The Department of Health (DoH) and the territorial health departments have general responsibility for public health.

E.167. The Food Standards Agency is a non-ministerial government department with responsibility for the safety of foods, and is a statutory consultee to the Environment Agency, NRW and SEPA on discharge authorisations and permits. The Food Standards Agency monitors radioactivity in food and holds the principal responsibility for any radioactivity in food in the UK. The Food Standards Agency would also advise the Government on food safety-related environmental effects of radioactivity released to the environment; it is free to publish this advice to ensure its independence.

E.168. In 2015, it is proposed that a new independent food standards body will be established in Scotland – a relevant Bill was introduced to the Scottish Parliament in spring 2014. If implemented ‘Food Standards Scotland’ will be a non-ministerial office of the Scottish Administration.

## **Responsibilities of operators or employers**

### **Operators / employers**

E.169. Under HSWA74 and the Energy Act 2013, nuclear site licensees have the prime responsibility for ensuring the safety of their workers and the public from dangers arising from their work.

E.170. In accordance with UK government policy, the producers and owners of radioactive waste are responsible for ensuring that:

- they do not create waste management problems which cannot be resolved using current techniques or techniques which could be derived from current lines of development;
- where it is practical and cost-effective to do so, they characterise and segregate waste on the basis of physical and chemical properties and store it in accordance with the principles of passive safety; and
- they undertake strategic planning, including development of programmes for the disposal of waste accumulated at nuclear sites, within an appropriate timescale and for the decommissioning of redundant plant and facilities.

E.171. The producers and owners of radioactive waste bear the cost of managing and disposing of the waste.

## **Responsibilities of regulators**

### **Office for Nuclear Regulation**

E.172. ONR is the nuclear safety regulator for all sites subject to a nuclear site licence under NIA65 in the UK. This authority is delegated by the Government to the Chief Nuclear Inspector. As a result, no civilian site can be used for the purpose of installing or operating a nuclear installation, or accumulating a bulk quantity of radioactive material, unless a nuclear site licence is granted by ONR.

E.173. NIA65 (as amended by Schedule 22 of the Environment Act 1995) requires ONR to consult the relevant environmental regulator on any issues which affect the creation, accumulation or disposal of radioactive waste from licensed nuclear sites, before issuing, amending or varying nuclear site licences, or attaching conditions to those licences.

E.174. In addition to these statutory consultation requirements, ONR has developed joint working arrangements with the UK environmental regulators to ensure co-ordinated and coherent regulation of the management of radioactive wastes on nuclear licensed sites.

E.175. ONR guidance states that any assessment or review that considers a licensee's management of radioactive wastes should include a consultation with the applicable environmental regulator.

E.176. When a nuclear licensee proposes to condition HAW into a form suitable for long-term storage or eventual disposal in the planned GDF, ONR seeks advice from the relevant environmental regulator on the long-term disposability of the proposed waste product. This protocol ensures ONR's expectations for the safety-related aspects of processing, interim storage and transport of packaged waste are compatible with environmental regulators' expectations on the long-term protection of the public and the environment.

### **Environment Agency, Natural Resources Wales and Scottish Environment Protection Agency**

E.177. The Environment Agency is the principal environmental regulator in England and reports to the Secretary of State for Environment, Food and Rural Affairs for its

activities. NRW and SEPA have broadly equivalent responsibilities in Wales and Scotland.

E.178. EPR10 makes the Environment Agency and NRW the regulatory bodies for permitting disposal of radioactive waste from nuclear licensed sites in England and Wales respectively, and RSA93 as amended by EA95 makes SEPA the appropriate regulatory body for sites in Scotland.

E.179. EPR10 implements parts of the BSS Directive in England and Wales. The same parts of the BSS Directive are implemented in Scotland through a Direction from Scottish Ministers to SEPA.

### **Transport of Radioactive Materials and Wastes**

E.180. Following the changes implemented by the Energy Act 2013, the Secretary of State for Transport is no longer the competent authority in the UK for regulating the safety of transport of all radioactive material and wastes by road, rail and inland waterways as responsibility for regulating those aspects passed to ONR.

E.181. The responsibility for regulation of the transport of radioactive materials and wastes by sea and air remained with the Department for Transport, delivered through the Maritime Coastguard Agency and Civil Aviation Authority respectively. ONR regulates the security aspects of movements of nuclear material, as defined by the Nuclear Industries Security Regulations 2003 (Ref. 130)

E.182. ONR must certify that all package designs and associated transport arrangements comply with statutory regulations prior to their use. ONR is also responsible for regulating the safety of transport operations. This is complemented by the assessment of emergency planning, investigation of incidents and independent assessment of the radiation and contamination levels of irradiated nuclear fuel flasks.

E.183. The regulatory requirements for the security aspects of transport of nuclear materials stipulate that a carrier must:

- be prior approved by ONR;
- satisfy ONR, through the submission of a Transport Security Statement and/or specific Transport Security Plans, that suitably robust measures are in place to ensure the security of nuclear material;
- comply with directions and instructions issued by ONR;
- report specific security matters to ONR; and
- notify ONR in advance of all intended movements of nuclear material.

### **General regulatory responsibilities**

E.184. In addition to the responsibilities mentioned above, each of the regulators provides advice on matters within their remit as required, or when requested, to other bodies, government and the public.

E.185. All regulators operate in an open and transparent way within their regulatory remit and comply with the UK's Freedom of Information legislation. Each regulator has a website on which information on its work is published, in particular, and where appropriate, including:

- any internal guidance on implementing legislation;
- reports of inspection or assessment or other regulatory activities; and
- specific guidance to operators on complying with legislation.

E.186. UK regulators take an active part in international co-operation and development, contributing to international standards, taking part in meetings of European and world regulators, and negotiating and implementing bilateral information exchange agreements with other national regulators.

E.187. Whereas operators have a duty to carry out environmental and safety assessments, the regulators similarly need to assess the operators' submissions to satisfy themselves that the operators are meeting their obligations.

## **Responsibilities of other agencies and bodies**

### **Public Health England**

E.188. Public Health England (PHE) was established on 1 April 2013 by the Health and Social Care Act 2012 (Ref. 131). PHE is an executive agency of the DoH and was formed by merging a number of agencies and health organisations, including the Health Protection Agency.

E.189. The roles and responsibilities of PHE include providing expertise and specialist advice on radiation protection in the UK, carried out mainly through its Centre for Radiation, Chemical and Environmental Hazards. This may include:

- the conduct of research or such other steps appropriate to the advancement of knowledge and understanding;
- providing technical services (whether in laboratories or otherwise);
- providing services for the prevention, diagnosis or treatment of illness arising from exposure to radiation;
- providing training;
- providing information and advice; and
- making available the services of any person or any facilities.

E.190. PHE may charge for its services, as appropriate.

E.191. Although PHE's general remit extends to England only, on matters of radiation hazards PHE also provides specialist support to the devolved administrations of Scotland, Wales and Northern Ireland.

E.192. PHE is a statutory consultee for the UK Justification Regulations. Under the Planning Act 2008 (Ref. 132) PHE is also statutory consultee for all infrastructure applications likely to involve radiation which could potentially cause harm to people.

## **Responsibilities of advisory bodies**

### **Committee on Radioactive Waste Management**

E.193. CoRWM was reconstituted in 2007 to provide independent scrutiny and advice to UK government ministers on the long-term management, including storage and disposal, of HAW.

E.194. The committee's primary task is to provide independent scrutiny on the Government's and NDA's proposals, plans and programmes to deliver a GDF, together with robust interim storage, as the long-term management option for the UK's higher-activity wastes. The committee undertakes a three-year rolling programme of work and the programme for 2014–17 is available on CoRWM's website.

### **Chief Nuclear Inspector's Advisory Panel**

E.195. The Energy Act 2013 enabled ONR to create advisory committees to provide independent advice on any of its functions. Although not a legal requirement, custom and practice has been to constitute advisory committees in relation to activities in the nuclear sector. The ONR Board has acknowledged that a mechanism is needed to ensure the Chief Nuclear Inspector has ongoing access to independent strategic technological advice. Establishment of the Chief Nuclear Inspector's Advisory Panel was underway at the time of this report being published.

### **Ionising Radiations Health and Safety Forum**

E.196. The Ionising Radiations Health and Safety Forum has been established to consider all matters concerning protection against ionising radiations that are

relevant to ONR's and HSE's remit. The forum consists of a wide cross-section of organisations including representatives from industry and the unions, local authorities, government departments and professional bodies. Its work includes consideration of the standards of protection for workers and others from work activities involving ionising radiations, monitoring the effectiveness of legislation and monitoring developments in technology.

#### **Committee on Medical Aspects of Radiation in the Environment**

E.197. The Committee on Medical Aspects of Radiation in the Environment (COMARE) assists and advises the DoH and the Scottish Government Health Department on behalf of Scottish Ministers on the health effects of natural and anthropogenic radiation in the environment and assesses the adequacy of the available data and the need for further research. Further information can be found on COMARE's website.

#### **Financial provisions for decommissioning and waste management**

E.198. In November 2001, the Government announced radical changes to previous arrangements for the clean-up of Britain's publicly-owned nuclear legacy which came fully into effect in April 2005 with the formation of NDA under the terms of the Energy Act 2004. These arrangements are mostly financed by the taxpayer and subsume all previous financial provisions for decommissioning made by the publicly-owned civil nuclear utilities. Separate arrangements for EDFs privately-owned nuclear power plants were outlined in paragraph B.46 and explained in detail in the sixth UK CNS report (Ref. 7).

E.199. NDA provides the strategic direction for cleaning up the civil public sector nuclear sites that are in its ownership, including all the UK Magnox reactors and Sellafield. Each site NDA owns has a contracted SLC. The SLC:

- employs the operational staff on the site;
- holds the nuclear site licence, compliance with which is overseen by ONR, and;
- holds the site's environmental authorisation or permit, compliance with which is overseen by the relevant environmental regulator.

E.200. NDA places and manages its contracts with the SLCs, and periodically awards new contracts for the ownership of the SLCs to provide improved strategic approaches and innovation in decommissioning. Full details of NDA's work including its strategy, agreed by the Government following public consultation, can be found on its website.

E.201. NDA has responsibility for commercial and waste management activities on its sites and for the eventual decommissioning of those sites. NDA is funded partly by Government and partly by revenue derived from commercial activities on its sites. NDA is tasked with ensuring it allocates a significant part of its funding to decommissioning and clean-up, prioritising its spending and ensuring its risks are both managed and mitigated. Further information on the finances of NDA is provided in Section F.

#### **Article 19.3 – Consideration of whether to Regulate Radioactive Materials as Radioactive Waste**

E.202. The UK adopts a position in line with the definition of radioactive waste in the Joint Convention, ie "radioactive waste means radioactive material in gaseous, liquid or solid form for which no further use is foreseen by the Contracting Party or by a natural or legal person whose decision is accepted by the Contracting Party, and which is controlled as radioactive waste by a regulatory body under the legislative and regulatory framework of the Contracting Party".

E.203. Assessment of waste management options includes not only materials currently classified as waste, but also takes into consideration the consequences of providing for other materials which may have to be managed as waste in the future. This includes separated plutonium and uranics, as well as a proportion of the UK's spent nuclear fuel that is not destined for reprocessing.

E.204. With the support of NDA, the UK Government is continuing to develop its policy on the management of separated plutonium. Currently, the UK Government's preferred policy is one of reuse, with any remaining plutonium that cannot be converted into Mixed-Oxide fuel being immobilised and treated as waste for disposal. At this time, the NDA holds its uranics at a nil value pending development of long-term options and cost estimates. In the future, assessments may ascribe a value or a liability to each type of uranic material.

E.205. Some radioactive materials are likely to be classified as radioactive waste in the future, as circumstances change. The UK Government encourages site operators to undertake forward planning by identifying robust options for the future management of these materials, up to and including the point of disposal.

## Article 20 Regulatory Body

1. Each Contracting Party shall establish or designate a regulatory body entrusted with the implementation of the legislative and regulatory framework referred to in Article 19, and provided with adequate authority, competence and financial and human resources to fulfil its assigned responsibilities.
2. Each Contracting Party, in accordance with its legislative and regulatory framework, shall take the appropriate steps to ensure the effective independence of the regulatory functions from other functions where organizations are involved in both spent fuel or radioactive waste management and in their regulation.

E.206. Under this Article, compliance with the Joint Convention is demonstrated in a way that has not substantially changed since the fourth UK report.

### Article 20.1 – Regulatory Body

E.207. In the UK, the regulatory bodies entrusted with implementing the framework described in Article 19 are identified below.

#### **Organisation of the regulatory body**

E.208. The legal framework of the regulatory body was introduced under Article 19. Further details of the regulatory structure and operation are provided below and at Annex L.3.

#### **Office for Nuclear Regulation**

E.209. Prior to April 2014, ONR was an executive agency of HSE. The Energy Act 2013 changed the status of the ONR to that of a public corporation in its own right from 1 April 2014. Since then ONR has been a standalone, fully independent, regulator responsible in law for delivering its own regulatory functions. Creation of ONR has consolidated into one organisation: regulation of nuclear safety; regulation of the transport of civil radioactive materials and wastes; regulation of nuclear security; and oversight of the UK's arrangements to meet International Safeguards commitments.

E.210. ONR has its own board consisting of non-executive and executive members, the non-executive members always being in the majority. The role of the ONR Board is to provide leadership, set strategy, agree the overarching policy framework within which ONR operates as a regulator, agree and monitor resources and performance and ensure good governance.

E.211. Central to delivery of ONR's core activities are effective governance arrangements. To achieve this, ONR has adopted an operating model based on matrix management arrangements, with staff organised into specialisms and working in programmes. There are two main types of programme – operational delivery programmes and enabling programmes.

E.212. The regulation of similar sites is organised into operational delivery programmes, each headed by a programme director. This structure allows ONR to focus on the strategic context of the sites, is aligned with industry structures and enhances the efficiency and consistency of regulatory activities.

E.213. In addition to the licensee-focused programmes, ONR also has a cross-ONR programme, which leads on strategic regulatory themes such as: emergency preparedness and response; regulatory intelligence; and special regulatory and technical projects.

E.214. The line management of technical specialists within ONR is through a professional lead for each identified specialism, including a professional lead for

ONR's specialists involved with the management of radioactive wastes and spent fuels. The main responsibilities of each professional lead cover:

- strategy and standards;
- support and guidance;
- resource planning and allocation; and
- knowledge management and succession planning.

E.215. Specialists are generally embedded within the operational delivery programmes and may carry out work on more than one programme concurrently, which ensures regulatory expectations across the various programmes is consistent.

E.216. The two key enabling programmes are Regulatory Assurance and Corporate Services.

E.217. Corporate Services includes: Finance and Human Resources; the Corporate Programme Management Office; and Policy (Domestic and International). The programme also administers research and technical support activities.

E.218. The primary role of the Regulatory Assurance Programme is to ensure ONR's regulatory decisions are robust and subject to an appropriate process of peer review. The Regulatory Assurance Programme secures compliance with ONR's own arrangements in addition to being responsible for the review and development of ONR's technical standards and associated business processes.

E.219. ONR's operating model provides versatile, agile and fit-for-purpose nuclear regulation ready to respond to the changing demands of an expanding UK nuclear industry, and integrates ONR in a manner that ensures the organisation can hold the nuclear industry to account efficiently and effectively on behalf of the public.

### **Office for Nuclear Regulation – Regulatory Management System**

E.220. ONR has launched a web browser-based business management system to provide an integrated and holistic approach to control of its internal systems, which covers all ONR's business processes, such as regulatory permissions, reporting, investigation, and enforcement.

E.221. The regulatory elements of the system include processes and procedures to ensure ONR meets its regulatory obligations in a quality assured manner. To support this objective, the system provides ONR Inspectors with two important sets of technical guidance that are also available to the public via the ONR website:

- Technical Assessment Guides (TAGs) – which provide guidance to ONR's Inspectors on the interpretation and application of ONR's SAPs when assessing the adequacy of licensees' safety cases and other safety documentation; and
- Technical Inspection Guides (TIGs) – which provide guidance for ONR's Inspectors on the planning, content and reporting of inspections to monitor the adequacy of nuclear site licensees' arrangements against legal requirements.

E.222. All the extant TIGs and TAGs were reviewed and updated during 2013 and are subject to periodic reviews approximately every three years.

E.223. The system administration is managed centrally, with controlled access granted to relevant technical areas in order to enable continuous improvement.

### **Office for Nuclear Regulation – Principles, Regulations and Guides**

E.224. The regulatory approach to nuclear safety in the UK is based on a nuclear site licensing regime. Most of the requirements for nuclear safety are implemented by means of conditions attached to the nuclear site licence. As a result, ONR does not specifically set out its requirements for nuclear safety in the form of regulations. However, some issues arising from EC and Euratom Directives have been

addressed by the implementation of UK regulations. There is an overlap between some requirements of the licence conditions derived under NIA65 and some of the regulations contained in IRR99 dealing with radiological protection.

E.225. ONR's SAPs (Ref. 133) form a framework of regulatory expectations for the use of ONR Inspectors when making technical judgments on the adequacy of licensees' safety submissions. The principles are supported by more detailed guidance in a suite of TAGs and other guidance that further assists decision-making within the nuclear safety regulatory process.

E.226. The SAPs are available to the public and provide nuclear site dutyholders with information on the regulatory principles against which the adequacy of their safety provisions will be judged by ONR Inspectors. However, the SAPs are not intended or sufficient to be used as design or operational standards as they reflect the non-prescriptive nature of the UK's nuclear regulatory system. In most cases the SAPs are guidance to ONR Inspectors, but where they refer to specific statutory limits (such as the dose criteria found in IRR99), they can be mandatory.

E.227. The basis for demonstrably adequate safety is to meet the normal requirements of good practice in engineering, operation and safety management. This is a fundamental requirement for the safety cases submitted to ONR by the UK nuclear site licensees. In addition, ONR expects safety cases will include a graded application of risk assessments and probabilistic analyses to identify potential weaknesses in proposed facility designs and operations. These should show what improvements were considered and demonstrate that an adequate level of safety is not unduly reliant on a small set of particular features.

E.228. The SAPs provide guidance to ONR Inspectors on practical application of the UK tolerability of risk framework and the terms embedded in relevant legal requirements such as SFAIRP and ALARA.

E.229. The SAPs enable a consistent and uniform approach to assessment within ONR. In carrying out an assessment, ONR's Inspectors form a judgement on the extent to which a particular safety submission has demonstrated that the relevant expectations found in the SAPs have been satisfied.

E.230. The current SAPs, published in 2006, are undergoing a wholesale review that will capture all potential learning points from the Fukushima accident and wider changes that have occurred in the last eight years. ONR expects to issue a new version of the SAPs later in 2014.

### **Environment Agency, Natural Resources Wales, Scottish Environment Protection Agency and Northern Ireland Environment Agency**

E.231. The UK's principal environmental regulators are the Environment Agency (in England), SEPA, NRW and NIEA. Their regulatory responsibilities include the authorisation or permitting of the disposal of radioactive wastes from nuclear sites licensed by ONR.

#### **Regulatory responsibilities**

E.232. ONR, the Environment Agency, NRW and SEPA work closely with one another to ensure the effective co-ordination of their respective regulatory activities at nuclear installations. Joint working arrangements facilitate the minimisation of the overall detriment due to radioactive waste management on licensed sites, from generation to disposal. Under the NIA65, the ONR consults the Environment Agency, NRW and/or SEPA before:

- granting a nuclear site licence; or
- varying a nuclear site licence if the variation relates to or affects the creation, accumulation or disposal of radioactive waste.

E.233. Similarly, the Environment Agency, NRW or SEPA consult ONR under EPR10 or RSA93 respectively on proposed (new or varied) environmental permits or authorisations for disposals of radioactive waste including discharges to the environment.

E.234. In addition to their own routine inspection activities on nuclear licensed sites, the Environment Agency, NRW and SEPA carry out joint inspections with ONR and co-operate in investigations of incidents and consideration of enforcement action where appropriate.

### **Authority, Competence, Financial and Human Resources**

E.235. The mandate, structure, financial and human resources, and inspectors' qualifications and training of each of the organisations comprising the UK 'regulatory body' are described in Annex L.3.

### **Responsibilities of other agencies and bodies**

E.236. The responsibilities and functions of Public Health England are described in paragraphs E.188 to E.192.

E.237. Further information on the nuclear regulators is at Annex L.3., which includes: mandates and duties; structure; and resources.

### **Article 20.2 – Regulatory body independence**

E.238. ONR's demonstrable independence as a regulator has been strengthened under the terms of the Energy Act 2013, by having direct responsibility for the enforcement of the nuclear safety regulatory system focussed on sites licensed under NIA65. Similarly, the environment agencies are responsible for providing the environmental protection regulatory system under EPR10 in England and Wales and RSA93 in Scotland and Northern Ireland. HSE has responsibilities for the regulation of radiological protection on sites that are not licensed under NIA65.

E.239. Governmental mechanisms are in place to maintain the independence of the regulatory bodies. ONR is sponsored by the Department for Work and Pensions, which has no role in promoting nuclear technology or responsibilities for nuclear facilities or activities.

E.240. The Secretary of State for Energy and Climate Change is answerable to Parliament for nuclear safety in Great Britain. ONR can provide factual information to this Minister on matters of nuclear safety regulation, but this Minister is not responsible for ONR's nuclear regulatory actions. The Secretary of State can issue a direction as to ONR's exercise of its functions. A direction may modify a function of ONR but (except in matters of national security) cannot be given in relation to the exercise of a regulatory function in a particular case.

E.241. The Environment Agency is sponsored by Defra. On radioactive waste matters, it works closely with DECC's Nuclear and Radioactive Waste Section and the DoH.

E.242. NRW is sponsored by the Welsh Government.

E.243. SEPA is sponsored by the Scottish Government. On radioactive waste matters, it works closely with the Environmental Quality Division of the Scottish Government, DECC and the DoH.

E.244. DECC has a number of policy roles in respect of the nuclear industry. These include responsibility for energy policy generally (including the role of nuclear power), prescribing the activities that should be subject to the nuclear licensing regime, nuclear emergency planning, nuclear security and safeguards, international treaties, the Joint Convention and the Convention on Nuclear Safety, and the international nuclear liability regime. It is also responsible for those parts of the UK civil nuclear industry still owned by the Government.

E.245. In carrying out its responsibilities DECC will, when appropriate, seek technical factual information on safety-related matters from ONR, and advice on environmental issues from the environment agencies.

# Section F

## Other General Safety Provisions

### Article 21 Responsibility of the Licence Holder

1. Each Contracting Party shall ensure that prime responsibility for the safety of spent fuel or radioactive waste management rests with the holder of the relevant licence and shall take the appropriate steps to ensure that each such licence holder meets its responsibility.
2. If there is no such licence holder or other responsible party, the responsibility rests with the Contracting Party which has jurisdiction over the spent fuel or over the radioactive waste.

F.1. Under this Article, compliance with the Joint Convention is demonstrated in ways that have not substantially changed since the fourth UK Joint Convention report.

#### Article 21.1 – Prime Responsibility for Safety

F.2. A fundamental principle of the non-prescriptive, goal-setting UK regulatory system is that responsibility for health and safety lies with those who own, manage or work in industrial and commercial undertakings.

F.3. Ownership of almost half the licensed nuclear sites in the UK, together with the assets and liabilities on those sites, transferred to NDA in April 1995 under the terms of the Energy Act 2004. The prime responsibility for safety on those sites remains with the relevant SLCs, who are the organisations in control of day-to-day operations. A fuller explanation of the legal framework applicable to those sites is provided in paragraphs E.9 to E.16.

#### Article 21.2 – Contracting Party Responsibility if there is no Licence Holder or Other Responsible Party

F.4. The Government takes the steps necessary to ensure that spent fuel and radioactive wastes are managed in a safe manner, including in the eventuality of radioactive waste or spent fuel being found on a site that does not hold a licence under NIA65.

F.5. If adequate facilities are not available for the safe disposal or accumulation of radioactive waste, under EPR10 the Secretary of State in England and Welsh Ministers in Wales have the power to provide such facilities, or may arrange for their provision by such persons as they may think fit. Similar powers are available to the Scottish Ministers under RSA93.

F.6. Site operators are expected to hold a nuclear site licence for storage of a 'bulk quantity' of radioactive material in accordance with the defined scope of NIA65. On sites where activities are not prescribed under NIA65, the relevant employer still bears responsibility for safety under the provisions of HSWA74 and supporting legislation including IRR99.

F.7. Any radioactive waste accumulated on a site without a nuclear site licence is subject to the full requirements of the environmental legislation. If the appropriate environmental regulator is satisfied that the waste ought to be disposed of, but that it is unlikely that the waste will be lawfully disposed of, EPR10 and RSA93 provide powers to the environmental regulators to arrange disposal of the waste themselves. LC33 affords a similar regulatory power on nuclear licensed sites, to the effect that ONR may Direct the disposal of radioactive waste from a licensed site; however, LC33 is also explicit that any such Direction must be in accordance with the requirements of the applicable environmental legislation.

## Article 22 Human and Financial Resources

Each Contracting Party shall take the appropriate steps to ensure that:

- (i) qualified staff are available as needed for safety-related activities during the operating lifetime of a spent fuel and a radioactive waste management facility;
- (ii) adequate financial resources are available to support the safety of facilities for spent fuel and radioactive waste management during their operating lifetime and for decommissioning;
- (iii) financial provision is made which will enable the appropriate institutional controls and monitoring arrangements to be continued for the period deemed necessary following the closure of a disposal facility.

F.8. Under this Article, compliance with the Joint Convention is demonstrated in a way that has not substantially changed since the fourth UK report.

### Article 22(i) – Availability of Qualified Staff

F.9. In order to comply with regulatory requirements, a nuclear licensee must demonstrate to ONR's satisfaction that it has:

- lines of authority leading to adequate control and supervision over its activities – whether those activities are carried out by the licensee's own staff or by contractors;
- staff resources at a level that maintains adequate safety margins and competent management of radioactive wastes;
- a precise definition and documentation of staff duties relevant to safety and the management of radioactive wastes;
- integration of the responsibilities that relate to health and safety into job functions;
- appropriately trained and experienced staff, ensuring adequate in-house expertise; and
- the provision of, or access to, a high level of health and safety expertise used in an active manner for the independent peer review of safety cases, internal audits and reviews.

F.10. This demonstration is primarily achieved by the provision of adequate arrangements to satisfy the requirements of the NIA65 site licence conditions, along with other relevant legislative requirements such as MHSW99.

F.11. The licensee is also required, under LC36, to have arrangements for the control of any change to its organisational structure or resources that might affect safety.

### Management of human resources for safety-related activities

#### **Regulatory background**

F.12. HSW74 places the responsibility for safety on the plant operator. This responsibility includes the competence and training of staff with safety-related roles. More specific requirements are included in MHSW99, in particular Regulation 13 on Capabilities and Training.

F.13. In addition, several of the NIA65 site licence conditions set goals that are relevant to training and management of human resources. LC10 requires licensees to make and implement adequate arrangements for suitable training of all site personnel with responsibility for any operations which may affect safety. LC12 requires licensees to make and implement adequate arrangements to ensure that only 'suitably qualified and experienced' persons perform duties that may affect safety. This includes the appointment of 'duly authorised persons' to control and supervise specific safety-related operations.

F.14. A number of other licence conditions, such as: plant modification procedures (LC22); emergency arrangements (LC11); and control of organisational change (LC36) also require licensees to address human resource and training issues in the context of delivering key functions.

F.15. ONR monitors the adequacy of, and compliance with, the arrangements made by licensees under the NIA65 site licence conditions. Under normal circumstances, ONR does not have any specific role in the selection, training and authorisation of staff to perform safety-related duties. However, ONR does have the power to intervene if, in its opinion, a person nominated by a licensee to perform the duties of a duly authorised person is unfit to fulfil the role.

F.16. ONR expectations for training and safety-related aspects of performance are addressed in the SAPs. The SAPs provide guidance to assist ONR inspectors in their judgments on the adequacy of licensees' provisions for training staff with responsibilities for safety. Relevant factors include: the management system for training on the site; analysis of jobs and tasks; development of training methods; assessment of trainees; provision of refresher training as required; and regular evaluation of the effectiveness of training. Licensees are expected to have a systematic and comprehensive approach to training and assessment of personnel with safety roles to comply with established ONR expectations.

F.17. Licensees are expected to place a strong emphasis on training to demonstrate an emergency response capability that meets the requirements of LC11. Training should enable staff to implement accident management strategies, undertake appropriate monitoring, and use the instrumentation and plant that is required in a severe accident environment.

## **Licensees' training programmes**

### **Qualification, experience and training**

F.18. For all tasks undertaken on a nuclear licensed site, it is a regulatory expectation that the staff of licensees and their contractors should receive adequate training. Such training should make all relevant personnel aware of the hazards on the site, together with the systems in place to control the risks to health and safety. For each post or role with a responsibility for safety, licensees are expected to ensure that all safety-related duties, responsibilities and competencies are systematically identified and the training needs of each individual are met.

F.19. An assessment of the competence of an individual to undertake a specific task should consider:

- knowledge, academic and practical qualifications, assessed training and experience;
- instructions and information provided to the person; and
- control and supervision required to carry out the task.

F.20. Procedures for assessing the competence of personnel prior to them undertaking a safety-related task will form part of a licensee's arrangements under LC10.

F.21. Responsibility for evaluating an individual's suitability for a specific task rests with the relevant licensee. ONR routinely inspects the adequacy and implementation of training programmes.

F.22. LC12 requires that any posts on site that may affect operational safety, or implement actions connected with site licence conditions, can only be performed by 'suitably qualified and experienced persons'. Where such actions need to be controlled or supervised, this must be done by 'duly authorised persons' appointed by the licensee. ONR regularly inspects the adequacy and implementation of this

process, and has powers under the site licence to ensure no person acts as a duly authorised person when considered unfit to do so.

### **Training of external personnel**

F.23. When licensees use contractors for safety-related work, they must satisfy themselves that the contractors' staff have appropriate qualifications and training to undertake the required tasks safely and competently. The training of contractors' staff to comply with the relevant safety rules is generally an explicit part of contractual agreements.

F.24. Wherever safety-related work on a nuclear licensed site is contracted to an organisation external to the site licensee, ONR expects the licensee concerned to act as an 'intelligent customer' for the contracted work. This requires the licensee to have sufficient in-house expertise and available resources to: accurately specify the required work using adequate standards; set up the contracts; oversee the quality of the work undertaken; and, if necessary, challenge the work of contractors.

F.25. Licensees at all times hold primary responsibility for ensuring safety on the licensed site and are required under LC17 to establish and implement management systems that give due priority to safety. Licensees are therefore responsible for ensuring their selected contractors are properly competent to undertake the work assigned to them.

F.26. ONR has published guidance to assist its inspectors in the judgement of whether licensees and contractors meet these responsibilities. Consistent with the goal-setting nature of UK regulatory philosophy, ONR does not prescribe any particular methods or systems of contractor selection or control, but does require licensees to have quality management systems in place that at all times deliver acceptable levels of safety.

F.27. For safety-critical engineered components, ONR may choose to examine the quality management arrangements of relevant suppliers. However, it is always the licensees' responsibility to ensure that these arrangements are adequate.

### **Periodic review**

F.28. ONR expects licensees to review the safety performance of their employees regularly. Although it is not an explicit requirement of LC10 for licensees to undertake formal performance reviews of their staff, the outputs from such reviews are expected to inform licensees' training plans.

### **Training programme development**

F.29. Licensees' training programmes should accommodate any significant changes that occur to: plant configuration; plant modifications; and corrective actions needed to respond to incidents. Plant modification proposals, made under the arrangements to comply with LC22, should identify any instructions and procedures that need to be changed along with associated training requirements. For large modifications that require ONR's formal consent prior to a return to service, ONR may seek evidence that satisfactory retraining of personnel has taken place prior to allowing the modified plant to restart.

### **Operational experience feedback to improve training**

F.30. LC7 requires licensees to develop adequate arrangements for the notification, investigation and reporting of incidents on site. Outcomes of such investigations should be reported to ONR and may be reportable to Ministers in specified circumstances. ONR expects licensees to identify any aspects of the event related to human performance, along with any emergent training deficiencies and necessary corrective actions.

F.31. ONR expects licensees to keep the adequacy of all their training courses under review, including analysis of feedback from trainees and their line managers. It

is good practice for licensees to undertake regular internal audits of their own training arrangements.

### **Competence of instructors**

F.32. Training instructors are expected to be staff of proven competence with relevant experience in the area of work on which they provide training and should themselves be mentored on how to present training materials effectively. Arrangements should be in place for assessment of the performance of instructors, informed by feedback from the staff who have received instruction.

### **Maintaining and enhancing the national nuclear skill base**

F.33. The UK nuclear sector currently employs around 44,000 people. A programme of continued operations, decommissioning and clean-up, together with a potential programme of new nuclear build, means the nuclear industry has a sustained demand for recruitment and training.

F.34. Skill gaps have been projected for the UK nuclear industry. Research led by Cogent, an industry-led skills council, analysed the workforce requirements for new nuclear power station build and operation. This research indicated that 1,000 new apprentices and 1,000 new graduates with a degree-level science, technology, engineering or mathematics qualification are required each year to support existing operations and new build activity throughout the industry and supply chain.

F.35. UK Government is working closely with Cogent, NSA Nuclear and industry to ensure the UK has a clear understanding of the key skills priorities for the nuclear sector and how those priorities can be met.

F.36. NSA Nuclear was set up in January 2008 specifically to develop the capability of the UK nuclear workforce. Working with existing training providers, it now provides more than 1,000 apprenticeships and 150 foundation degrees in the sector. Cogent and NSA Nuclear have developed training standards applicable to the whole industry. NSA Nuclear has also developed a Nuclear Skills Passport to provide employees and contractors in the nuclear sector a physical record of industry-specific training and qualifications.

F.37. NDA has a statutory duty under the Energy Act 2004 to ensure adequate skills are available for it to carry out its duties, and an annual budget to develop those skills through a skills and capability strategy.

F.38. The National Nuclear Laboratory demonstrates the Government's commitment to protect and grow the UK's national nuclear technology capability and skills base. Some 500 staff at the £250-million purpose-built facility run a wide range of radioactive and non-radioactive experimental programmes, as well as offering a wide range of analytical services.

F.39. At university level there has been a very positive response to the shortage of graduates entering the industry. A number of new postgraduate nuclear courses have been set up, with an increasing number of students taking up places. The nuclear content of some undergraduate courses is being enhanced and, for the first time for many years, there will be the chance to obtain a degree in nuclear engineering. The number of students undertaking postgraduate research is also increasing. Of particular note is Manchester University's establishment of the Dalton Nuclear Centre, which offers a range of courses and conducts research on nuclear topics.

### **Article 22(ii) – Financial resources**

F.40. Financial resources that support the safety of facilities dealing with radioactive wastes and spent fuel are generally managed by licensees as part of normal operating costs, the principal elements of which tend to comprise:

- maintenance and enhancement of safety and environmental protection;
- plant monitoring and asset care;
- sampling, analysis and treatment of radioactive waste;
- materials and services (the costs of engineering, consumable components such as filters, transport costs and other miscellaneous charges such as insurance);
- staff costs (salaries and pension provisions), and
- depreciation (representing the proportion of the fixed assets written off in relation to their assumed life for accounting purposes).

F.41. Financial control processes determine the authority required before expenditure is committed. Where a licensee manages a liability on behalf of another organisation (eg for NDA), these processes generally include a link to the liability owner.

F.42. Special financial provision is made for the particular liabilities relating to the reprocessing and storage of spent fuel, the storage and disposal of radioactive waste and decommissioning costs.

F.43. The site licensees retain primary responsibility for the safety of the sites for which they hold a licence. However, where sites are owned by NDA, under the site licensee's contract with NDA the costs outlined above will normally be recoverable costs which may be charged to NDA, provided they are incurred in compliance with the applicable contract and NDA's Programme Control Procedures. NDA is financed through a combination of direct funding from the UK Government and income from commercial activities on NDA's sites.

F.44. Restructuring of British Energy led to creation of the Nuclear Liabilities Fund which is dedicated to the discharge of liabilities associated with the UK AGRs and Sizewell B. NDA acts as gatekeeper to the NLF and applies a series of tests that ensure the NLF funds can only be used for the intended purpose.

F.45. Financial provisions to address the anticipated future liabilities associated with proposed new nuclear power stations in England and Wales are overseen through the development, scrutiny and approval of Funded Decommissioning Plans.

F.46. Before ONR grants a nuclear site licence, it seeks assurance from DECC on the issue of liability, but does not have any review responsibilities.

### **Financing radioactive waste management**

F.47. The audited accounts of the UK's operators of spent fuel, reprocessing and radioactive waste management facilities include details of waste management costs and the provisions made to meet them. There is currently no available disposal route for HAW in the UK, so such wastes at present have to be kept in safe and secure interim storage awaiting development of the planned GDF. The costs of storing these wastes comprise:

- costs of managing the HAW that arises from the processes undertaken during a plant's operational life; and
- costs of managing the HAW that arises from plant decommissioning.

F.48. The cost of managing radioactive waste during the operational phase of a facility is typically spread across materials, services and staff costs in the reported accounts. Materials and services costs in accounts tend to include the costs associated with disposals of LLW, with an estimated price that reflects both the short-term operational cost and onwards disposal costs.

F.49. Disposals of radioactive waste, including discharges to the environment, should only be undertaken in accordance with regulatory permits or authorisations.

The Environment Agency, NRW and SEPA, recover their regulatory costs from operators – these costs cover the processes of granting, monitoring and enforcing authorisations or permits.

F.50. NDA requires its contracted site operators to prepare detailed plans for their sites to a prescribed format, known as Lifetime Plans (LTPs). LTPs cover commercial activities as well as decommissioning and clean-up costs. Each component of the plan for each site is described, along with the expected timing of each component and a forecast cost of delivering each component in the appropriate year on an undiscounted basis at current price levels.

F.51. Although the plans are extremely detailed, there is significant inherent uncertainty in the future cost estimates that underpin the provisions for management of spent fuel and radioactive wastes on the NDA sites. Some specific uncertainties that NDA and its SLCs are working to address include:

- site end-states;
- inventory of material to be retrieved from legacy facilities;
- performance of aged infrastructure that is reaching the end of its operational life;
- contaminated land quantities and treatments required;
- programming of work and risks arising from programme inter-dependencies; and
- disposition plans for wastes – HLW, ILW, and LLW – and spent fuels.

F.52. NDA's cost estimates are calculated as the sum of the LTP base estimates for all the sites in NDA ownership, including contingencies and risks; an additional estimate for risks managed directly by NDA rather than by SLCs; and an allowance for the disposition of waste and nuclear materials. Audited accounts of NDA are made available to the public via NDA's website and include more information.

### **Financing decommissioning programmes**

F.53. NDA has responsibility for contracting the operation of commercial and waste management operations on the sites within its estate and for the eventual decommissioning of those sites. The current estimate for the total lifetime cost of decommissioning the sites is around £58 billion (discounted) and the programme is likely to take up to 120 years to complete. NDA is exploring ways to reduce this cost and shorten the timescales, while still maintaining safety, security and environmental standards.

F.54. The portion of NDA's funding that is met by the UK Government is administered through the sponsoring department, DECC. The NDA's budget is currently around £3 billion a year, with a declining proportion of NDA's outgoings being offset by income from commercial operations on NDA sites.

### **Financing disposal of high-activity sealed sources**

F.55. The HASS Regulations strengthened the requirements for holders of HASS to have financial controls in place in order to underwrite the safe future management and disposal of disused HASS. Financial provision, or an acceptable alternative (for example, a secured agreement to return the HASS to its supplier), must be made to meet the costs of disposal of any HASS acquired. Government has provided guidance to the UK regulators on the nature of the arrangements that holders of HASS should make in order to meet the financial provision requirement.

## Article 23 Quality Assurance

**Each Contracting Party shall take the necessary steps to ensure that appropriate quality assurance programmes concerning the safety of spent fuel and radioactive waste management are established and implemented.**

F.56. Under this Article, compliance with the Joint Convention is demonstrated in ways that have not substantially changed since the fourth UK report. Some updates have been implemented to improve clarity and include small changes such as a variation of Licence Condition 17.

F.57. Within the UK, quality assurance is an inherent feature of licensees' management systems. A licensee's philosophy and systems for quality assurance will be applied across all work activities on the licensed site that have implications for nuclear safety, security and environmental protection.

F.58. The UK regulators closely monitor all aspects of the quality assurance systems adopted by nuclear licensees who undertake activities relevant to the Joint Convention; they ensure the applied systems are robust to the particular challenges inherent to the management of radioactive wastes and spent fuels. These challenges typically include:

- the need for licensees to at all times have an accurate understanding of the scale, nature and location of all radioactive wastes and spent fuels accumulated on their sites;
- the need for the systems used to control radioactive wastes to be properly optimised and integrated in terms of safety and environmental protection by, for example, avoiding unnecessary double handling of wastes and promoting waste minimisation and recycling.
- maintenance of a sufficient level of radioactive waste management expertise and human resources;
- the need for licensees to adopt quality assurance systems that address the needs of all relevant stakeholders in their management of radioactive wastes and spent fuel, which generally include: the waste owner; operators of any relevant downstream waste treatment and disposal facilities; information for the required regulatory permissions; the public; and future generations;
- the need for consignments of radioactive wastes and spent fuels between sites to take place in a fully quality assured manner in accordance with relevant transport regulations;
- capture of all the data necessary to demonstrate that the Waste Acceptance Criteria of the intended disposal facility for radioactive wastes are being complied with; and
- protection of knowledge and data over the extended timescales associated with interim storage of HAW and spent fuels destined for disposal at the planned GDF via systems that need to be robust and sustainable in the long term.

F.59. Compliance with this article is linked to the requirements of IAEA Safety Standard GS-R-3, 'The Management System for Facilities and Activities' (Ref. 140) supported by Safety Guide GS-G-3.1 (2006), 'Application of the Management System for Facilities and Activities' (Ref. 141) and Safety Guide GS-G-3.5 (2009), 'The Management System for Nuclear Installations' (Ref. 142).

F.60. ONR's SAPs broadly reflect these IAEA requirements and were benchmarked against the IAEA standards that applied at the time the latest version

of the SAPs was published in 2006. The SAPs recognise the importance of leadership and management for safety and expect quality management systems to be an integral part of this.

## **Management system**

### **Regulatory requirements and expectations**

F.61. LC17 places a duty on licensees to establish and implement management systems which give due priority to safety. In addition, LC17(2) requires licensees to make and implement adequate quality management arrangements in respect of all matters which may affect safety. LC32 places particular requirements on licensees to ensure their management systems are effective in minimising the level of radioactive wastes accumulated upon the site.

F.62. As a benchmark of established good practice, ONR expects licensees to base their quality management arrangements on recognised national or international quality management standards and adequately address all relevant matters of safety. An integrated management system is a requirement of GS-R-3 and encouraged by ONR to ensure safety is an inherent consideration within all the licensee's activities rather than confined to quality / safety management systems.

F.63. Many of the UK nuclear licensed sites use routes through which radioactive wastes transfer from the point of generation through several steps before dispatch off the site or placement into long-term storage. Radioactive wastes may be managed by a series of business units or contracted organisations that each carry out one or more parts of the overall waste management process. In such circumstances, ONR places particular emphasis on the importance of licensees maintaining effective oversight of the entire waste management system and integrating the individual steps.

F.64. Licensees undertaking decommissioning work or addressing accumulations of legacy radioactive wastes may encounter significant uncertainties, especially in the process of dealing with plant and wastes of advanced age. ONR expects licensees to adopt a precautionary approach to any associated safety risks, in terms of: the assigned level of risk; the categorisation of associated protection systems; and the adopted remediation methods.

F.65. ONR also recognises that licensees can face particular challenges in keeping their management systems fit-for-purpose when a plant reaches the end of its operational life and enters into the process of decommissioning. The transition into decommissioning can involve a dramatic change to the nature of tasks being undertaken on a site, such that licensees may need to undertake extensive programmes of staff training, alter their means of controlling work and integrate specialist knowledge from elsewhere.

### **General requirements**

F.66. Licensees' management systems describe the organisational structures and arrangements for such things as: control of documentation; control and supervision of staff and activities; establishment and maintenance of competency; verification of work; and audits and reviews of performance. GS-R-3 requires an integrated approach to ensure safety is taken into account in all these elements.

### **Safety culture**

F.67. Licensees are encouraged to use their management systems to promote a strong safety culture. This is typically achieved by:

- clear safety leadership from senior management;

- promotion of the ability of staff at all levels to question the delivery of relevant safety principles and practices with the aim of continuously improving nuclear safety;
- the ability of staff to report in a timely manner on safety issues;
- training in error-prevention methods;
- developing methods to enhance learning, to learn from experience, and benchmarking against industry good practice; and
- close monitoring of safety performance.

### **Graded application of management system requirements**

F.68. Most UK licensees apply a graded management system that gives a hierarchy of controls that can be applied to activities in a tailored way, dependent on safety significance, hazards and complexity of the task.

F.69. In addition to the potential for plant and equipment failures, this approach should include a consideration of the potential for human error to lead to adverse safety consequences if the planned activities are ill-conceived or inadequately executed. This is a particularly important consideration for unique decommissioning tasks outside the previous experience of the personnel involved.

F.70. Licensees are expected to apply appropriate levels of: scrutiny; supervision; inspection; monitoring; documentation; training; audit; and surveillance.

### **Documentation of the management system**

F.71. Licensees typically describe their management systems in a hierarchical structure. The top tier includes policies, organisational structure, and the mission or principal objectives. The second tier contains processes and procedures and job or post profiles. The third tier normally contains working level instructions and training material. ONR regularly inspects all the different levels of such management systems to gain assurance that activities on the site are being controlled in a manner that is compatible with the plant safety case and meets all relevant regulatory requirements.

### **Management responsibility**

#### **Management commitment**

F.72. Senior management of licensees have an important role in the implementation and improvement of management systems, including the development of organisational values and expected behavioural standards for individuals. To demonstrate commitment, some licensees have developed activities where senior managers actively engage with individuals and teams in the workplace to instil and promote good behaviours and practices and encourage continual improvement.

#### **Organisational policies**

F.73. Licensees may develop policies on the topics that are appropriate to the facilities and the range of activities they carry out. Consequently, policies differ between different licensees but normally include topics such as: health and safety; protection of the environment; prevention of accidents; quality; people; and risk management. Licensees develop and implement their own strategies to meet the aims of the policies they establish.

F.74. Licensees may use objective safety performance indicators to communicate some of their safety-related priorities to the workforce and regulators, and as a means of tracking their safety performance.

## Planning

F.75. Licensees develop business plans for the various stages in the plant lifecycle, ie design, construction, commissioning, operation and decommissioning. Licensees are at liberty to identify where the achievement of a business plan requires the input of other organisations, but at all times retain responsibility for the achievement and effectiveness of their own plans.

F.76. The volumes and types of radioactive wastes generated will vary as a nuclear plant transitions through its lifecycle stages. This may result in a need for the licensee to adapt its arrangements in order to continue satisfying regulatory expectations. For example, a large decommissioning project may generate radioactive wastes on a scale that is beyond the capacity of the site's pre-existing waste management infrastructure and outside the experience of staff, requiring a programme of upgrades and training.

F.77. ONR expects licensees to plan on the basis of achieving their business objectives whilst maintaining adequate levels of safety, inclusive of any time required for the regulatory assessment of safety submissions prior to required permissions.

## Responsibility and authority for the management system

F.78. Licensees' management systems are authorised for use by senior management and are mandatory for employees. Arrangements typically include processes to provide senior management with an oversight of the suitability, adequacy and practical level of compliance with the management system. Licensees clearly identify in related documents the key responsibilities of managers and others who carry out the work.

## Resource management

### Provision of resources

F.79. LC17 requires licensees to establish and implement management systems that give due regard to safety. The allocation of sufficient resources is not an explicit requirement of LC17. However ONR's view is that a licensee's arrangements cannot be considered adequate, if the level of resources provided by the licensee for undertaking safety-related activities is found to be clearly inadequate.

F.80. Provision of adequate resources is recognised by ONR to be a key element of delivering compliance with LC32, to enable the successful and efficient management of radioactive wastes – in terms of both specialist waste management expertise and facilitation of the required waste management processing steps.

F.81. LC36 was introduced specifically to guard against any undermining of safety-related resources as a consequence of ill-considered cost-cutting. However, the activities required to establish, implement, assess and continually improve the management system are a fundamental part of licensees' arrangements. In addition to all personnel having some responsibility for the delivery of the management system and its components, dedicated personnel are responsible for the assessment, review and collation of management information to support continual improvement.

F.82. Licensees are expected to determine the level of resources necessary to safely carry out their activities during the planning stage. This should include the resources and tasks needed to manage all anticipated radioactive wastes in a manner that is safe and protects the environment. The minimum level of competent personnel for activities that may affect safety should be included in the site's nuclear baseline.

F.83. The required competence for personnel, particularly for those whose work may affect safety, should be determined and documented in a post profile. Training

should be provided via a structured and systematic approach, regularly assessed to ensure required standards are achieved. Continuing competence over time should be assessed through supervision and appraisal and, especially for safety-critical work, refresher training can be provided if necessary. Increasingly, licensees are using specialist external resources such as contractors to undertake specific projects, but responsibility remains with the licensee to ensure the competence of any contractors that may be used.

## **Process implementation**

### **Developing processes**

F.84. A fundamental consideration in the development of licensees' management systems is the need to demonstrate compliance with the NIA65 licence conditions and other legal requirements. In addition, accredited management systems have to meet national and international quality management requirements and guides. On this basis, licensees have to implement suitable processes to meet a range of requirements and periodically review those arrangements to ensure they remain fit-for-purpose.

F.85. A licensee's management system will also be the vehicle by which all other arrangements required to satisfy NIA65 are identified, referenced and controlled.

F.86. Historically in the UK, licensees' management systems were entirely based on procedures. In more recent times, licensees have converted towards process-based management systems.

### **Process management**

F.87. In order to optimise their effectiveness, licensees ensure that processes are planned, documented, assessed, reviewed and improved. Work performed under each process is carried out under controlled conditions using approved procedures, instructions and records, which are subject to periodic review. Licensees retain overall responsibility where processes are contracted to other organisations.

### **Generic management system processes**

F.88. GS-R-3 identifies generic management system processes, such as: control of documents; control of products; control of records; purchasing; communications; and management of organisational change. As a matter of course, licensees will cover these basic elements of any management system. Increasing use is being made of electronic media for the control of documents and records.

F.89. All licensees have established procurement arrangements. An integral part of these arrangements is the evaluation and selection of suppliers and contractors, including compliance of contractors with requirements of licensees' management systems. Alternatively a contractor may use another means to provide an equivalent level of control itself.

F.90. Licensees use a variety of approaches and media to communicate to internal and external stakeholders on performance and intentions.

## **Measurement, assessment and improvement**

### **Monitoring and measurement**

F.91. Monitoring and measurement are fundamental elements of licensees' management systems. As with plant design and operation, there is a strong element of defence-in-depth in the audit and review process. Licensees employ a multi-layered audit and review approach to self-assessment, task-independent audit and review, and independent audit and review that could be carried out by third-party organisations. In addition to the audits and reviews carried out by, or on behalf of, the

licensees, ONR, as part of its regulatory activities, also carries out inspections of the licensees' arrangements.

### **Self-audit of procedures**

F.92. Audit and assessment functions are embedded within licensees' arrangements and take many forms, including independent, external and self-audit. Self-audits are normally conducted by reviewing procedures and performance and the measures undertaken within specific topic areas. Results from self-audits can give an oversight of overall compliance and identify improvement opportunities. Related improvement activities are normally communicated using existing reporting mechanisms. Improvement actions, some of which may be agreed with the regulators, can be captured within improvement plans and management systems. Self-audit activities can complement independent assessment and collectively these arrangements form an overall assurance process.

### **Audit of vendors**

F.93. A licensee's supply chain management arrangements cover the strategy, pre-qualification, tendering and award of contracts and the oversight arrangements following award of contracts. A pre-qualification and tender process generally requires a vendor to submit relevant information for consideration. Licensees are expected to assess the vendor's suitability in terms of their ability and capacity to deliver against the specifications required. Depending on the safety significance of the items or services required, a licensee may undertake a site visit / audit at the vendor's premises where appropriate. In line with the hierarchy of controls required under the Quality Assurance grading process for the safety significance of items or services, an independent inspection body may be used to undertake an audit of the vendor against technical specifications. The inspection body would generally forward its findings to a technical specialist employed by the licensee, who will review and assess the results for acceptability against: safety implications; relevant codes; standards; statutory requirements; and records management.

### **Independent assessment**

F.94. Licensees typically employ diverse means of independent assessment. These can include:

- audit, directed at assessing implementation of, and conformance with, the management system;
- inspection, directed at assessing compliance with the nuclear site licence and other applicable legal requirements;
- oversight, directed at surveillance to assess the safe and reliable performance of power plant; and
- peer review, where subject-matter experts from other sites, licensees or operators provide a critical assessment of working practices against recognised best practice and standards.

F.95. Licensees are increasingly seeking externally accredited certification of their management systems against international management system standards such as ISO 9001 (quality) (Ref. 143), ISO 14001 (environment) (Ref. 144), OHSAS 18001 (occupational health and safety) (Ref. 145) and PAS 55-1 (asset management) (Ref. 146).

### **Management system review**

F.96. Licensees are expected to regularly review their management systems, to ensure their arrangements continue to deliver adequate levels of safety and provide a basis for continued improvement. Information from a number of sources may be considered, including: performance of processes; results from assessments; non-

conformances and corrective actions; lessons learnt from other licensees and operator, and; known opportunities for improvement. Reviews should identify any extant weaknesses and obstacles to good performance and determine where changes and improvements need to be made to policies, objectives and processes. For some licensees, a single management system review is carried out annually. For others, reviews of parts of the management system are carried out at planned intervals, ensuring that the whole management system is reviewed within a specified overall period.

### **Non-conformances and corrective and preventive action**

F.97. Licensees, as part of a positive safety culture, should encourage the identification and reporting of non-conformances. Items, services and processes that do not meet safety requirements should be identified through a number of processes that can include: inspections on receipt; inspections in-service; contract reviews; supervision and monitoring; in addition to self-assessment and independent assessment as discussed above. The significance of a non-conformance typically depends on: its potential effect on nuclear safety and/or management of radioactive wastes; its cost; and its effect on the licensee's objectives.

F.98. Appropriate corrective action to address the root cause of any significant non-compliance should be undertaken in a timely fashion and the remedy monitored to completion. Analysis of data relating to non-conformances can help plant management to identify any developing trends and that appropriate longer-term preventive actions.

F.99. Information on events is shared between the different UK licensees via the mechanism of an operational experience liaison group (OELG).

### **Improvement**

F.100. Licensees may use a number of processes to support continual improvement of their management systems. If a need for a significant safety-related improvement emerges, the licensee is expected to commit the resources necessary to implement the required changes in a timely fashion. Depending on the scale of the required improvement, it may be included in a business plan or a specific improvement plan so that progress can be demonstrably monitored to completion. This approach is compatible with the ONR SAPs on leadership, in showing commitment to safety and system improvement.

F.101. The identification of opportunities for improvement is an ongoing responsibility on licensees, with a focus on the legally required periodic reviews of safety and environmental performance. External influences such as changes to standards or legislation, as well as changes in social and business expectations, all provide the need to regularly update business plans and management systems.

## Article 24 Operational Radiation Protection

1. Each Contracting Party shall take the appropriate steps to ensure that during the operating lifetime of a spent fuel or radioactive waste management facility:
  - (i) the radiation exposure of the workers and the public caused by the facility shall be kept as low as reasonably achievable, economic and social factors being taken into account;
  - (ii) no individual shall be exposed, in normal situations, to radiation doses which exceed national prescriptions for dose limitation which have due regard to internationally endorsed standards on radiation protection; and
  - (iii) measures are taken to prevent unplanned and uncontrolled releases of radioactive materials into the environment.
2. Each Contracting Party shall take appropriate steps to ensure that discharges shall be limited:
  - (i) to keep exposure to radiation as low as reasonably achievable, economic and social factors being taken into account; and
  - (ii) so that no individual shall be exposed, in normal situations, to radiation doses which exceed national prescriptions for dose limitation which have due regard to internationally endorsed standards on radiation protection.
3. Each Contracting Party shall take appropriate steps to ensure that during the operating lifetime of a regulated nuclear facility, in the event that an unplanned or uncontrolled release of radioactive materials into the environment occurs, appropriate corrective measures are implemented to control the release and mitigate its effects.

F.102. Under this Article, compliance with the Joint Convention is demonstrated in a way that has not substantially changed since the fourth UK report.

### Protection and safety optimisation

F.103. Optimisation is the process of determining what level of protection and safety makes exposures to ionising radiations, and the probability and magnitude of potential exposures, ALARA. In the UK, the ALARP principle is used and is fundamental to all health and safety legislation. The principle requires all nuclear site operators to follow relevant good practice and also adopt practices that could further reduce the risk if it is reasonably practicable to do so. Where relevant good practice in particular cases is not clearly established, the operator has to assess the significance of the risks (both their extent and likelihood) to determine what action needs to be taken.

F.104. Some irreducible risks may be so serious that they cannot be permitted. At the other extreme, some risks may be so trivial that it is not worth incurring significant cost to reduce them further. Licensees must take measures to reduce risk, unless the costs in terms of time, trouble and money of taking particular actions are clearly excessive (in gross disproportion) compared with the benefit of the risk reduction.

F.105. The widely used International Commission on Radiological Protection concept, ALARA (economic and social factors being taken into consideration) is equivalent to ALARP, but unlike ALARP does not have a legal basis in UK law. Financial equivalent values are used in the ALARP analyses, although the cost benefit analysis is only one input to the ALARP decision. The values used (value of unit collective dose) are those recommended by the Health Protection Agency Centre for Radiation, Chemical and Environmental Hazards (HPA-CRCE). For the general public, the value is £20,000 per manSv and for occupationally exposed workers the value is £50,000 per manSv. The values may be subject to modification to take account of gross disproportion and financial inflation.

F.106. IRR99 implements the EC BSS Directive 96/29/Euratom under the auspices of HSWA74, and implements the recommendations of the ICRP.

F.107. To meet IRR99 Regulation 8 and nuclear site licensing requirements, licensees must optimise protection to provide the highest level of safety that is reasonably practicable. This optimisation would include, but not be limited to, the following criteria reflecting the fundamental principles of the SAPs:

- the dutyholder for a nuclear site or facility must demonstrate effective understanding of the hazards and their control through a comprehensive and systemic process of safety assessment;
- measures for controlling radiation risks must ensure that no individual bears an unacceptable risk of harm;
- all reasonably practicable steps must be taken to prevent and mitigate nuclear or radiation accidents, and;
- arrangements must be made for emergency preparedness and response in the case of nuclear or radiation incidents.

F.108. Licensees are obliged by IRR99 to restrict exposure by means of engineering controls, such as shielding, physical separation, containment, ventilation and warning devices, where these are reasonably practicable, rather than relying on systems of work or personal protective equipment. At nuclear installations, whether or not licensees' employees undertake the work, the licensees are responsible for controlling work and ensuring doses to individuals are ALARP.

F.109. A dose constraint is a prospective restriction on the individual dose delivered by a source of ionising radiation, which serves as an upper bound on the dose in optimising the protection and safety of persons who may be affected by the source. IRR99 Regulation 8 requires employers to use dose constraints, where appropriate, in the planning stage of radiation protection. This is achieved through good planning of work activities to restrict individual exposures SFAIRP. In general, the licensees have considerable experience in developing dose databases which provide accurate dose forecasts for planned tasks.

F.110. IRR99 does not include a notion of a dose below which optimisation is always regarded as satisfied. The duty on the radiation employer (for nuclear sites this is generally the licensee, but may also include other employers having staff working at the site) given in Regulation 8(1) is to restrict SFAIRP the extent to which employees and other persons are exposed to ionising radiation. This requirement has no lower dose boundary and is satisfied when the radiation exposures are demonstrably ALARP. ONR has published SAPs which include some lower dose targets called Basic Safety Objectives (BSOs) of 1mSv/year for employees working with ionising radiation, and 0.02mSv/year for any person off the site. The BSO represents a dose value below which the regulator will not normally use its resources to seek further improvements, provided it is satisfied with the validity of the licensee's arguments. It does not represent a notional value of optimisation and a radiation employer at a nuclear licensed site would still have to seek further dose reductions below the BSOs if these were reasonably practicable.

F.111. The Approved Code of Practice supporting IRR99 gives practical guidance on the most appropriate methods of complying with the regulatory requirements. Advice has also been published on establishing management procedures to restrict exposure.

## Investigations

F.112. If an employee has a recorded whole-body dose greater than 15mSv (or a lower level established by the employer) for the year, the employer must carry out an investigation (under IRR99 Regulation 8). The purpose of this investigation is to establish whether or not sufficient is being done to restrict exposure SFAIRP.

F.113. IRR99 Regulation 25 requires employers undertaking work with ionising radiation to inform HSE if an exposure in excess of a dose limit occurs or is

suspected, whether this arises from a single incident or through an accumulated dose. In such circumstances the employer is expected to carry out a thorough investigation.

### **Dose monitoring and record keeping**

F.114. If an employee is likely to receive a radiation dose greater than three-tenths of a relevant dose limit in a year (eg 6mSv in the case of whole-body exposure), the employer has to designate that employee as a classified person. The employer then has to arrange for any significant doses (internal or external) received by that person to be assessed by a dosimetry service approved by HSE (or by ONR acting on HSE's behalf) for the measurement and assessment of doses for the relevant type of radiation. HSE and ONR also approve dosimetry services to co-ordinate individual doses received and to produce and maintain dose records for classified persons.

F.115. To help the employer assess the effectiveness of the dose control measures, dosimetry services provide a written summary of the doses recorded for each classified employee at least once every three months. By the end of March each year, the dosimetry services must also send HSE summaries of all recorded doses relating to classified persons for the previous year.

F.116. For nuclear licensed sites, LC18 requires licensees to monitor the average effective dose equivalent and notify ONR if this figure exceeds the level specified by HSE (currently 5mSv) for any specified class of persons. The classes of persons enable differentiation between the dose received by employees and contractors, and by classified and non-classified persons.

### **Central Index of Dose Information**

F.117. In January 1987, HSE established a computerised Central Index of Dose Information (CIDI) in order to receive and process the annual dose summaries. All dose summaries and personal data provided to HSE are treated as confidential.

F.118. The CIDI generates statistical information from the dose summaries. Detailed information relating to annual dose statistics has been published for each year from 1986 to date. Upkeep of CIDI is currently contracted by HSE to Public Health England.

### **Article 24.1(i) – ALARA and ALARP**

F.119. The dose uptake (collective and individual mean) for individuals involved in nuclear fuel reprocessing has reduced progressively over the last three years, with only one individual exceeding 6mSv per year. Dose uptakes for radioactive waste management have increased over the three-year period, although no individual has exceeded 6mSv per year. This is an indication of the continued application of the ALARA/ALARP principle within the industry. Within the nuclear decommissioning sector the annual collective dose and individual dose uptake are somewhat lower than in the previous three-year period but remain indicative of the increased pace of decommissioning of legacy plants in the UK. This is a particularly challenging area of work and the regulator is encouraging the industry to develop innovative techniques to keep doses ALARP. Table F.1 below shows this over the period from 2003 to 2012 for workers undertaking fuel reprocessing, radioactive waste treatment and the decommissioning of nuclear facilities.

F.120. Information on individuals is collated by many employers to help them understand which activities are giving the highest radiation doses. This is confidential information and thus not publicly available. However, summary information is publicly available and it is demonstrable that UK employers have achieved considerable dose reductions over the past 20 years.

## **Regulatory activities**

F.121. The provisions of IRR99, for both workers and members of the public, at spent fuel, reprocessing and radioactive waste management facilities, are enforced through inspections by ONR.

F.122. The environment agencies exercise regulatory control over exposures to the public resulting from authorised discharges of radioactive materials into the environment. They enforce the conditions attached to environmental permits or authorisations for radioactive waste disposal issued under EPR10 and RSA93 respectively.

## **Licensing requirements**

F.123. For nuclear licensed sites, in addition to the application of IRR99, the regulation of radiological hazards is also achieved through the licensing regime. As previously described, the licensing of spent fuel, reprocessing and radioactive waste management facilities ensures that the safety of the public and workers from the effects of ionising radiation is assessed during design, construction, commissioning, operation and decommissioning.

F.124. The adequacy of the licensees' safety cases is assessed by ONR against the guidance of the SAPs and the Approved Code of Practice supporting IRR99. The principles relating to radiological protection ensure that each licensee continuously strives to keep all radiation exposures ALARP.

## **Co-operation between regulatory bodies**

F.125. The joint responsibility for regulating doses to the public requires close co-operation between ONR and the environment agencies. Memoranda of Understanding are in place to ensure that regulatory activities are consistent, co-ordinated and comprehensive.

**Table F.1 Dose information for Classified Persons**

<b>Nuclear Fuel Reprocessing</b>										
<b>Year</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>
Total Classified Workers	3869	3977	3555	3518	2849	2858	2771	2286	2201	2116
Collective Dose (Man-mSv)	2641	2561	2476	2918	2201	2027	1896	1620	1353	1059
Mean dose, (mSv)	0.7	0.6	0.7	0.8	0.8	0.7	0.7	0.7	0.6	0.5
Classified persons with dose >6mSv										
<b>Year</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>
6.1 to 10mSv	15	17	9	5	1	3	0	1	0	0
10.1 to 15mSv	0	0	0	0	0	0	0	0	0	0
15.1 to 20mSv	0	0	0	0	0	0	0	0	0	0
>20mSv	0	0	0	0	0	0	0	0	0	0
<b>Radioactive Waste Treatment</b>										
<b>Year</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>
Total Classified Workers	364	339	291	249	227	237	252	239	227	231
Collective Dose (Man-mSv)	69	72	60	51	61	46	71	40	48	74
Mean dose (mSv)	0.2	0.2	0.2	0.2	0.3	0.2	0.3	0.2	0.2	0.3
Classified persons with dose >6mSv										
<b>Year</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>
6.1 to 10mSv	1	0	0	0	0	0	0	0	0	0
10.1 to 15mSv	0	0	0	0	0	0	0	0	0	0
15.1 to 20mSv	0	0	0	0	0	0	0	0	0	0
>20mSv	0	0	0	0	0	0	0	0	0	0
<b>Decommissioning</b>										
<b>Year</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>
Total Classified Workers	2531	2821	3317	3460	4454	4277	3672	3252	3323	3443
Collective Dose (Man-mSv)	2642	2410	3190	4046	2952	3485	2753	1816	2306	1913
Mean dose (mSv)	1.0	0.9	1.0	1.2	0.7	0.8	0.7	0.6	0.7	0.6
Classified persons with dose >6mSv										
<b>Year</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>
6.1 to 10mSv	63	31	64	48	13	122	64	28	33	28
10.1 to 15mSv	1	0	1	58	0	0	0	0	0	0
15.1 to 20mSv	0	0	0	0	0	0	0	0	0	0
>20mSv	0	0	0	0	0	0*	0	0	0	0

\* Previously reported as 1, in error.

### **Article 24.1(ii) – Dose Limitation**

F.126. IRR99 lays down dose limits for persons engaged in work with ionising radiation. For adult employees, the dose limit for whole body exposure is currently 20mSv per year.

F.127. In practice, all doses recorded for employees at spent fuel, reprocessing and radioactive waste management facilities are well below dose limits for normal operations. IRR99 also allows for dose limitation for an individual worker in specified circumstances to be based on a dose of 100mSv averaged over a period of five consecutive calendar years, with a maximum of 50mSv in any one year. However, this is acceptable only if the licensee can demonstrate to HSE's or ONR's satisfaction that an annual limit of 20mSv is impracticable for that person.

F.128. Notwithstanding dose limits, the employer responsible for the work must restrict exposure SFAIRP.

F.129. No workers in UK radioactive waste or spent fuel management facilities have exceeded this limit during the time period covered by this report.

### **Article 24.1(iii) – Measures to Prevent Unplanned and Uncontrolled Releases of Radioactive Materials into the Environment**

F.130. The UK nuclear licensing regime, as applied to spent fuel, reprocessing and radioactive waste management facilities, is designed to ensure that there is a very low probability of uncontrolled accidental releases of radioactivity into the environment. This is achieved by the requirement for licensees to demonstrate, through a safety case, that the design of any plant has taken into account the full range of reasonably foreseeable fault conditions. The plant design should provide protection, so that if a fault condition occurs the provided safety systems will act to ensure the risk of a resultant release of radioactivity is below strict criteria.

## **Article 24.2 – Radioactive Discharges**

### **Discharge Authorisations**

F.131. Operators must obtain an environmental permit under EPR10 or an authorisation under RSA93 for discharge of radioactivity to the environment, or disposal by means of burial, incineration or transfer of waste off the site. Environmental permits and authorisations may:

- specify the disposal routes to be used, and place limits and conditions on disposal;
- place a requirement to use BAT under EPR10 (England and Wales) or BPM under RSA93 (Scotland and Northern Ireland) to minimise the volume and activity of radioactivity discharged to the environment, and to minimise the radiological effects on the environment and on members of the public;
- require sampling and analysis to determine compliance with authorisation conditions, reporting of the quantities of radioactive waste disposed of and any instance of non-compliance with limits; and
- specify improvements in waste management arrangements.

F.132. The limits on radioactive discharges are set on the basis of the 'justified needs' of the practice being conducted by the licensees, ie they must make a case that the proposed limits are necessary to allow safe and continued operation of the plant. In setting limits, the environment agencies use monitoring, discharge and plant performance data to ensure that the public's exposure to radiation through any discharges would be less than the dose constraints and limits set by the UK

Government. These constraints are set out in EPR10 and the Radioactive Substances (Basic Safety Standards) (Scotland) Direction 2000 (Ref. 147). They are:

- a source constraint of 0.3mSv per annum for an individual facility which can be optimised as an integral whole in terms of radioactive waste disposals;
- a site constraint of 0.5mSv per annum for a site comprising more than one source, eg where two or more facilities are located together; and
- a dose limit of 1.0mSv per annum from all sources of human-made radioactivity, including the effects of past discharges but excluding medical exposures.

F.133. In addition to meeting dose limits and constraints, doses to members of the critical group must be kept ALARA.

F.134. Environmental permits under EPR10 for the disposal of radioactive waste are reviewed annually by the Environment Agency and NRW. SEPA reviews authorisations under RSA93 when it is considered appropriate to do so, although in practice this is at least once every five years. Environmental permits and authorisations for discharges are placed on public registers where they are open to inspection and discharge limits are published in various documents, for instance in the annual report by the Food Standards Agency, Environment Agency, NRW, SEPA and NIEA on Radioactivity in Food and the Environment (RIFE). The regulatory bodies carry out checks on the actual discharges made, in terms of activity and radionuclide composition, and have powers of enforcement, including prosecution under EPR10 or RSA93 if the terms of an environmental permit or authorisation are breached.

F.135. It is the Government's view that the unnecessary introduction of radioactivity into the environment is undesirable, even at levels where the doses to both human and non-human species are low and, on the basis of current knowledge, are unlikely to cause harm. The progressive reduction of discharge limits, and of actual discharges, having regard to the application of BAT under EPR10 or BPM under RSA93, is a central tenet of the way in which radioactive discharges should be controlled, and has been a feature of UK policy since 1993.

### **Regulatory environmental radiological surveillance**

F.136. In addition to the requirements placed on operators to monitor radioactivity in the environment around their sites, the environment agencies and Food Standards Agency undertake independent monitoring programmes. Radioactivity in surface and ground water, radiation dose rates on beaches and public occupancy areas, radioactivity in sediments and environmental material etc are sampled and analysed. The results of the monitoring are published annually.

F.137. The Food Standards Agency undertakes a programme of monitoring and assessment to ensure that authorised discharges of radioactivity from nuclear sites do not result in unacceptable doses to members of the public via their diet. The results of the monitoring programmes are published annually in the RIFE reports, the latest version being RIFE-18, issued in October 2013 (Ref. 134).

F.138. In Northern Ireland, NIEA carries out its own independent monitoring programme.

F.139. Environmental permits under EPR10 (in England and Wales) and authorisations under RSA93 (in Scotland) for discharges of radioactivity to the environment set numerical limits on discharges and require operators to minimise the activity discharges by applying BAT (under EPR10) or BPM (under RSA93) and to monitor the levels of radionuclides discharged in the local environment. The independent monitoring carried out by the Food Standards Agency, SEPA and NIEA over the last three years has confirmed that, in terms of radioactive contamination,

terrestrial foodstuffs and seafood produced in and around the UK are safe to eat. In 2009, consumers' exposure to artificially produced radioactivity via the food chain (for aquatic, terrestrial and total dose pathways) remained below the EU annual dose limit to members of the public of 1mSv for all artificial sources of radiation (excluding doses from medical sources). Details can be found in RIFE 2012.

F.140. A compilation of year-on-year discharges of radioactivity from the UK's spent fuel, reprocessing and radioactive waste management facilities, together with information on public radiation exposure is given in the annual RIFE report. Many UK nuclear site licensees publish annual reports of their safety and environmental performance on a voluntary basis. Further information is available on the websites of the relevant organisations, see Annex L4.

### **Radiation exposure to other countries**

F.141. Radiation exposure to members of the public living adjacent to a nuclear site in the UK must be less than the dose limits laid down in the International Basic Safety Standards for Protection against Ionising Radiation and for the Safety of Radiation Sources (Ref. 148) and the BSS Directive. Dose estimates indicate that the radiation exposure to the public in other countries as a consequence of UK radioactive discharges will be much less than these dose limits.

F.142. The Euratom Treaty requires compliance with measures to monitor radioactivity in the European environment (Articles 35 and 36) and to prevent radioactive discharges or waste disposal in one member state country resulting in contamination of the environment of another member state country (Article 37). In this context, the EC decides whether any plan for the disposal of radioactive waste would result in significant contamination from a health point of view. The UK has submitted data to the EC in respect of all operations covered under Article 37, since its accession to the Euratom Treaty in January 1973. In every case, the Commission's opinion has been favourable. The UK has also submitted monitoring data to the EC as required under Article 36 of the Treaty.

### **Article 24.3 – Unplanned or Uncontrolled Releases**

F.143. NIA65 LC34 concerns the control and containment of radioactive materials and radioactive wastes, SFAIRP, to prevent their leakage or escape, and the detection, notification, recording, investigation and reporting of any leakage or escape that does occur.

F.144. LC34 stresses the importance of control and containment of radioactive materials and wastes on nuclear licensed sites in order to prevent leakage or escape, and ensures that any leak or escape that does take place will be detected.

F.145. IRR99 Regulation 30 requires radiation employers to notify HSE in the event of an uncontrolled leakage or escape of a radioactive substance that exceeds the values on quantity and concentration specified in IRR99 Schedule 8.

F.146. Corrective measures to bring back under control any unplanned releases or uncontrolled releases of radioactivity with the potential to travel outside the boundary of the licensed facility, and to mitigate their effect, are dealt with under Article 25 (Emergency Preparedness).

## Article 25 – Emergency Preparedness

**Each Contracting Party shall ensure that before and during operation of a spent fuel or radioactive waste management facility there are appropriate on-site and, if necessary, off-site emergency plans. Such emergency plans should be tested at an appropriate frequency.**

**Each Contracting Party shall take the appropriate steps for the preparation and testing of emergency plans for its territory insofar as it is likely to be affected in the event of a radiological emergency at a spent fuel or radioactive waste management facility in the vicinity of its territory.**

F.147. Under this Article, a revision of ONR's policy for determining the Emergency Planning Areas surrounding nuclear sites is the only substantial change to the way in which compliance with the Joint Convention is demonstrated since the fourth UK report.

F.148. REPIIR Regulation 9(1) places a duty on ONR to determine the size of the area in the vicinity of a nuclear site across which a local authority is required to have an off-site emergency plan to protect the public in case of a reasonably foreseeable radiation emergency. ONR has recently developed its approach to encompass two stages of assessment, further details are given in paragraphs A.2.63 to A.2.64.

### **Emergency Preparedness for Radiological Emergencies at UK Nuclear Installations**

F.149. Precautions in the design, construction, operation and decommissioning of nuclear installations reduce the risk of an accident that might affect the public to a low level. However, all UK licensees are required to prepare an emergency plan to protect the public and workforce in the event of an accidental release of radioactivity. Such plans are prepared in consultation with local communities, the police, ambulance service and other bodies. Implementation of emergency plans is regularly tested in exercises monitored by ONR to ensure licensees are compliant with the requirements of LC11 and other legislation – principally REPIIR.

F.150. REPIIR (Ref. 89) implements in Great Britain the Articles on intervention in cases of radiation emergency in EU Directive 96/29/Euratom (Ref. 149) and EU Directive 89/618/Euratom (Ref. 90) (known as the Public Information Directive) on informing the general public about health protection measures to be applied. REPIIR places on a statutory basis the arrangements whereby a local authority with a nuclear site or sites in its area prepares an off-site emergency plan. REPIIR also covers the responsibilities for reviewing and testing off-site emergency plans – the preparation and testing of off-site emergency plans is regulated by ONR.

F.151. NIA65 LC11 requires licensees to have adequate arrangements to respond effectively to any incident, ranging from a minor on-site event to a significant release of radioactive material with off-site consequences. LC11 requires employees to be properly trained and the arrangements to be exercised. There is also a requirement for licensees to consult with any person not in their employ who may be required to participate in emergency arrangements. The licensees must submit to ONR for approval such parts of the arrangements as ONR may specify. Once approved, no alteration or amendment can be made to the approved arrangements without a further formal approval.

F.152. REPIIR establishes the multi-agency arrangements for dealing with nuclear emergencies. Since 2004 these have been complemented by a range of measures under the Civil Contingencies Act, which requires multi-agency responders to work together through Local Resilience Forums to assess the risk from, and prepare a response to, a range of potential hazards relevant to their location.

F.153. DECC co-ordinates a UK programme to improve emergency preparedness arrangements for response to any emergency with off-site effects from a licensed civil nuclear site in England and Wales.

F.154. As such, the programme brings together organisations with interests in off-site nuclear emergency planning including: nuclear operators; regulators; relevant Local Authorities and Resilience Forums; government departments, and; other agencies that may be involved in the response to an emergency. The Nuclear Emergency Planning and Response Programme (NEP&R), allows for discussion of common problems, exchanging information and experience and agreeing improvements in planning, procedures and organisation. Under its previous guise as the Nuclear Emergency Planning Liaison Group (NEPLG), it issued Guidance (Ref. 151) to all organisations that may be involved in planning for a civil or defence nuclear emergency. The guidance describes the underlying arrangements that have been developed for responding to an emergency in the UK over a number of years and any nuclear specific arrangements. The NEP&R programme also reviews results of Level 2 and 3 emergency exercises to ensure that important lessons identified from those exercises are put into practice.

F.155. The Nuclear Emergency Arrangements Forum (NEAF) provides operators of nuclear licensed sites with a discussion forum relating to on-site emergency response planning and includes the operators' role in connection with off-site response. NEAF is chaired by a representative of the nuclear operators, nominated by the Safety Director's Forum.

F.156. ONR attends both the NEP&R Board and NEAF to provide advice from the regulatory perspective to stakeholders at the national and local levels.

F.157. The Local Authority Working Group provides a forum for local authority planning officers, representatives of industry and other appropriate bodies including ONR to discuss emergency planning issues relating to the nuclear industry.

## **Main elements of the on-site plan**

### **Arrangements for preparedness and response**

F.158. LC11 requires licensees to rehearse their emergency arrangements to ensure their adequacy. ONR agrees a programme of demonstration emergency exercises that ONR will witness, judge the adequacy of and provide feedback on to the licensee. Prior to the exercise, the licensee is expected to consult ONR on the scenario to be rehearsed. If ONR judges that the exercise was not an adequate demonstration of compliance with legal requirements by the licensee, ONR may request the licensee to repeat the exercise.

F.159. ONR's formal consent is required prior to bringing nuclear fuel onto a reactor site for the first time. As part of the assurances required prior to granting this consent, the establishment of appropriate emergency and evacuation arrangements have to be demonstrated, including the approval of an on-site emergency plan that is in the public domain and cannot be changed without the approval of ONR. ONR agreement may further be required when changes to the emergency plan are proposed as a result of changes in hazard on the site, for example when a reactor moves into care and maintenance as part of the decommissioning process. At any of these stages, ONR may require a demonstration of the revised emergency arrangements prior to the granting of Consent to proceed to the next stage. This may be by examining the training records for all staff affected, or by ONR staff observing a demonstration exercise. Throughout the life of the nuclear installation, the emergency arrangements are subject to review and, with ONR's Approval, revision as appropriate. As part of the licensee's training arrangements, all staff participate in a regular programme of emergency exercises, which requires each shift at each nuclear site to exercise the arrangements at least once a year.

## **Testing of emergency plans and emergency response coordination**

F.160. NIA65 LC11 requires rehearsal of emergency arrangements to ensure their effectiveness. The principal source of regulatory expectations for off-site components of emergency plans is REPIR, which requires production of off-site plans by the local authority in consultation with emergency responders, for those sites where an off-site radiation emergency is reasonably foreseeable. REPIR also covers the responsibilities for reviewing and testing off-site emergency plans.

F.161. Emergency planning areas are specified around nuclear installations where there is the potential for an off-site release of radioactivity sufficiently large that it would constitute a radiation emergency as defined in REPIR. The extent of these zones is defined by ONR, based on the most significant release of radioactivity from an accident which can be reasonably foreseen, and on population factors.

F.162. The prime function of the off-site facility (Strategic Co-ordination Centre or SCC) is as a centre where the various responding agencies will progress the strategic elements of command and control in response to the incident.

F.163. The Strategic Co-ordinating Group (SCG) is the decision making group within the SCC, made up of representatives of the principal responding organisations, and is normally chaired by a senior Police Commander. The SCG decide on actions to be taken off-site to protect the public, ensure those actions are implemented effectively and ensure authoritative information and advice is issued to the public (through press statements and conferences at a dedicated Media Briefing Centre).

F.164. The declaration of an off-site nuclear emergency at a site is the responsibility of the operator in accordance with its arrangements to comply with LC11 and REPIR. This would be followed immediately by notification of the emergency services and local and national authorities. A cascade notification mechanism is in place thus the Operator can focus on dealing with the nuclear emergency. Each organisation with responsibilities for dealing with the emergency would be represented at the SCC. These would generally include the operator, the police, the local authority, the health authority, the local water company, fire service and ambulance service. Relevant government departments and agencies would also be represented, these would include: the Home Office; DECC; if appropriate the Scottish or Welsh Governments; PHE; ONR and the relevant environmental regulator.

F.165. During a civil nuclear emergency the Secretary of State for Energy and Climate Change appoints a senior representative from ONR to be the Government Technical Adviser (GTA). Operating autonomously of the ONR for the duration of the emergency, the role of the GTA is to provide independent authoritative advice to the SCG on the handling the off-site response to the emergency and, where appropriate, provide briefings to the media on behalf of Government

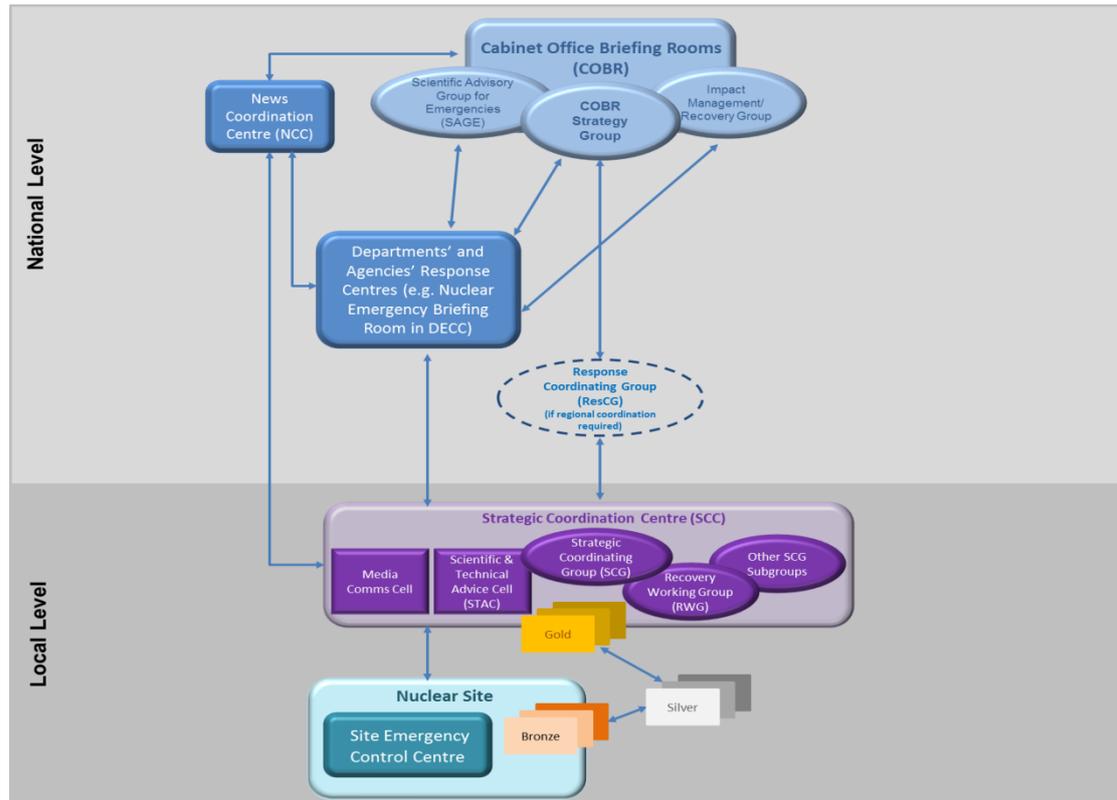
F.166. PHE would provide advice on public protection measures. The Food Standards Agency would issue advice and restrictions (if required) to prohibit food contaminated to unacceptable levels from entering the food chain.

F.167. Representatives at the SCC communicate with their respective organisations and are responsible for ensuring that adequate information and advice was available, both at the SCC and all relevant emergency control centres. The representatives liaise closely to ensure a proper assessment of the situation is made, that appropriate actions are taken and that the public is being kept informed. Figure F.1 shows the arrangements diagrammatically.

F.168. The Cabinet Office Briefing Room (COBR) facility is likely to be activated during a nuclear emergency. From here the central government response is activated, monitored and coordinated. The key decision-making body in COBR for the response to a nuclear emergency will be a Strategy Group chaired by the Prime

Minister or Minister from the Lead Government Department (DECC for civil site emergencies and Home Office for terrorism-related emergencies). The Lead Government Department will provide key briefings and updates to the group.

**Figure F.1 Emergency arrangements structure**



F.169. In the event that the operator believes that there is the potential for, or there has been, an off-site release they will declare an off-site nuclear emergency. The off-site plan co-ordinated by the local authority identifies the cascade notification and activation process for setting up the multi-agency response organisation.

F.170. The operator's technical information on plant prognosis and radiological assessments is important in the response to an emergency. The operator has two key roles in this respect:

- to monitor the environment on and around the site for radioactivity; and
- to provide advice to the off-site organisations, prior to the appointment of the GTA, on any measure that should be taken to protect the public, eg sheltering, taking of potassium iodate tablets or evacuation.

F.171. Emergency arrangements are tested regularly, with exercises divided into three categories (Levels 1, 2 and 3). Level 1 exercises are held at each nuclear licensed site and concentrate primarily on the operator's response on the site, with limited play off-site. Level 1 exercises are usually held once a year, though some lower-hazard sites may hold exercises every two or three years. ONR will witness and provide feedback on the adequacy of Level 1 exercises. In addition, each site has a programme of training and exercises for all staff involved in the emergency scheme and each role has a training profile that defines the type and frequency of training. As a minimum, each shift will take part in a site exercise every year when all the elements of the emergency organisation are practised.

F.172. Level 2 exercises are aimed at demonstrating the arrangements detailed in the Local Authority Off-Site Plan, particularly the functioning of the SCC and the response of organisations to a nuclear emergency.

F.173. From the annual programme of Level 2 exercises, one is chosen to be a Level 3 exercise, which will rehearse not only the functioning of the SCC but also the involvement of the lead government department. The decision on which exercise

should be selected as the Level 3 is made jointly between the dutyholders and the lead government department (DECC or the Scottish Government) in consultation with ONR.

### **Public information**

F.174. REPIR provides a legal basis for the supply of information to members of the public who may be affected by a nuclear emergency. The requirements are placed on the operator and the relevant local authorities. In addition, the information services of local agencies and central government, together with the news media, are available to help inform the public of the facts and assessments made during the course of any accident that might occur.

F.175. REPIR requires that members of the public within the Regulation 9(1) area determined by ONR, who could be at risk from a reasonably foreseeable radiation emergency, should receive certain prescribed information. Such information must be distributed in advance of any emergency occurring. Site operators provide this information in a variety of forms, updated at regular intervals not exceeding three years. The operator also makes the information available to the wider public, usually by providing information on request or by placing copies in public buildings such as libraries and civic centres. Every nuclear installation licensee also has local liaison arrangements that provide links with the public in the vicinity of the site.

### **Information in the event of an emergency**

F.176. REPIR requires local authorities to prepare and keep up-to-date arrangements that ensure that members of the public actually affected by a nuclear emergency receive prompt and appropriate information. The operator is also expected to make an official announcement as soon as possible after an emergency has been declared. While the agencies involved in responding to the emergency would deal with any queries they receive, the main channel of communication with the public outside the immediate vicinity of the affected site would be through the media.

F.177. The duration and extent of an emergency would depend on the scale and nature of the radioactive release. Once the release had been terminated, ground contamination would be checked and the police would advise those who had been evacuated when they could return home. At about this stage, the emergency condition would be officially terminated, but the return to completely normal conditions might take place over a period of time.

F.178. For an emergency at a nuclear installation in the UK, DECC would take the responsibility for notifying other countries. Under existing early notification conventions, DECC would inform the European Community, the IAEA, and countries with which the UK has bilateral agreements and arrangements, about the accident and its likely course and effects.

F.179. The UK regularly takes part in exercises with other countries to test the emergency arrangements to be enacted in the event of a nuclear emergency in another country that has the potential to affect the UK, or where an incident in the UK has potential to impact on another state.

### **Measures to enhance emergency preparedness programmes**

F.180. The UK has a well-developed programme of site, regional and national exercises of emergency plans. The ONR encourages the use of modular and desktop exercises to test different parts of the local authority off-site plan as well as the set-up of the SCC. Examples of such exercises have included the set-up and use of Reassurance Monitoring Units, media exercises and 'no notice' exercises.

F.181. After each Level 2 exercise, the relevant dutyholder facilitates a debrief in which all participating organisations have opportunity to comment on all aspects of

the exercise. The dutyholder then submits an exercise report to ONR highlighting good practices and areas for improvement, as well as any actions identified. Lessons are reviewed and any actions requiring improvement to: emergency facilities; equipment; procedures; training, etc are identified and monitored to completion via the Local Resilience Forum or Emergency Planning Consultative Committee.

F.182. Using the exercise outcomes, ONR produces an annual report titled 'Lessons Identified from Level 2/3 Exercises'. This report is an overview of exercises, together with a summary of the overarching issues requiring national attention and recommendations for improvements. This is submitted to the National Operations, Training and Exercise Group and is reviewed by the DECC-chaired 'Lessons Identified Sub-group' to identify actions to improve emergency response. These actions are included in a DECC Action Tracking Paper.

### **Response to emergencies outside of UK**

F.183. DECC is the lead government department for co-ordinating the response to an overseas nuclear emergency. The UK has signed a number of international agreements covering exchange of information in the event of a nuclear emergency. The Radiation Incident Monitoring Network (RIMNET) is the contact point for inward notifications under these arrangements. The National Response Plan, implemented by DECC with support from other agencies, provides arrangements for dealing with an emergency. This includes DECC maintaining contact arrangements and duty officers that ensure the UK can be notified of an emergency at any time. RIMNET comprises 94 gamma dose rate monitors located throughout the UK and provides a secondary alert mechanism in the event of non-notification. RIMNET is the UK's national radiological database. DECC's established procedures include the notification and alert of UK organisations with responsibilities for dealing with an overseas nuclear accident. It maintains the NEBR and Technical Co-ordination Centre containing the equipment required for management of the response.

## Article 26 Decommissioning

**Each Contracting Party shall take the appropriate steps to ensure the safety of decommissioning of a nuclear facility. Such steps shall ensure that:**

- **qualified staff and adequate financial resources are available;**
- **the provisions of Article 24 with respect to operational radiation protection, discharges and unplanned and uncontrolled releases are applied;**
- **the provisions of Article 25 with respect to emergency preparedness are applied; and**
- **records of information important to decommissioning are kept.**

F.184. Under this Article, compliance with the Joint Convention is demonstrated in a way that has not substantially changed since the fourth UK report.

F.185. In the UK, decommissioning on licensed nuclear sites takes place subject to the same legislative requirements and regulatory expectations that apply to the operational phase of a nuclear facility's lifecycle. This approach ensures continuity of the arrangements to comply with Articles 24 and 25.

F.186. The safety of decommissioning is regulated by ONR under the NIA65 licensing regime – all 36 of the standard nuclear site licence conditions that apply during a facility's operational life continue to apply through decommissioning. Under the terms of NIA65, a nuclear licensed site cannot be de-licensed until ONR provides written confirmation to the licensee that ONR is satisfied there is 'no danger' from ionising radiation from any article remaining on the site – further details on ONR's policy for de-licensing can be found in paragraphs E.106 to E.110.

F.187. LC35 requires licensees to make and implement adequate arrangements for the decommissioning of any plant that may affect safety, inclusive of adequate decommissioning programmes. LC35 also grants ONR the power to Direct a licensee to commence decommissioning, in the interests of safety. ONR has provided guidance to assist its Inspectors in their judgment of whether licensees' arrangements made under LC35 are adequate.

F.188. ONR's primary objective in its regulation of decommissioning is to secure a progressive and systematic reduction in radiological hazards, achieved in a manner that optimises the protection of individuals, society and the environment. ONR therefore expects licensees will construct coherent plans to decommission their facilities, targeted at ultimate removal of all significant radiological hazards wherever that is reasonably practicable. The relevant factors licensees should consider in determining their priorities for decommissioning are explicit in government policy and repeated in ONR's decommissioning-related SAPs.

F.189. In some circumstances decommissioning may require a temporary increase in risk in order to secure a reduction in hazard that gives an overall safety benefit in the longer term (eg a need to isolate protection systems in order to undertake invasive clean-up work). This circumstance requires rigorous substantiation, including a demonstration that risks at each stage of the activity are maintained ALARP.

F.190. The advanced age of some UK nuclear facilities implies that decommissioning can require licensees to face uncertainties, which may involve factors such as: the as-built status of plant or structures; incomplete radioactive inventories; and unknown effects of long-term ageing. Regulatory expectations for the management of uncertainty are based on the precautionary principle and embedded in the UK risk management framework (Ref. 152).

F.191. The nature of some decommissioning tasks may necessitate a greater emphasis on administrative controls to deliver adequate margins of safety.

Decommissioning may also give rise to elevated conventional safety risks, for example work in areas with restricted access, work at height, or in confined spaces. In such circumstances, ONR expects the licensees to carry out fit-for-purpose risk assessments that recognise all relevant sources of risk and implement an adequate range of risk-reduction measures.

F.192. EIADRR99 requires ONR to consult the public before giving formal consent to start the decommissioning of nuclear reactors of sufficiently high continuous thermal load.

F.193. The following aspects of decommissioning under Article 26 are covered in the equivalent sections under Articles 24 and 25: staff qualification; financial resources; radiological protection; discharges; unplanned and uncontrolled releases; emergency preparedness; and records

# Section G/H

## Safety of Spent Fuel, Reprocessing and Radioactive Waste Management

GH.1. The nature of regulatory requirements and the way nuclear activities are operated in the UK are such that there is very little difference in the UK's report under Section G (Safety of Spent Fuel Management and Reprocessing Management) and Section H (Safety of Radioactive Waste Management). Therefore, for this report, the two sections are combined. Where there is a difference, this is clearly indicated in the text.

### Long-term management of radioactive waste

GH.2. In October 2006, the UK Government accepted CoRWM's main recommendation that geological disposal, preceded by safe and secure interim storage, was the best available approach for the long-term management of the UK's higher-activity radioactive wastes.

GH.3. In June 2008, following public consultation, the UK Government and devolved administrations for Wales and Northern Ireland published a White Paper, 'Managing Radioactive Waste Safely: A Framework for Implementing Geological Disposal'. This set out a staged framework for implementing geological disposal based on voluntarism and partnership with local communities. This process consisted of six distinct stages:

- Stage 1: Invitation issued and Expression of Interest from communities.
- Stage 2: A consistently applied 'sub-surface unsuitability' test in the area(s) that expressed an interest.
- Stage 3: Community consideration leading to Decision to Participate.
- Stage 4: Desk-based studies in participating areas.
- Stage 5: Surface investigations on remaining candidates.
- Stage 6: Underground operations.

GH.4. In July 2014, the UK Government published the 'Implementing Geological Disposal' White Paper, which updated and replaced (in England and Northern Ireland) the 2008 White Paper. It sets out the overarching policy framework for implementing geological disposal, including initial actions led by the UK Government and the intended developer RWM to support the voluntarist process for siting a GDF. A national geological screening exercise will bring together existing geological data to provide robust information on the potential for siting a GDF across England, Wales and Northern Ireland. A GDF in England will be formally established as a nationally significant infrastructure project for planning consent purposes, and the Government will develop a GDF National Policy Statement to support this. Further work with experts will develop the detailed process of working with communities. On completion of these initial actions, in around 2016, the outputs will enable communities to engage with more confidence in the process to implement a GDF.

GH.5. The Scottish Government is not a sponsor of the programme for implementing geological disposal, but does remain committed to dealing responsibly with radioactive waste arising in Scotland. The Scottish Government published its policy on HAW in January 2011, based on the principles of long-term management of HAW in near-surface near-site facilities.

GH.6. The Welsh Government has continued to play an active role in the programme, having reserved its position on the policy of geological disposal in the 2008 White Paper.

GH.7. The UK Government considers, based on scientific consensus and international experience that despite some differences in characteristics, the radioactive wastes and spent fuel expected to arise from new nuclear power plants (NNP) will be capable of being accommodated in the same GDF as the UK's pre-existing legacy waste. The regulators have scrutinised these aspects as an integral part of the GDA process. In 2011, the Government set out in the National Policy Statement for Nuclear Power Generation the reasons why it was satisfied that adequate arrangements will exist. The UK Government considered these conclusions in the 2014 'Implementing Geological Disposal' White Paper and continued to be satisfied that they apply.

**Articles 4 and 11**

Each Contracting Party shall take the appropriate steps to ensure that at all stages of [spent fuel] [radioactive waste] management, individuals, society and the environment are adequately protected against radiological [and other] hazards.

- In so doing, each Contracting Party shall take the appropriate steps to:
- ensure that criticality and removal of residual heat generated during [spent fuel] [radioactive waste] management are adequately addressed;
- ensure that the generation of radioactive waste [associated with spent fuel management] is kept to the minimum practicable, [consistent with the type of fuel cycle policy adopted];
- take into account interdependencies among the different steps in [spent fuel] [radioactive waste] management;
- provide for effective protection of individuals, society and the environment, by applying at the national level suitable protective methods as approved by the regulatory body, in the framework of its national legislation which has due regard to internationally endorsed criteria and standards;
- take into account the biological, chemical and other hazards that may be associated with [spent fuel] [radioactive waste] management;
- strive to avoid actions that impose reasonably predictable impacts on future generations greater than those permitted for the current generation;
- aim to avoid imposing undue burdens on future generations.

GH.8. Under these Articles, compliance with the Joint Convention is demonstrated in a way that has not substantially changed since the fourth UK report.

GH.9. The way that the UK ensures adequate protection of individuals, society and the environment against radiological hazards is described in detail in other parts of this report, in particular Section E on the legislative and regulatory system; Article 21 on the responsibility of the licence holder; Article 24 on operational radiation protection; and Article 25 on emergency preparedness.

**Requirements of the nuclear site licence**

GH.10. ONR exercises powers under the following NIA65 licence conditions that are of particular relevance to Articles 4 and 11:

- LC14 requires the licensee to set up arrangements for the preparation and assessment of the safety-related documentation comprising 'safety cases' to ensure that the licensee justifies safety during design, construction, manufacture, commissioning, operation and decommissioning.
- LC19 enables ONR to control the design and construction of any facility used for the management of spent fuel or radioactive waste. Regulatory consent to the construction of any new facility will only be given when ONR is satisfied with the licensee's safety case that must address all nuclear safety issues, including criticality, shielding, containment and the ability of the plant to remove decay heat under normal and fault conditions.
- LC20 allows ONR to control design changes that could impact on the plant safety case.
- LC21 requires the licensee to produce arrangements to safely commission new facilities: ONR uses its powers to ensure that there are sufficient safety systems in place. The licensee cannot take a new

plant into operation without the consent of ONR and this will be given when ONR is satisfied with the pre-operational safety case.

- LC22 is used to control modifications to any operating spent fuel or radioactive waste management facility and again the licensee cannot carry out a modification which could have a significant effect on safety without the agreement of ONR.
- LC23 requires that the spent fuel or radioactive waste management facility has an adequate safety case and that it identifies the conditions and limits that ensure that the plant is kept safe.
- LC24 ensures that all operations that may affect safety, including any instructions to implement Operating Rules, are undertaken in accordance with written operating instructions.

### **Criticality, shielding, containment and removal of residual heat generated**

GH.11. Criticality, shielding, containment and residual heat removal are addressed in the licensees' safety cases, operating rules and operating instructions. Prior to granting permission for the associated work activities to take place, ONR judges the adequacy of the totality of the licensees' arrangements, comparing them with the targets and standards expressed in ONR's SAPs.

### **Minimising the generation of radioactive waste**

GH.12. The licensee of a spent fuel management facility is required under LC32 (Accumulation of Radioactive Waste) to ensure that the rate of production and total quantity of radioactive waste accumulated on the site is at all times minimised and adequate records are made. Related requirements are found in IRR99.

GH.13. Statutory guidance issued in July 2009 (Ref. 153) by the UK Government to the Environment Agency (and now applicable to NRW) includes the use of BAT as the means an operator must use to achieve an optimised outcome for radioactive discharges into the environment. Application of BAT is required under EPR10 in England and Wales. In Scotland and Northern Ireland, the use of BPM continues to apply to optimisation of radioactive waste discharges. Both BAT and BPM require an operator to demonstrate how optimisation has been applied to discharges of radioactive waste. In doing this, an operator should undertake a systematic and proportionate examination of waste management options having regard to the waste hierarchy, which requires those who generate waste to avoid, reduce, recycle, minimise and recover wastes as appropriate.

### **Interdependencies in spent fuel and radioactive waste management**

GH.14. The handling treatment, storage and reprocessing of spent fuel, and the management of radioactive waste are all prescribed activities under NIA65. Therefore the safety of all such activities, including, where appropriate, storage and reprocessing at Sellafield or storage at another licensed site, is regulated by ONR. ONR also regulates the safety of the transport of spent fuel from reactor sites to Sellafield.

GH.15. ONR and the environment agencies in England, Wales and Scotland have developed joint working arrangements and joint guidance to industry in order that the environmental impact and safety of the management of radioactive waste and spent fuel can be regulated in a coherent and holistic manner.

GH.16. In February 2010, the Nuclear Directorate of HSE (whose role is now performed by ONR), the Environment Agency and SEPA published joint guidance on the management of HAW on nuclear licensed sites and introduced the concept of RWMCs (Ref. 154) RWMCs are intended to provide a transparent demonstration of

adequate radioactive waste management for the waste stream(s) covered, through a combination of:

- compliance with all the regulatory requirements that apply in the complete process of radioactive waste management, from the point of generation to disposal;
- provision of an acceptable outcome in terms of national policy;
- consistency with national and international standards of radioactive waste management; and
- taking account of the interdependencies between all steps in the generation and management of radioactive waste.

GH.17. An RWMC should provide the complete story of the management of radioactive waste streams that cannot necessarily be demonstrated in a coherent way through examination of individual plant safety cases and environmental documentation. General contents of an RWMC may include, in summary form:

- a description of the waste (including the source of arising, characteristics, inventory and quantities);
- ownership of the waste;
- management strategy for the waste streams;
- proposed waste management processes;
- relevant buildings and plant involved (eg for conditioning or storage) and their physical state;
- relevant aspects of the facility organisation and the management of radioactive waste (eg the overall waste strategy for the site);
- interdependencies between all steps in generation and management of radioactive waste management;
- how the generation of radioactive waste is minimised;
- how the radioactive waste is adequately controlled and contained;
- how any applicable safeguards and security issues will be addressed;
- how the radioactive waste meets the relevant requirements to enable its transport and disposal;
- quality assurance arrangements; and
- information and records management arrangements.

GH.18. The UK's development and application of the concept of RWMCs was commended as good practice by the 2013 IRRS Mission to the UK.

### **Protection of individuals, society and the environment**

GH.19. Section E on the regulatory system describes how this provides effective protection of individuals, society and the environment, and how these relate to internationally endorsed criteria and standards.

### **Biological, chemical and other hazards**

GH.20. The biological, chemical or other hazards associated with the handling, treatment, storage and, where appropriate, reprocessing of spent nuclear fuel are subject to HSWA74 and associated regulations such as the Control of Substances Hazardous to Health Regulations (Ref. 155). By taking a comprehensive approach to regulation, ONR ensures that the licensee considers all hazards that could impact on the workers at the site, the public and the environment, and not simply those related to the radioactive hazard of such materials.

### **Impacts and burdens on future generations**

GH.21. It is UK government policy to ensure that the impact and burdens on future generations of today's activities are properly taken into account. This is reflected in government policy for nuclear decommissioning (Ref. 156), which was updated in

2004 to reflect the creation of NDA and establishment of NDA's mission to address the major part of the UK's civil nuclear legacy.

GH.22. The concept of inter-generational equity is also an important part of the UK's strategy for sustainable development (Ref. 157).

**Article 5** - Each Contracting Party shall take the appropriate steps to review the safety of any spent fuel management facility existing at the time the Convention enters into force for that Contracting Party and to ensure that, if necessary, all reasonably practicable improvements are made to upgrade the safety of such a facility.

**Article 12** - Each Contracting Party shall in due course take the appropriate steps to review:

(i) the safety of any radioactive waste management facility existing at the time the Convention enters into force for that Contracting Party and to ensure that, if necessary, all reasonably practicable improvements are made to upgrade the safety of such a facility;

(ii) the results of past practices in order to determine whether any intervention is needed for reasons of radiation protection bearing in mind that the reduction in detriment resulting from the reduction in dose should be sufficient to justify the harm and the costs, including the social costs, of the intervention.

GH.23. Under these Articles, compliance with the Joint Convention is demonstrated in a way that has not substantially changed since the fourth UK report.

GH.24. All existing facilities on nuclear licensed sites have to comply with licence conditions and, in respect of the review of safety, the licensee is required to undertake periodic safety reviews for all safety-related facilities. Licence Condition 15 (Periodic Review) ensures that the licensee reviews the safety case for its spent fuel management, radioactive waste management and reprocessing facilities regularly against an agreed programme. This is usually at least every 10 years. In addition, for those plants that require a Consent to start up following an outage for inspection and maintenance, the adequacy of the safety case is reviewed prior to the Consent for start up being granted.

GH.25. All existing spent fuel management and reprocessing facilities also hold permits or authorisations for the disposal of radioactive waste, granted by the environment agencies. EPR10 and RSA93, as amended by the Energy Act 2004, require the environment agencies to periodically review environmental permits and authorisations for discharges. Such reviews must consider the limits and conditions attached to each environmental permit or authorisation. The Environment Agency and NRW implement this through an annual review of environmental permits. The level of actual discharges and the margin between discharges and limits will be considered against UK government policy that limits should reflect closely the actual discharges. The environment agencies may decide to vary environmental permits or authorisations following a review, to set more stringent limits and conditions, and to require improvement programmes to be instituted. The conditions attached to environmental permits and authorisations ensure that doses to members of the public are kept ALARA with social and economic factors taken into account, and exert a downward pressure on discharges of radioactive waste to the environment.

GH.26. The Food Standards Agency in England and Wales carries out an extensive programme of sampling and analysis of foods produced close to nuclear installations. In Scotland a similar programme of environmental and food sampling is carried out by SEPA in liaison with the Food Standards Agency. If this programme revealed that past activities had resulted in unacceptable concentrations of radioactivity in foods, the Food Standards Agency, in conjunction with the Environment Agency, NRW or SEPA, as appropriate, would take steps to ensure that future activities do not cause these unacceptable levels to continue.

### **Intervention for past practices**

GH.27. The Radioactive Contaminated Land Regulations 2006 (Ref. 158) as amended in 2007 (Ref. 159) were introduced to put into place certain requirements of

the BSS Directive in England and Wales. The Radioactive Contaminated Land (Scotland) Regulations 2007 (Ref. 160) and the Radioactive Contaminated Land (Scotland) (Amendment) Regulations 2007 (Ref. 161), together with the Radioactive Contaminated Land Regulations (Northern Ireland) 2006 (Ref. 162) introduced similar requirements in Scotland and Northern Ireland respectively. For land to be determined as radioactive contaminated land, a 'significant pollutant linkage' must be present. A pollutant linkage comprises a radioactive contaminant and a human receptor, with a pathway capable of linking the two. All three elements need to occur on site for a pollution linkage to exist. The pollutant linkage becomes 'significant' if it results in harm to human health, or there is significant possibility of such harm occurring. This has been defined as a dose that exceeds one or more of the following:

- an effective dose of 3mSv per year;
- an equivalent dose to the lens of the eye of 15mSv per year; or
- an equivalent dose to the skin of 50mSv per year.

GH.28. In addition to humans, the Radioactive Contaminated Land (Scotland) Regulations 2007 include water as a receptor and include 'significant pollution of the water environment' as part of the definition of 'radioactive contaminated land'. The Regulations also identify that radioactive contaminated land exists for:

- terrestrial biota or plants, with a dose rate from lasting exposure of more than 40microGy per hour; or
- aquatic biota or plants, with a dose rate of more than 400microGy per hour.

GH.29. If land is 'determined' as radioactive contaminated land, intervention will be carried out to remediate the land, provided this is justified, ie when the benefits of reducing the detriment outweigh the harm and costs (including social costs) of taking action.

GH.30. EPA90 does not apply in Northern Ireland. Parallel regulations were introduced there in 2006 and 2007 to ensure that the UK fully complies with its obligations under Articles 48 and 53 of the BSS Directive, which lays down the basic safety standards for the protection of the health of workers and the general public against the dangers arising from ionising radiation. Further information is on the Defra website.

GH.31. ONR has powers under NIA65 to regulate land contaminated with radioactivity within the boundaries of nuclear licensed sites. For this reason, the requirements of Part 2A of EPA90 do not apply to land contaminated with radioactivity on nuclear licensed sites (Ref. 138).

## Articles 6 and 13

## Siting of Proposed Facilities

### **Articles 6 and 13**

1. Each Contracting Party shall take the appropriate steps to ensure that procedures are established and implemented for a proposed [spent fuel] [radioactive waste] management facility:

(i) to evaluate all relevant site-related factors likely to affect the safety of such a facility during its operating lifetime;

(ii) to evaluate the likely safety impact of such a facility on individuals, society and the environment;

(iii) to make information on the safety of such a facility available to members of the public;

(iv) to consult Contracting Parties in the vicinity of such a facility, insofar as they are likely to be affected by that facility, and provide them, upon their request, with general data relating to the facility to enable them to evaluate the likely safety impact of the facility upon their territory.

2. In so doing, each Contracting Party shall take the appropriate steps to ensure that such facilities shall not have unacceptable effects on other Contracting Parties by being sited in accordance with the general safety requirements of Article 4.

GH.32. These Articles demonstrate compliance with the Joint Convention in a way that has not changed substantially since the fourth UK report (other than the reform to the planning law in England and Wales described in Section A).

GH.33. An organisation wishing to construct any type of spent fuel management or reprocessing facility on a new site in the UK must obtain planning permission, a nuclear site licence and an environmental permit or an authorisation for radioactive waste discharges. The following text summarises the legal requirements, policy and implementation issues.

### **National Laws and Regulations for Planning and Licensing**

#### **Planning permission**

GH.34. Arrangements for planning permission are addressed in Section E.

GH.35. Proposals for spent fuel management facilities or reprocessing facilities must be accompanied by an assessment of the environmental impact of the proposed development if required by the relevant Environmental Impact Regulations (Refs. 163, 164 and 165).

#### **Nuclear Site Licence**

GH.36. NIA65 requires that a licence is granted before any site is used for installing or operating a nuclear installation. The power to grant this licence is delegated to the Chief Inspector Nuclear who, under Section 4(1) of NIA65, can attach such conditions as may appear to be necessary or desirable in the interests of safety or radioactive waste management. The Chief Inspector Nuclear will not grant a licence for a new site or sanction a new facility on an existing site unless ONR is satisfied with the licensee's safety case. This safety case will address siting issues to demonstrate that the proposed site is acceptable for such an installation in respect of its impact on the local population and environment. For new facilities on existing sites, the licensee's safety case is required to show that the new facility will not adversely affect the characteristics and safety of the existing site. Section 6(1) of NIA65 requires the Minister for Energy and Climate Change to maintain a list showing every site for which a nuclear site licence has been granted, and including a map or maps showing the position and limits of each such site.

## **Licensing**

GH.37. The site for any significant new spent fuel, reprocessing or waste management facility would normally be subject to a public inquiry. ONR would not license such a facility until the completion of the public inquiry and a ministerial decision made under planning law. ONR's licensing process would run concurrently with a public inquiry to avoid unnecessary delays. However, ONR would not grant a licence in advance of a decision on planning consent.

GH.38. Before granting a licence for any spent fuel, reprocessing or waste management facility, ONR would seek the views of the environment agencies to ensure that they were content with the radioactive waste disposal and discharge implications.

## **Radioactive waste permits or authorisations**

GH.39. Any new spent fuel, reprocessing or waste management facility would require prior authorisation under EPR10 or RSA93 to dispose of radioactive waste, including solid waste, and aqueous and gaseous discharges. Such disposals would not be authorised unless appropriate dose limits and constraints were met.

GH.40. If required, the Environment Agency, NRW or SEPA would give evidence to a public inquiry as to whether a proposed nuclear installation could be granted an environmental permit under EPR10 or an authorisation under RSA93.

## **Hazards**

GH.41. For spent fuel, reprocessing or waste management sites, the licensee would be expected to submit to ONR a safety case to demonstrate the suitability of the site and its compliance with ONR's siting criteria. Generally, the safety case would address the impact of the facility on the surrounding area from routine operations and fault conditions. Typically, the licensee would need to consider details of present and predicted population around the site, and the local infrastructure such as housing, schools, hospitals, factories etc. The factors ONR would assess would include: emergency planning; external hazards such as flooding; seismicity; and other geological factors. ONR would assess this information in the safety case using the siting criteria in the SAPs.

GH.42. Consideration is also given to any undue effects the presence of the nuclear installation might have on the local environment, for example, the environmental effects of radioactive discharges.

## **Emergency arrangements**

GH.43. As stated above, one of the key factors in assessing the suitability of a site for a nuclear installation is the impact of a possible nuclear emergency on the population in the area. Although nuclear installations in the UK are designed and operated to high standards, it is regarded as prudent to have effective arrangements to respond to and mitigate the consequences of an emergency.

GH.44. The licensee must have an emergency plan as described under Article 25 (see Section F). ONR must be satisfied that the size, nature and distribution of the population around the site will not prevent implementation of the emergency plan.

## **Topography**

GH.45. The siting of the nuclear installation will require consideration of the topography of the area that might affect the dispersion of the radioactivity discharged from the site in normal operation, or released in the event of an accident. In addition, aspects of the topography of the area around the site that may affect the movement of people and goods are identified, and their effect on the safety of the plant is examined. This examination determines whether the topography and road and rail systems could create difficulties if it became necessary to evacuate people from the area around the plant.

### **Information available to the public**

GH.46. The planning application process provides an opportunity to inform and obtain views from the public in relation to any proposals for the construction and operation of a spent fuel, reprocessing or waste management facility. Similarly, the environment agencies will consult on a developer's application for the permitting or authorisation of the disposal of radioactive waste from the site. ONR, the Environment Agency, NRW and SEPA have corporate policies to ensure that public information is available in an open and transparent manner subject to the requirements of the Freedom of Information Act 2000 (Ref. 166) and the Freedom of Information (Scotland) Act 2002 (Ref. 167).

### **Maintaining the continued acceptability of the site**

GH.47. Once the site is in operation, ONR must be satisfied that the characteristics of the site are preserved to ensure the continued effectiveness of the emergency plan, and that the general radiological siting criteria continue to be met. ONR monitors this through the local authority land use planning controls. This requires ONR to be consulted on developments within a specified radius of the site. Continued re-evaluation by the licensee of the external hazards and of the emergency plans is required under LC15 and LC11 respectively. Guidance on re-evaluation of the specific demographic requirements on siting is given to ONR Inspectors in the SAPs.

GH.48. Circular 04/00: 'Planning controls for hazardous substances' (Ref. 168) issued by the Department for Communities and Local Government, and a similar circular from the Scottish Development Department (5/1993) (Ref. 169) give advice on the exercise of planning control over hazardous development and over development in the vicinity of hazardous installations.

GH.49. These circulars provide guidelines for the types of development in the vicinity of hazardous installations on which HSE should be consulted. They establish HSE as a statutory consultee for development in the vicinity of hazardous installations covered by the Regulations for Control of Development (Hazardous Substances) (Ref. 170). From 1 April 2014 ONR became a statutory consultee for those hazardous installations that are also GB nuclear sites. ONR has non-statutory arrangements, operated under the same administrative arrangements, to be consulted by local authorities in the case of planning applications in the vicinity of all other types of nuclear installations. ONR Inspectors assess such planning applications to determine:

- whether a proposed development would raise the population to near the maximum guidelines set out in the Government's siting policy for nuclear installations;
- whether the external hazards recognised in the nuclear safety case include the hazard from a proposed hazardous installation, or alternatively whether a newly introduced hazard can be incorporated whilst continuing to demonstrate adequate safety;
- for a proposed development within the nuclear licensed site, whether the licensee has made a satisfactory safety case for the proposed development and for any existing licensable activities on the site that it would impinge upon, and whether the proposed activity is suitable for a nuclear licensed site;
- for a proposed development within the detailed emergency planning zone (where applicable), ONR refers the application to the local authority responsible for the off-site emergency plan, who then liaises with the responsible bodies under the plan, to find out:

- whether the development can be incorporated into the emergency plan; or
- whether the emergency plan could be modified to incorporate the development.

GH.50. ONR requires assurance that the impact of developments in the immediate vicinity of a nuclear installation is accommodated in the emergency preparedness arrangements, to satisfy REPPiR requirements.

GH.51. ONR also engages with local planning authorities with regard to the allocation of land for development as set out in their Local Plans.

GH.52. Licensees and ONR monitor and assess any phenomena that might affect safety (for example something that may change the assumptions concerning external hazards) around each nuclear site. This is done as part of the normal regulatory process and during the PSRs. In addition, ONR maintains a database of the estimated population around nuclear installations, based upon the most recent 10-yearly population census, updated to take account of subsequent planning applications for residential developments.

### **Periodic reviews of the discharge limits of Authorisations and Environmental Permits**

GH.53. Environmental permits and authorisations for discharges are reviewed regularly, including consideration of the level of actual discharges, the margin between discharges and limits, and the application of BAT under EPR10 or BPM under RSA93 to minimise waste generation and discharges to the environment. Against a background of UK government policy of progressive reduction in discharges overall, the environment agencies may decide to vary environmental permits or authorisations, following a review, for example, to set revised limits or conditions or to require improvement programmes to be implemented.

### **International obligations**

GH.54. Any new spent fuel management or reprocessing management activity is likely to involve a need to discharge radioactive waste. The UK, as a member state of the European Union, is required to provide the European Commission with such general data relating to any plan for the disposal of radioactive waste under the provisions of Article 37 of the Euratom Treaty. The information will make it possible to determine whether the implementation of such a plan is liable to result in the radioactive contamination of the water, soil or airspace of another member state – as per the Commission Recommendation of 11 October 2010 on application of Article 37 of 2010/635/Euratom (Ref. 171).

### **Government siting policy**

GH.55. The Nuclear National Policy Statement published in 2011 includes a list of the eight sites assessed as potentially suitable for new nuclear power stations up to the end of 2025. These sites are: Bradwell; Hartlepool; Heysham; Hinkley Point; Moorside in Cumbria; Oldbury; Sizewell; and Wylfa.

### **Staged regulation of underground radioactive waste disposal facilities**

GH.56. UK Government reiterated in the White Paper 'Implementing Geological Disposal' that it favours an approach based on voluntarism and partnership for siting of a GDF. A single facility for all the UK's HAW is preferred, although the UK Government remains open to other options. No technical reasons have yet arisen that would prevent the development of one GDF to manage the UK's entire HAW inventory for disposal. Such a development would largely depend on whether a large enough volume of suitable rock exists in an area willing to host a GDF, in which the underground facilities can be constructed and whether the developer is able to make an acceptable safety case.

GH.57. After selection of a site (or sites) for investigation, the relevant environmental regulator will regulate the development of any future GDF under the Environmental Permitting (England and Wales) Regulations 2010 (the Radioactive Substances Act 1993 in Northern Ireland), using a process known as 'staged regulation'. Staged regulation provides regulatory control from very early in the development of a GDF and enables the environmental regulator to maintain regulatory control throughout each stage of development from the start of intrusive site investigation, through construction and operation, and eventually to closure. The developer will need regulatory approval before each stage of development can begin and, in particular, disposal of radioactive waste will not be allowed without the appropriate environmental permit.

GH.58. 'Implementing Geological Disposal' notes the UK Government intends that the planned GDF will be a licensed nuclear site under NIA65 and therefore regulated by ONR. Consideration is presently being given to how this intent can be best delivered and any implications for the existing legislation.

GH.59. The staged regulation process is more fully described in the regulatory guidance for authorisation of geological disposal facilities for solid radioactive waste published by the Environment Agency and NIEA.

## Articles 7 and 14 Design and Construction of Facilities

### Articles 7 and 14

Each Contracting Party shall take the appropriate steps to ensure that:

- the design and construction of a spent fuel management facility provide for suitable measures to limit possible radiological impacts on individuals, society and the environment, including those from discharges or uncontrolled releases;
- at the design stage, conceptual plans and, as necessary, technical provisions for the decommissioning of a spent fuel management facility are taken into account;
- at the design stage, technical provisions for the closure of a disposal facility are prepared;
- the technologies incorporated in the design and construction of a spent fuel management facility are supported by experience, testing or analysis.

GH.60. Under these Articles, compliance with the Joint Convention is demonstrated in a way that has not substantially changed since the fourth UK report.

### **Safety in design**

GH.61. The design and construction of spent fuel, radioactive waste and reprocessing facilities are controlled under the conditions attached to the nuclear site licence, in particular the safety case requirements under LC19.

GH.62. Disposal of solid radioactive waste to either a near-surface disposal facility or to a GDF would only be permitted if prior authorisation for disposal is obtained from the relevant environment agency. The environment agencies have published guidance documents on the requirements for the permitting or authorisation of near-surface facilities (Ref. 172) and GDFs (Ref. 173) for the disposal of radioactive wastes. The following requirement relevant to safety in design is common to both guidance documents:

- **Requirement R3: Environmental safety case**  
An application under RSA93 or EPR10 relating to a proposed disposal of solid radioactive waste should be supported by an environmental safety case.

GH.63. The environmental safety case should include an environmental safety strategy supported by detailed arguments to demonstrate environmental safety. The environmental safety strategy should describe the fundamental approach taken to demonstrate the environmental safety of the disposal system. It should include a clear outline of the key environmental safety arguments and say how the major lines of reasoning and underpinning evidence support these arguments. The strategy should explain, for example, how the chosen site, design for passive safety and multiple barriers each contribute to environmental safety.

### **Measures to limit radiological impacts of disposals**

GH.64. Applications for environmental permits or authorisations to dispose of radioactive waste need to show how the design has used BAT or BPM to:

- minimise the volume and activity of the radioactive waste requiring disposal; and
- minimise the activity of gaseous and aqueous radioactive waste discharged to the environment.

GH.65. Environmental permits and authorisations also place a requirement on operators to maintain in good repair the systems and equipment provided to minimise disposals of radioactive waste, and to check these systems. Such systems will include all abatement plant, such as filters and delay tanks.

GH.66. The environment agencies' Guidance on the Requirements for Authorisation (GRA) sets out a number of principles and requirements. Most of those applicable to limiting radiological impacts during design and construction are common to the guidance covering both near-surface disposal and GDFs respectively, with the exception of Requirement R7 on human intrusion, which is treated differently. This difference is discussed below:

**Principle 1: Level of protection against radiological hazards at the time of disposal and in the future**

Solid radioactive waste shall be disposed of in such a way that the level of protection provided to people and the environment against the radiological hazards of the waste both at the time of disposal and in the future is consistent with the national standard at the time of disposal.

**Principle 2: Optimisation (ALARA)**

Solid radioactive waste shall be disposed of in such a way that the radiological risks to individual members of the public and the population as a whole shall be ALARA under the circumstances prevailing at the time of disposal, taking into account economic and societal factors and the need to manage radiological risks to other living organisms and any non-radiological hazards.

**Requirement R5: Dose constraints during the period of authorisation**

During the period of authorisation of a disposal facility for solid radioactive waste, the effective dose from the facility to a representative member of the critical group should not exceed a source-related dose constraint and a site-related dose constraint.

The environment agencies must have regard to the following maximum doses to individuals which may result from a defined source, for use at the planning stage in radiation protection:

- 0.3mSv per year from any source from which radioactive discharges are made; or
- 0.5mSv per year from the discharges from any single site.

**Requirement R6: Risk guidance level after the period of authorisation**

After the period of authorisation, the assessed radiological risk from a disposal facility to a person representative of those at greatest risk should be consistent with a risk guidance level of  $10^{-6}$  per year (ie 1 in a million per year).

The guidance uses the term 'risk guidance level' to describe the assessment standard for natural evolution of the system (not including human intrusion), because it indicates the standard of environmental safety that the environment agencies are looking for, but does not suggest that there is an absolute requirement for this level to be met.

**Requirement R7: Human intrusion after the period of authorisation – for near-surface disposal facilities**

The developer / operator of a near-surface disposal facility should assess the potential consequences of human intrusion into the facility after the period of authorisation on the basis that it is likely to occur. The developer / operator should, however, consider and implement any practical measures that might reduce the chance of its happening. The assessed effective dose to any person during and after the assumed intrusion should not exceed a dose guidance level in the range of around 3mSv/year to around 20mSv/year. Values towards the lower end of this range are applicable to assessed exposures continuing over a period of years (prolonged

exposures), while values towards the upper end of the range are applicable to assessed exposures that are only short-term (transitory exposures).

The environment agencies do not envisage that the developer / operator will be able to substantiate that human intrusion into a near-surface disposal facility is unlikely to occur after the period of authorisation. Wastes in such a facility are potentially vulnerable to disturbance by relatively commonplace human actions.

**Requirement R7: Human intrusion after the period of authorisation – for geological disposal facilities**

The developer / operator of a GDF should assume that human intrusion after the period of authorisation is highly unlikely to occur. The developer / operator should consider and implement any practical measures that might reduce this likelihood still further. The developer / operator should also assess the potential consequences of human intrusion after the period of authorisation.

Geological facilities will receive all radioactive waste that cannot be disposed of in near-surface facilities. Human intrusion into this type of facility after the period of authorisation may be regarded as highly unlikely, but not impossible, because of the facility's deep location, expected to be well beyond the reach of many types of intrusive activity. There can be no guarantee of protection for anyone who comes into direct contact with the waste from a geological facility. A person coming into direct contact with high-level waste, for example, might receive any radiation dose up to and including a fatal dose.

The environment agencies expect the developer / operator of a GDF to provide submissions on human intrusion as part of the environmental safety case. It is expected that these submissions would be of a technical quality consistent with other parts of the case. The environment agencies shall expect the developer / operator to make the argument that human intrusion into the disposal facility is highly unlikely to occur and to use the material presented in the submissions to help judge whether the disposal facility is properly optimised.

**Requirement R8: Optimisation**

The choice of waste acceptance criteria, how the selected site is used and the design, construction, operation, closure and post-closure management of the disposal facility should ensure that radiological risks to members of the public, both during the period of authorisation and afterwards, are ALARA, taking into account economic and societal factors.

**Requirement R9: Environmental radioactivity**

The developer / operator should carry out an assessment to investigate the radiological effects of a disposal facility on the accessible environment both during the period of authorisation and afterwards with a view to showing that all aspects of the accessible environment are adequately protected.

The GRA includes more detailed explanations of all these requirements and associated regulatory expectations.

**Measures to limit radiological impacts of uncontrolled releases**

GH.67. The safety case required for the design of a spent fuel, radioactive waste or reprocessing facility will include the safety of the plant under normal and fault conditions. Therefore, the safety case will address all the measures that are taken to prevent faults that could lead to an uncontrolled release of radioactivity or, in the event of an accidental release, to limit its impact.

GH.68. ONR assesses the adequacy of the licensee's safety case to ensure that the required level of defence-in-depth has been met before agreeing to the construction or operation of the plant.

### **Requirements on reliable, stable and easily manageable operation**

GH.69. Another important aspect of the design process is a detailed consideration of the role of the operator. Particular emphasis during the design stage is placed on identifying the safety actions required of the operators and specifying the user-interface design. ONR's regulatory oversight ensures that both the design and plant operating instructions address human factor considerations to ensure safe, reliable and easily managed operation.

GH.70. The following environment agencies' requirement for radioactive waste disposal facilities is common to the guidance on near-surface disposal and geological disposal:

#### **Requirement R4: Environmental safety culture and management system**

The developer / operator of a disposal facility for solid radioactive waste should foster and nurture a positive environmental safety culture at all times and should have a management system, organisational structure and resources sufficient to provide the following functions:

- planning and control of work,
- the application of sound science and good engineering practice,
- provision of information,
- documentation and record-keeping, and
- quality management.

The environment agencies expect the developer / operator of a disposal facility to foster and nurture a positive environmental safety culture, ie appropriate individual and collective attitudes and behaviours, and require its suppliers to do the same. This culture needs to be reflected in and reinforced by the developer's management system.

### **Prevention of accidents and their mitigation**

GH.71. A central and key element during the design process is the analysis of possible accidents on the spent fuel, radioactive waste or reprocessing facility. This covers all significant sources of radioactivity associated with the plant and all planned operating modes. The analysis starts with a list of initiating faults, including internal and external hazards, and faults due to personnel error that have the potential to lead to any person receiving a significant dose of radiation. A radiological analysis is performed for fault sequences, which could lead to the release of radioactive materials, to determine the maximum effective dose to persons on or off the site. The fault sequences are normally grouped, and a 'bounding case' for each group is specified. These bounding cases take account of the demands made on the safety system. They have consequences at least as severe as any member of the group of fault sequences that they bound.

GH.72. The fault analysis process leads to the determination of the design basis accidents (DBAs) for the nuclear installation. These accidents are drawn from the fault analysis, but do not include initiating faults that are determined to be very improbable.

GH.73. DBAs are analysed on a conservative basis and assume the worst normally-permitted configuration of equipment and unavailability for maintenance, test or repair. For each design basis fault sequence or bounding case which leads to a release of radioactive material, the radiological analysis determines the maximum

effective dose to a person outside the site. The DBA establishes the minimum safety system requirements for each initiating fault and also identifies the operator's administrative requirements. It therefore provides information for:

- the performance requirements for the safety systems and safety-related equipment;
- the determination of the plant operational limits and the formulation of the operating rules; and
- the preparation of the plant operating instructions for fault conditions.

### **Decommissioning provisions at the design stage**

GH.74. The safety case produced at the design stage should include at least an outline decommissioning plan to show how the design of the plant will facilitate its safe decommissioning and dismantling.

GH.75. The SAPs require the licensee to prepare an outline decommissioning plan to show how the design of the plant will facilitate its safe decommissioning and dismantling.

### **Closure of disposal facilities**

GH.76. In relation to the closure of a disposal facility, the environment agencies' GRA states:

#### **Principle 4: Reliance on human action**

Solid radioactive waste shall be disposed of in such a way that unreasonable reliance on human action to protect the public and the environment against radiological and any non-radiological hazards is avoided both at the time of disposal and in the future.

#### **Requirement R12: Use of site and facility design, construction, operation and closure**

The developer / operator of a disposal facility for solid radioactive waste should make sure that the site is used and the facility is designed, constructed, operated and capable of closure to avoid unacceptable effects on the performance of the disposal system.

#### **Requirement R14: Monitoring**

In support of the environmental safety case, the developer / operator of a disposal facility for solid radioactive waste should carry out a programme to monitor for changes caused by construction, operation and closure of the facility.

GH.77. The guidance also states that although the environment agencies shall regard disposal of a consignment of waste as taking place at the time when the consignment is placed in the facility, they shall not consider the disposal process complete until all the requirements of the environmental safety case have been met. At the design stage and periodically during the lifetime of the facility, the developer / operator should demonstrate that it is able to close the disposal facility satisfactorily and, where relevant, seal any preferential pathways that will or may be introduced as a result of the siting, construction and operation of the disposal facility.

### **Technologies proven by experience or qualified by testing or analysis**

GH.78. Nuclear installations designed to modern standards have included the qualification of equipment for DBAs within their safety cases. This qualification often involved arduous testing, or comprehensive analysis, or both, consistent with modern national or international standards or other specific regulatory requirements.

GH.79. For older plant, there will not be evidence from the design phase to address modern requirements for equipment qualification and safety analysis. In addition, the

experience of operation of earlier nuclear installations has provided operational, maintenance and inspection data. This has led to increased confidence in meeting required safety equipment performance levels or, alternatively, the need for a modification or replacement with more modern technologies meeting current safety design criteria, where appropriate.

GH.80. Furthermore, the PSR requirements of the UK nuclear site licences have meant that for many years the UK has been monitoring and improving the safety of its nuclear installations as a matter of routine. This activity will continue in the future under the legal requirements of the nuclear site licence.

GH.81. The environment agencies' GRA states that all work that supports the environmental safety case needs to follow good engineering practice, for reasons of both quality management and optimisation. The guidance makes clear that this will usually mean applying tried and tested methods, except where the technology used in the construction and operation of a disposal facility is at the leading edge of engineering practice. It also states that, in such instances, a judgment will need to be made as to whether the benefits of using a novel technology instead of a tried and tested method are sufficient to outweigh any uncertainties about the outcome of using it. Before the decision is made to use a novel technology, the environment agencies shall expect the developer / operator to have carried out trials to demonstrate that any such uncertainties are kept to a minimum.

## Articles 8 and 15 – Assessment of Safety of Facilities

### Articles 8 and 15

Each Contracting Party shall take the appropriate steps to ensure that:

- before construction of a spent fuel management facility, a systematic safety assessment and an environmental assessment appropriate to the hazard presented by the facility and covering its operating lifetime shall be carried out;
- in addition, before construction of a disposal facility, a systematic safety assessment and an environmental assessment for the period following closure shall be carried out and the results evaluated against the criteria established by the regulatory body;
- before the operation of a spent fuel management facility, updated and detailed versions of the safety assessment and of the environmental assessment shall be prepared when deemed necessary to complement the assessments referred to in paragraph (i).

GH.82. Under these Articles, compliance with the Joint Convention is demonstrated in a way that has not substantially changed since the fourth UK report (ie in a way that has implications for the Joint Convention obligations).

### **Systematic safety assessments**

GH.83. The safety case is the basis for much of the assessment and regulation of safety at nuclear licensed sites with spent fuel, reprocessing and radioactive waste disposal facilities in the UK. The assessment of the licensee's safety case starts before construction starts. The safety case consists of a tiered set of safety analysis reports covering a range of topics, from general safety principles through to detailed aspects of design and operation. This set of documents provides a written justification of the safety of the installation (eg evidence to support the selection of the concepts and processes, detailed data used in calculations for specific components, calling as necessary on specific research and development programmes).

GH.84. The safety case is continually developed and updated as the installation progresses through design, construction, commissioning, operation and, finally, decommissioning. At various stages in the life of a nuclear installation, the licence requires the licensee to review the adequacy of its safety case to ensure it is up to date and fit for purpose.

GH.85. The conditions attached to site licences granted under NIA65 require licensees to produce adequate safety documentation. In particular, this should include arrangements relating to: LC14 (Safety Documentation); LC16 (Site Plans, Designs and Specifications); LC19 (Construction or Installation of New Plant); LC20 (Modification to Design of Plant Under Construction); LC21 (Commissioning); LC22 (Modification or Experiment on Existing Plant); LC23 (Operating Rules); LC28 (Examination, Inspection, Maintenance and Testing). These LCs ensure that the licensee produces and maintains a safety case of adequate standard throughout the life of the installation.

### **Safety case evolution**

GH.86. A safety case evolves as a plant or activity moves from one phase of its lifecycle to another and should be updated or amended to take into account changing circumstances, which can include:

- developments in safety standards;
- transition from operations to decommissioning;

- changes in engineering;
- interfaces with other plants;
- operational experience feedback; and
- implications of modifications (including plant ageing effects) and emergent non-conformances.

GH.87. It is important that the safety significance of these aspects is examined and that the safety case is updated, as appropriate, to reflect the current situation. Thus, the documentation that forms the safety case is subject to appropriate quality assurance procedures, discussed under Article 23, and significant changes to the safety case are controlled as modifications.

GH.88. Supplementary documents may also be used to justify an activity at a point in time. For example, a method statement may demonstrate that the integrity of plant will be maintained and quality ensured during any modifications or during the installation of new plant. Similarly, any temporary plant modification may require a temporary change to the safety case to justify operations which lie outside the normal operations described by existing rules and instructions.

### **Regulatory validation activities**

GH.89. In the course of its nuclear regulatory work, ONR scrutinises the activities of licensees, both at their licensed nuclear sites and through assessment of the licensees' written safety cases. Inspectors examine the licensees' safety cases to satisfy themselves that the safety claims of the licensees are justified or demonstrated. For site inspections, ONR uses the safety case to help prepare inspections and to determine parameters and values against which to judge the safety of plants. Both general and specific targeted inspections are undertaken to ensure that the installation and its operation remain in accordance with its current safety case.

### **Systematic environmental assessments**

GH.90. The UK recognises that any proposed new spent fuel management or reprocessing facility will be subject to the requirements of EU Directive No 85/337/EEC (Ref. 174), as amended by EU Directive No 97/11/EC (Ref. 175), on the assessment of the impacts of certain projects on the environment. Where environmental assessment is required, the developer must prepare an environmental statement that includes a description of the likely significant effects on the environment and the measures envisaged to avoid, reduce or remedy any significant adverse effects.

GH.91. The environment agencies' GRA includes the following requirements relevant to this Article for facilities to be used for the disposal of solid radioactive wastes:

#### **Requirement R3: Environmental Safety Case**

An application under RSA93 or EPR10 relating to a proposed disposal of solid radioactive waste should be supported by an environmental safety case.

The developer / operator will be responsible for providing and updating the environmental safety case at each step during the development of a disposal facility and at suitable intervals during the period of authorisation. The environmental safety case, including quantitative environmental safety assessments, will need at each step to be sufficiently detailed and comprehensive for the regulatory decisions it is intended to inform and support. While the disposal facility is being operated and up until the time when it is closed, the environment agencies shall expect any necessary updates to be provided progressively in a timely manner.

**Requirement R9: Environmental radioactivity**

The developer / operator should carry out an assessment to investigate the radiological effects of a disposal facility on the accessible environment, both during the period of authorisation and afterwards, with a view to showing that all aspects of the accessible environment are adequately protected.

**Requirement R11: Site investigation**

The developer / operator of a disposal facility for solid radioactive waste should carry out a programme of site investigation and site characterisation to provide information for the environmental safety case and to support facility design and construction.

**Requirement R14: Monitoring**

In support of the environmental safety case, the developer / operator of a disposal facility for solid radioactive waste should carry out a programme to monitor for changes caused by construction, operation and closure of the facility.

GH.92. In fulfilling its responsibility to protect consumers from unacceptable concentrations of radionuclides in foods, the Food Standards Agency assesses the doses that could be received by consumers of locally-produced foods. This data is provided to either SEPA, NRW or the Environment Agency to inform the regulatory decisions on proposed authorisations and environmental permits respectively. In order to compare the assessed dose to statutory limits, the assessment has to consider all environmental and human health pathways for radiation, not just the consumption of food.

## Articles 9 and 16 – Operation of Facilities

### **Articles 9 and 16**

Each Contracting Party shall take the appropriate steps to ensure that:

- the licence to operate a spent fuel [radioactive waste] management facility is based upon appropriate assessments as specified in Article [8] [15] and is conditional on the completion of a commissioning programme demonstrating that the facility, as constructed, is consistent with design and safety requirements;
- operational limits and conditions derived from tests, operational experience and the assessments, as specified in Article [8] [15], are defined and revised as necessary;
- operation, maintenance, monitoring, inspection and testing of a [spent fuel] [radioactive waste] management facility are conducted in accordance with established procedures;
- engineering and technical support in all safety-related fields are available throughout the operating lifetime of a [spent fuel] [radioactive waste] management facility;
- procedures for characterization and segregation of radioactive waste are applied;
- incidents significant to safety are reported in a timely manner by the holder of the licence to the regulatory body;
- programmes to collect and analyse relevant operating experience are established and that the results are acted upon, where appropriate;
- decommissioning plans for a [spent fuel] [radioactive waste] management facility are prepared and updated, as necessary, using information obtained during the operating lifetime of that facility, and are reviewed by the regulatory body.
- plans for the closure of a disposal facility are prepared and updated, as necessary, using information obtained during the operating lifetime of that facility and are reviewed by the regulatory body.

GH.93. Under these Articles, compliance with the Joint Convention is demonstrated in a way that has not substantially changed since the fourth UK report.

### **Licensing process and national law**

GH.94. As previously described, no one may operate a nuclear installation unless they hold a nuclear site licence granted by the CNI, acting under delegated powers. The conditions attached to the nuclear site licence define the key activities the licensee must carry out in order to effectively manage the safety of the installation.

GH.95. The environment agencies require prior permitting or authorisation, under either EPR10 or RSA93, before radioactive waste is consigned to a disposal facility. Compliance with conditions and limits set in environmental permits under EPR10 and in authorisations under RSA93 is monitored by the environment agencies through inspection and other assessment activities, such as monitoring of wastes disposed to the facility and monitoring of discharges from the facility.

### **Licence to operate nuclear installations**

GH.96. A nuclear site licence is required prior to commencement of the construction of a nuclear installation on the site. The report on Article 15 addresses the licensing process and the safety analysis during the design, construction and commissioning phases.

GH.97. In practice, there is a transitional period for the nuclear installation as it moves from its construction to its operational phase. This period is controlled by a commissioning schedule and programme, which give details and requirements for

each item of plant or equipment, and groups of plant or equipment, to be brought to a state that is acceptable for operation in the totality of the facility. Certain key stages in the commissioning programme are identified at which ONR's Consent is required before further progress towards operation can be made. The final Consent during the commissioning phase is the Consent to move to routine operation. This is issued once the safety case has been substantiated by the results of commissioning tests, and all the necessary documents and systems are in place for the continued operation and maintenance of the plant. This final Consent is effectively an authorisation for routine operation.

### **Operational limits and conditions**

GH.98. The operational limits and conditions for a nuclear installation are based on its safety case and limits therein. The safety case limits are normally the measurable plant parameters that define the envelope for demonstrably safe operation and the safety conditions that are prerequisites, in terms of plant configurations and operator actions, to keep plant within this envelope.

GH.99. Licensee's arrangements under the nuclear site licence provide for adequate control over modifications to plant operating limits or conditions. Where the limits and conditions necessary for safety are defined in the form of operating rules, ONR may specify that, once approved by ONR, no alteration or amendment can be made to such operating rules without ONR's prior approval.

GH.100. The environment agencies will periodically review environmental permits under EPR10 and authorisations under RSA93 for the disposal of radioactive waste. Reviews may lead to revision of the limits and conditions in environmental permits and authorisations.

### **Operation, maintenance, monitoring, inspection and testing**

GH.101. Operation, maintenance, monitoring, inspection and testing at nuclear installations are all covered under conditions attached to nuclear site licences. Details are provided in Annex L.6 (Licensing) but the key areas are:

- LC24 – all operations that may affect safety must be undertaken in accordance with written operating instructions; and
- LC28 – licensees must make and implement arrangements for the regular and systematic examination, inspection, maintenance and testing of all plant which may affect safety.

### **Engineering and technical support**

GH.102. Nuclear site licences issued under NIA65 contain a number of requirements to ensure sufficient safety-related engineering and technical support is available throughout the life of a nuclear installation. In particular:

- LC12 – only suitably qualified and experienced persons should perform any duties that may affect the safety of operations on the site; and
- LC36 – requires the licensee to assess the safety impact of any change to its organisational structure or resources before these changes are carried out.

GH.103. Licensees commission and undertake research to support the safe operation of their nuclear installations. In addition, the Government has given ONR responsibility to co-ordinate safety-related research to address the following objectives:

- Adequate and balanced nuclear safety research to properly address the technical issues deemed likely to emerge in the short and long term.

- The contribution research makes to securing higher standards of nuclear safety as a matter of continuous improvement is maximised.
- Results of research having implications for nuclear safety are appropriately disseminated.

There are two secondary objectives:

- Maintenance of a sufficient range of independent research capability in the UK, to ensure the primary objectives can be met on a sustainable basis.
- Proper account is taken of lessons learnt from international collaboration in research.

GH.104. ONR directs the safety-related elements of the programme by identifying the relevant safety issues, expressed in a statement of Nuclear Research Needs (NRN) published in 2013 (Ref. 176 and 177). Previously, ONR published an annual Nuclear Research Index (NRI) for operating civil nuclear reactors (last published November 2012) and a Decommissioning, Fuel and Waste Programme NRI, primarily concerned with activities at Sellafield (last published April 2013). More recently ONR undertook to publish an integrated statement of NRN to identify the requirements for nuclear-safety related research across the whole of ONR's regulatory remit. This was partly in response to a review and report on nuclear research and development capabilities produced in 2011 by the House of Lords Select Committee on Science and Technology and a recommendation in the HM Chief Inspector of Nuclear Installations Final Report on the accident at Fukushima.

GH.105. In producing the NRN, ONR took account of the views of other organisations having regulatory responsibilities for certain aspects of the programmes, namely the Environment Agency, SEPA, NRW, the Defence Nuclear Safety Regulator, nuclear site licensees and other UK nuclear dutyholders and key stakeholders. The 2013 NRN contained a contribution from the environment agencies and ONR is continuing to work with them, and DNSR, to explore the possibility of publishing a comprehensive regulators statement of NRN covering safety and environmental matters later in 2014.

GH.106. The environment agencies require operators of both nuclear facilities and disposal sites to demonstrate compliance with their environmental permits or authorisations. Operators must be able to demonstrate that they are meeting limits and conditions through appropriate organisational structures and resources; this would include setting down and adhering to work procedures and having appropriate engineering and technical resources.

## **Operation of a disposal facility and waste acceptance criteria**

GH.107. The environment agencies' GRA states that the developer / operator of a radioactive waste disposal facility will be responsible for all information necessary to support the environmental safety case, and will need to provide it to the appropriate environment agency in a timely way within an agreed documentation structure so that its relevance to the environmental safety case is clear. The guidance also states that technical information should be submitted in an agreed form that allows the regulator to understand fully the arguments put forward in the environmental safety case and to carry out its own environmental safety assessments to support its judgments.

GH.108. Provision of information by the developer / operator is part of demonstrating compliance with:

### **Requirement R4: Environmental safety culture and management system**

The developer / operator of a disposal facility for solid radioactive waste should foster and nurture a positive environmental safety culture at all times and should have a management system, organisational structure and resources sufficient to provide the following functions:

- planning and control of work;
- the application of sound science and good engineering practice;
- provision of information;
- documentation and record-keeping, and;
- quality management.

### **Requirement R14: Monitoring**

In support of the environmental safety case, the developer / operator of a disposal facility for solid radioactive waste should carry out a programme to monitor for changes caused by construction, operation and closure of the facility

GH.109. The environment agencies' GRA sets out a requirement on waste acceptance criteria for radioactive waste disposal facilities:

### **Requirement R13: Waste acceptance criteria**

The developer / operator of a disposal facility for solid radioactive waste should establish waste acceptance criteria consistent with the assumptions made in the environmental safety case and with the requirements for transport and handling, and demonstrate that these can be applied during operations at the facility.

GH.110. The guidance states that waste characterisation, treatment and packaging are the responsibility of the consignor of the radioactive waste to the disposal facility. However, it is the responsibility of the developer / operator of the facility to make sure that the waste accepted for disposal is consistent with the environmental safety case and the operational requirements at the facility, including transport and handling.

## **Reporting of incidents significant to safety at nuclear licensed sites**

GH.111. LC7 (incidents on the site) is a general requirement to make arrangements to notify, record, investigate and report incidents:

- (i) as is required by any other condition attached to the licence;
- (ii) as ONR may specify; and
- (iii) as the licensee considers necessary.

GH.112. Under (i) above there are, for example, requirements to notify, record, investigate and report incidents arising under LC23 (Operating Rules); LC28 (Examination, Inspection, Maintenance and Testing); and LC34 (Leakage and

Escape of Radioactive Material and Radioactive Waste). Incidents to be notified etc include those referred to in NIA65 Section 7 in the Nuclear Installations (Dangerous Occurrences) Regulations 1965 (Ref. 178), and in IRR99 Regulations 25 and 30. In making the arrangements required under LC7, licensees should include the need to notify incidents which fall into any of the following categories:

- occurrences on a nuclear installation site, under section 22(1) of NIA65, which are to be reported by the quickest means possible under section 4(1) of the Nuclear Installations (Dangerous Occurrences) Regulations 1965, to DECC and ONR;
- a confirmed breach of, or discharge expected to breach quantitative limits of an environmental permit under EPR10 or an authorisation under RSA93 for the disposal of radioactive waste;
- a confirmed release to atmosphere or spillage of a radioactive substance which exceeds, or is expected to exceed, the limits set out in Column 4 of Schedule 8 of the IRR99 (except where the release is in a manner specified in an environmental permit under EPR10 or an authorisation under RSA93) to be notified forthwith to ONR; and
- a confirmed or suspected over-exposure of a worker to ionising radiation under section 25 of IRR99, to be notified as soon as practicable to ONR.

GH.113. ONR has made arrangements with licensees via which ONR is informed of any incidents covered by international reporting arrangements, for which ONR is the UK reporting authority, ie:

- the International Nuclear Event Scale (INES); and
- the IAEA/NEA Incident Reporting System.

GH.114. Certain incidents are covered by agreements for ministerial reporting to Parliament, and these are published by ONR in a quarterly statement. The criteria for ministerial reporting are:

- dangerous occurrences reportable under Nuclear Installations (Dangerous Occurrences) Regulations 1965;
- confirmed exposure to radiation of individuals which exceeds or which is expected to exceed the dose limits specified in Schedule 4 to IRR99;
- examination, inspection, maintenance or test of any part of the plant that has revealed that the safe operation or condition of the plant may be significantly affected;
- a confirmed release to atmosphere or spillage of a radioactive substance which exceeds, or is expected to exceed, the limits set out in IRR99 (except where the release is in a manner specified in an environmental permit under EPR10 or an authorisation under RSA93); and
- a confirmed breach of, or discharge expected to breach quantitative limits of, an environmental permit under EPR10 or an authorisation under RSA93 for the disposal of radioactive waste.

GH.115. The UK is a signatory to the 1986 IAEA Convention on 'Early Notification of a Nuclear Accident' (Ref. 179) which requires notifying the IAEA whenever 'a release of radioactive materials occurs or is likely to occur and which has resulted or may result in an international trans-boundary release that could be of radiological safety significance for another state'. The UK competent authority and contact point for issuing and receiving notification and information on the nuclear accident is DECC.

GH.116. In addition to reporting incidents at nuclear installations, ONR publishes a quarterly newsletter that reports key events at nuclear installations in the UK, as well as the current activities of the regulatory authority.

### **Programmes to collect and analyse operating experience at nuclear licensed sites**

GH.117. Operational matters which may affect safety and which are identified during operation or during maintenance, inspection and testing are notified, recorded, investigated and reported as required by LC7. These requirements ensure that experience gained during operation is properly considered, and that any findings or recommendations that will improve safety are recognised and acted upon. The operational records required under LC25 not only demonstrate to the regulators compliance with site licence conditions and other regulatory requirements, but also constitute part of the plant history that operators need to make safety and commercial judgments. For example, the results of routine examinations of the plant under LC28 may be used to justify a change to the intervals between maintenance, or a change from preventive maintenance to condition-based maintenance.

GH.118. The licensees' arrangements for investigation of plant events include requirements for the impact on other installations and operators to be considered in off-site reporting, and regular reviews of such reports to be taken into account by other nuclear installation licensees. In this way, dissemination of a plant event on one installation can be used by other installations to assess and report formally on its impact on their plant.

GH.119. ONR has agreed guidance with licensees as part of a system of event notification which identifies the types of incidents ONR wishes to have reported, and offers examples of each. The guidance covers nuclear safety, radiation safety, safeguards, security and transport. Associated with this guidance is a central reporting system on a standard form which prompts the licensee for information of importance. The information is collated in a central database and distributed to relevant parties.

GH.120. An analysis of operating experience is a key part of the periodic safety reviews that are required under LC15. The main review is carried out at least every 10 years, but other reviews may also take place before start-up after statutory outages.

GH.121. The information collected on events by ONR is analysed monthly to determine lessons learnt. In addition, licensees provide feedback on investigations of all events notified to ONR. Trending of events along with other relevant data (inspection findings, issues from other industries, feedback on trending from licence holders) is used to identify issues for learning. Several other routes for sharing learning exist which ensure the learning is targeted to the most appropriate recipients.

GH.122. ONR is responsible for national publication of the results of its regulatory activities (such as the assessment of licensees' PSRs) and international reporting of events. ONR brings to the attention of licensees any international events of significance.

### **Decommissioning Plan preparation and updating at nuclear licensed sites**

GH.123. LC35 requires licensees to have arrangements for the safe decommissioning of any plant or process that may affect safety. This includes arrangements for the production and implementation of decommissioning programmes and plans for each spent fuel or reprocessing facility.

GH.124. ONR expects licensees to review and update its decommissioning plans throughout the lifetime of the facility, on a periodic basis and with increasing frequency as the facility approaches the end of its operational life. Prior to and during the operational phase, ONR will review decommissioning plans periodically in accordance with its guidance. Once the facility enters into decommissioning there is generally a continuous regulatory oversight of the decommissioning plan and its implementation, associated arrangements and safety case documentation that should be proportionate to the hazards being managed.

GH.125. Regulatory activities may include: review or assessment of decommissioning plans and related documentation; compliance inspection; granting of permissions for activities; and, if necessary, enforcement.

GH.126. More information on the regulatory expectations for decommissioning, including expectations for decommissioning strategies, is set out under Article 26.

### **Plans for closure of a facility for radioactive waste disposal**

GH.127. The environment agencies' GRA states that the disposal process will not be regarded as complete until all the requirements of the environmental safety case have been met. This would include sealing and closure of the facility as set out in Requirement R12.

GH.128. The guidance states that, at the design stage and periodically during the lifetime of the facility, the developer / operator should demonstrate that it is able satisfactorily to close the disposal facility and, where relevant, seal the access tunnels, shafts and drifts, boreholes and any other potential preferential pathways for radionuclide transport that will or may be introduced as a result of the siting, construction and operation of the disposal facility. Also, in design, construction, operation and closure the developer / operator will need to take into account a number of effects that may arise from properties of the waste, including:

- gas generation through microbial, chemical, or radiolytic action, or as a result of radioactive decay;
- heat generation through microbial or chemical action, or as a result of radioactive decay; and
- criticality through concentration of fissile nuclides.

GH.129. The guidance states that these topics will need to be considered in the environmental safety case.

## Article 10 – Disposal of Spent Fuel

**If, pursuant to its own legislative and regulatory framework, a Contracting Party has designated spent fuel for disposal, the disposal of such spent fuel shall be in accordance with the obligations of Chapter 3 relating to the disposal of radioactive waste.**

GH.130. Under this Article, compliance with the Joint Convention is demonstrated in a way that has not substantially changed since the fourth UK report.

GH.131. In the UK, spent fuel from the existing nuclear power plants has not been designated as radioactive waste for disposal. However, the Government is currently not expecting any proposals to reprocess spent fuel from new nuclear power plants and therefore spent fuel from these power stations is expected to be designated as HAW and disposed of at the planned GDF following a period of safe and secure interim storage.

## Article 17 – Institutional Measures after Closure of Radioactive Waste Disposal Facilities

Each Contracting Party shall take the appropriate steps to ensure that after closure of a disposal facility:

- (i) records of the location, design and inventory of that facility required by the regulatory body are preserved;
- (ii) active or passive institutional controls such as monitoring or access restrictions are carried out, if required; and

if, during any period of active institutional control, an unplanned release of radioactive materials into the environment is detected, intervention measures are implemented, if necessary.

GH.132. Under this Article, compliance with the Joint Convention is demonstrated in a way that has not substantially changed since the fourth UK report.

GH.133. The environment agencies' GRA for radioactive waste disposal facilities states that the developer / operator will need to set up and maintain a comprehensive system for recording information on all aspects of the project affecting the environmental safety case. The information to be recorded should include:

- decisions taken and the reasons for them,
- data and results from the site investigation and characterisation programme,
- design documents, drawings and engineering details of the facility as constructed,
- records of waste form and characterisation,
- records of waste emplacements and their location in the facility,
- details of facility closure, and
- results of monitoring and assessment at all stages of the project.

GH.134. Duplicates of the records should be kept at diverse locations and in durable form. During the period of authorisation, the records will be needed by both the organisation exercising control and by the regulators. The environment agencies also expect operators to make arrangements at the end of their period of authorisation, for the records to be included in the public archive.

GH.135. The guidance also states that the process of optimising a disposal facility requires the continuous attention of the developer / operator from the design stage through to the end of the period of authorisation. The requirement is for radiological risks to members of the public to be ALARA during both the period of authorisation and afterwards. Radiological risks during the period of authorisation are reduced by reducing exposure to radiation. Radiological risks after the period of authorisation are reduced either by reducing potential exposure, or by reducing the probability of that exposure being received.

GH.136. Disposal facility developers and operators are required to establish a strategy and programme for monitoring the facility to support the environmental safety case. This includes during any period of institutional control after closure of the facility. However, the environment agencies recognise that, in the longer term, institutional controls cannot be relied upon and the developer will be expected to assess the likelihood and consequences of possible future human actions (Requirement R7).

### **Period of institutional control for radioactive waste disposal facilities.**

GH.137. If an environmental safety case claims a facility will be under active institutional control for some time after closure, the GRA requires the operator to

provide evidence that the proposed arrangements will be reliably implemented. Any claims placed on active institutional control need to be supported by detailed forward planning and a demonstration of funding arrangements.

GH.138. Such organisational arrangements may need to provide for:

- continued management and staffing,
- security,
- site surveillance, with scope for remedial work if needed,
- environmental monitoring,
- control of land use, and
- management of records.

GH.139. Operators are expected to provide evidence that these provisions can be relied on to remain effective throughout the claimed period of time. Because of the the potential for major social changes, it is unlikely that the environment agencies would accept a claim for active institutional control lasting longer than 300 years after the end of waste emplacement.

GH.140. For any time after closure of the facility where the developer / operator does not claim, or the relevant environment agency does not accept, that there will be active institutional control, the regulatory approach will be to apply a risk guidance level (Requirement R6) and, for human intrusion, a dose guidance level (Requirement R7). Authorisations or permits for disposal will only be granted if it is shown that the continued isolation of the waste from the accessible environment shall not depend on actions by future generations to maintain the integrity of the disposal system.

# Section I

## ARTICLE 27 – Trans-boundary Movement

**1. Each Contracting Party involved in transboundary movement shall take the appropriate steps to ensure that such movement is undertaken in a manner consistent with the provisions of this Convention and relevant binding international instruments.**

**In so doing:**

- i. a Contracting Party which is a State of origin shall take the appropriate steps to ensure that transboundary movement is authorized and takes place only with the prior notification and consent of the State of destination;**
- ii. transboundary movement through States of transit shall be subject to those international obligations which are relevant to the particular modes of transport utilized;**
- iii. a Contracting Party which is a State of destination shall consent to a transboundary movement only if it has the administrative and technical capacity, as well as the regulatory structure, needed to manage the spent fuel or the radioactive waste in a manner consistent with this Convention;**
- iv. a Contracting Party which is a State of origin shall authorize a transboundary movement only if it can satisfy itself in accordance with the consent of the State of destination that the requirements of subparagraph (iii) are met prior to transboundary movement;**
- v. a Contracting Party which is a State of origin shall take the appropriate steps to permit re-entry into its territory, if a transboundary movement is not or cannot be completed in conformity with this Article, unless an alternative safe arrangement can be made.**

**2. A Contracting Party shall not licence the shipment of its spent fuel or radioactive waste to a destination south of latitude 60 degrees South for storage or disposal.**

**3. Nothing in this Convention prejudices or affects:**

- i. the exercise, by ships and aircraft of all States, of maritime, river and air navigation rights and freedoms, as provided for in international law;**
- ii. rights of a Contracting Party to which radioactive waste is exported for processing to return, or provide for the return of, the radioactive waste and other products after treatment to the State of origin;**
- iii. the right of a Contracting Party to export its spent fuel for reprocessing;**
- iv. rights of a Contracting Party to which spent fuel is exported for reprocessing to return, or provide for the return of, radioactive waste and other products resulting from reprocessing operations to the State of origin.**

I.1. Under this Article, compliance with the Joint Convention is demonstrated in a way that has not substantially changed since the fourth UK report.

I.2. The UK has transposed into UK law the requirements of EU Directive 2006/117/Euratom ('the Shipments Directive') (Ref. 180), which was drafted specifically to ensure compliance with this Article. The Shipments Directive extended the regulatory regime for transfrontier shipments to include spent fuel shipped for reprocessing. This Directive was supplemented by Commission Recommendation 2008/956/Euratom of 4 December 2008 (Ref. 181) on criteria for the export of radioactive waste and spent fuel to third parties.

I.3. The Shipments Directive provides a regulatory framework for supervision and control of shipments of radioactive waste and spent fuel into, out of, or through the European Community. The Directive is implemented in UK law by the Transfrontier Shipment of Radioactive Waste and Spent Fuel Regulations 2008 (Ref. 182), which require prior written approval by the competent authorities of all states involved (states of origin, destination and EU states of transit) before such a shipment can be

authorised. The Environment Agency is the competent authority for authorising shipments into and out of England; NRW, SEPA and NIEA are the competent authorities for their respective parts of the UK.

I.4. Regulatory control of the import and export of radioactive wastes in accordance with the Transfrontier Shipments Regulations is achieved through the mechanisms of notification and prohibition. The Environment Agency's International Waste Shipments team co-ordinates the sharing of notifications between consignors and consignees, including confirmation of receipt of wastes. These arrangements allow for confirmation that wastes have been imported or exported in compliance with the consents. Independent auditing of these arrangements by the Environment Agency (or the equivalent competent authorities in Wales, Scotland and Northern Ireland) ensures that they remain robust and effective and that, in the event of non-compliance, suitable provision for return or alternative arrangements can be secured.

I.5. On receipt of an application from the consignor of the waste or spent fuel, the relevant UK competent authority seeks the approval, in writing, of the competent authority of the country of destination (usually an environmental or nuclear regulator) using a standard document in accordance with Commission Decision 2008/312/Euratom (Ref. 183). It is UK practice to notify all countries of transit, whether they are EU Member States or not. In addition, before a shipment to or from the UK is authorised, the proposal will be checked for compliance with:

- government policy on the import and export of radioactive waste;
- government policy for the long-term management of solid low-level radioactive waste; and
- EU Directive 2011/70/Euratom on the responsible and safe management of spent fuel and radioactive waste (in particular, Articles 2 and 4 of the Directive).

I.6. Trans-boundary movements of radioactive materials and spent fuel must comply with the national and international regulations and standards applying to the mode of transport used. For shipments by sea, safety of sea transport is governed by the Merchant Shipping (Dangerous Goods and Marine Pollutants) Regulations 1997 (Ref. 184).

I.7. There is a standing ban on shipments to destinations south of latitude 60 degrees south.

I.8. The export of radioactive waste for treatment is permitted provided it meets certain conditions, including a satisfactory options assessment and an assurance that the shipment is to facilitate the recovery of reusable materials or for treatment that will subsequently enable the waste to be more easily managed or stored when returned to the UK. In all cases where import or export of radioactive waste would add materially to the waste needing to be disposed of, the processed radioactive wastes have to be returned to the UK.

I.9. The reciprocal process applies when the relevant UK competent authority responds to a request to approve the import of radioactive waste into the UK from another EU Member State. For the import of radioactive waste from outside the EU, the recipient of the waste must apply to the appropriate UK competent authority for authorisation of the shipment.

I.10. EU Regulation (Euratom) 1334/2000 (Ref. 185), Regulation 3(1) provides that "an authorisation shall be required for the export of the dual-use items listed in Annex 1". Nuclear materials are included in Annex 1. EU Regulation 1334/2000 is implemented in the UK by the Dual Use Items (Export Control) Regulations 2000 (SI 2000/2620) (Ref. 186). This usually results in an export licence application. In addition, the Nuclear Suppliers Group (NSG) Guidelines (Ref. 187) are applied, as the UK is a member of the NSG and of the IAEA.

I.11. Trans-boundary movement of radioactive substances between Member States is regulated by EU Regulation (Euratom) No 1493/93 (Ref. 188).

### **Transboundary shipments**

I.12. The shipment of high-level vitrified waste byproducts from reprocessing, from the UK to overseas clients, has been occurring routinely since 2010.

I.13. Since 2007, the UK has been exporting metallic wastes from nuclear decommissioning for treatment by melting. Shipments have been made to Sweden, Germany and the USA. The metal is mostly carbon steel, but alloy steels, depleted uranium and lead have also been treated and recycled. The overseas companies engaged in these recycling processes repatriate the radioactive furnace slag and other process wastes to the UK. As a large proportion of the metals are recycled, the secured reduction in the volume of radioactive waste metal requiring disposal in the UK's is typically greater than 10:1. This is an ongoing international trade.

I.14. Small numbers of shipments have been made for other treatments and processes, including incineration. The quantities of oil and other combustible wastes involved are generally low, as most combustible wastes are dealt with at UK facilities.

I.15. All shipments are carried out in compliance with the Shipments Directive and EU Directive 2011/70/Euratom, and hence with this Article.

# Section J

## Article 28 – Disused Sealed Sources

- 1. Each Contracting Party shall, in the framework of its national law, take the appropriate steps to ensure that the possession, remanufacturing or disposal of disused sealed sources takes place in a safe manner.**
- 2. A Contracting Party shall allow for re-entry into its territory of disused sealed sources if, in the framework of its national law, it has accepted that they be returned to a manufacturer qualified to receive and possess the disused sealed sources.**

J.1. Under this Article, compliance with the Joint Convention is demonstrated in a way that has not substantially changed since the fourth UK report.

J.2. The UK has implemented EU Directive 2003/122/Euratom (Ref. 189) on the control of high-activity sealed radioactive sources and orphan sources. The Directive was transposed in the UK as the HASS Regulations, and as Directions from the Secretary of State and Ministers of the devolved administrations to the environment agencies. The combination of these measures provides the UK regulatory regime for management of high-activity sealed sources. In England and Wales, the provisions of the HASS Regulations have been incorporated into EPR10; this did not involve any change in the scope or nature of regulatory standards.

J.3. Directive 2003/122 requires EU Member States to have in place regulatory systems for the authorisation of practices involving high-activity sealed sources. Under the HASS Regulations 2005, before issuing such an authorisation, the relevant competent authority must ensure that adequate arrangements exist for the safe management of sources, including when they become disused sources. These latter arrangements may provide for the transfer of disused sources to the supplier or to a recognised storage facility. In addition, financial provision must have been made to cover the cost of managing disused sources safely, including in the eventuality of the holder becoming insolvent or going out of business. The UK Government has developed guidance for the Environment Agency (also applicable to NRW) on the acceptable arrangements companies can make to meet the requirements for such financial provision (Ref. 190). Across the UK, there are approximately 300 HASS authorisations.

J.4. On nuclear licensed sites, LC4 (Restrictions on Nuclear Matter) ensures that the licensee carries out its responsibilities to control the entry and storage of nuclear matter (including sources) on the licensed site. In all cases, IRR99 Part VI applies, covering the arrangements for the control of radioactive substances, articles and equipment.

J.5. The Transfrontier Shipment of Radioactive Waste and Spent Fuel Regulations 2008 (see Section I), Regulation 3 (b), excludes “shipments where a sealed source (other than one containing fissile material) is returned by its user to the supplier of the source in another country”. This facility exists for sealed sources that are radioactive waste, ie they are radioactive sources “for which no use is foreseen”. In these circumstances, no transfrontier shipment authorisation is required.

J.6. Shipments of sealed sources between Member States of the EU are regulated under EC Regulation 1493/93. The consignor of the shipment must obtain a declaration from the recipient, endorsed by the competent authority of the member state of destination, that it has complied with the relevant provisions of the BSS Directive and other relevant national requirements. The consignor must also provide the competent authority in the state of destination with a quarterly report of such

shipments. The UK competent authority under Regulation 1493/93 for shipments to or from nuclear sites is ONR); for all other consignees / consignors, the competent authority is the relevant environment agency.

J.7. Following completion of the government-funded Surplus Source Disposal Programme, the Environment Agency in 2013 funded and completed a further programme of work to collect and dispose of orphan radioactive sources from across scrapyards in England. Nearly 500 radioactive items from 16 sites (those that declared they held such items) were collected. Such numbers are likely to have accumulated over at least 10 years. Most of the sources were of relatively low activity, with only eight of them being sealed sources above 1MBq.

J.8. The environment agencies and UK Government are exploring the options for robust arrangements to be implemented to enable future safe management of orphan radioactive sources that may be found at sites that are not appropriately permitted under EPR10 or authorised under RSA93. An established framework is in place for the safe recovery of any orphan source discovered in a public place: the National Arrangements for Incidents involving Radioactivity (NAIR) scheme, which involves the police and nuclear sites or major hospitals recovering an orphan source.

#### **Access to Recognised Installation for disused radioactive sources**

J.9. EU Directive 2003/122/Euratom required EU Member States to put in place regulatory arrangements to ensure appropriate provision exists to manage sources safely. This includes provision for the transfer of disused sources to a recognised storage facility, pending disposal (a 'recognised installation'). During 2013, work intended to progress decommissioning and clean-up at the Harwell nuclear licensed site led to the closure of a facility key to the transfer of redundant sources to a recognised installation (at the Sellafield site), and inadvertently resulted in a limited availability of transfer routes for redundant sources into a recognised installation within the UK. The Environment Agency has raised this issue as a matter of urgency with Government and work is underway to review the options for ensuring the provision of robust arrangements in future and avoiding conflict in planning between nuclear decommissioning and clean-up aspirations and the maintenance of key national infrastructure.

# Section K

## Planned Activities to Improve Safety

**This section provides an opportunity to give a summary of safety issues of concern identified earlier, and planned future actions to address those issues, including where appropriate measures of international co-operation.**

K.1. Continuous improvement in safety levels over time is a fundamental objective of the nuclear safety and environmental regulators in the UK. Previous sections have explained how this objective is achieved at spent fuel management, reprocessing and radioactive waste management facilities. The main extant issues of concern and planned future actions are outlined below.

### **Remediation of High-Hazard Legacy Plants at Sellafield**

K.2. NDA's strategy, approved by the Secretary of State for Energy and Climate Change and Scottish Ministers in March 2011, has a priority of reducing the risk and hazard from the legacy radioactive wastes stored on the sites NDA owns.

K.3. This priority is particularly pertinent to Sellafield, where the Legacy Ponds and Silos (LP&S) pose the most significant challenges. LP&S comprises four main plants on the site that were used historically, either to prepare fuel for reprocessing and/or to store radioactive wastes. They are:

- Pile Fuel Storage Pond;
- First Generation Magnox Storage Pond;
- Magnox Swarf Storage Silos; and
- Pile Fuel Cladding Silo.

K.4. Significant inventories of highly radioactive materials and wastes have been accumulated within these facilities for over five decades. The majority of these radioactive materials and wastes are found in potentially mobile forms and some have heat-generating capability. The plants were not built to modern engineering standards and their condition is deteriorating, such that there is increased urgency to reduce the risk their inventories pose. The facilities were not designed with decommissioning in mind, so innovative technology is being developed to inspect and retrieve the radioactive materials and wastes for storage in modern containment facilities, ahead of its subsequent treatment, packaging and storage.

K.5. The importance placed on making tangible, demonstrable progress to reduce the hazards posed by LP&S has driven a significant increase in resources the Government and NDA have made available at Sellafield, together with a revision to ONR's regulatory strategy for the site as described in paragraphs A.3.96 to A.3.101.

### **Delivery of the Magnox Operating Programme**

K.6. The UK's programme of electricity generation using Magnox reactors is drawing to a close. At the time of publication, the UK remained on target to reprocess all its spent Magnox fuel by around 2020, an important enabler in meeting the UK's international commitments relating to radioactive discharges to the marine environment.

K.7. The MOP enables cross-site integration of the defuelling, transport and reprocessing tasks required to deliver the above aim. This has allowed the NDA and its SLCs to identify rate-limiting factors within the overall process, addressed by a strengthening of management arrangements and prioritising the performance of key plant via the Magnox Throughput Improvement Plan.

K.8. Significant logistical and process challenges remain and require proactive management, primarily caused by the age of the plants involved, which has led to variability in the reprocessing rates achieved.

### **Initiatives to Strengthen the UK Skills Base for Management of Radioactive Wastes and Spent Fuel**

K.9. The mission of the Nuclear Energy Skills Alliance (NESA, Ref. 139) is to ensure the UK nuclear industry and its supply chain are supported by a workforce with the skills, capability and capacity to successfully deliver the current and future UK nuclear programme with the highest standards of professionalism, safety and competitiveness.

K.10. NESA members include the Cogent Sector Skills Council, Construction Skills, ECITB, National Skills Academy for Nuclear, Semta Sector Skills Council, Dalton Nuclear Institute, BIS, DECC and the Welsh Government.

K.11. NESA has identified key areas in which there is a risk of skills shortages in the UK and a range of measures to address those risks.

K.12. NESA has identified a number of skills priorities and the following are deemed urgent:

- project and programme managers;
- construction project managers;
- steel fixing;
- high integrity welders;
- safety case authors;
- research and development personnel;
- basic requirements and nuclear awareness;
- site/construction supervisors; and
- apprenticeships and higher level apprenticeships.

K.13. The other identified priorities include:

- Design Engineers/technicians;
- Quality Assurance;
- Control and Instrumentation Engineers;
- Non Destructive Testing Engineers;
- Security Safeguards;
- Nuclear Regulators; and
- Health Physics.

K.14. NESA members have also identified general workforce capability priorities, namely:

- educating new entrants on the basic requirements for working on nuclear sites in the UK and promoting awareness and understanding of the nuclear industry;
- the flexibility and mobility of the workforce and supply chain;
- the ability to demonstrate supply chain competence; and
- trained and qualified craft and technician personnel.

K.15. Other areas at present highlighted by NESA include skills for transportation and logistics for radioactive materials and a high demand for science, technology, engineering and mathematics.

K.16. The most prominent programme of skills development address the specific needs relating to management of radioactive wastes and spent fuels is delivered via NDA's People Strategy. Direct investment from NDA has helped deliver major skills and training facilities across the UK including:

- Energus, a nuclear skills training centre in West Cumbria;
- the Dalton Cumbria Facility, a world-leading nuclear research facility also in West Cumbria;
- the Engineering Skills Centre at North Highlands College in northern Scotland;
- the Energy Skills Centre at Bridgwater College in Somerset; and
- the Energy Centre at Coleg Menai in Wales.

K.17. Alongside these capital projects, NDA is delivering a number of skills initiatives including nuclear graduates – a two-year postgraduate programme covering areas such as science, business and management which includes placements with sponsor organisations such as Rolls Royce, Sellafield Ltd and Magnox.

### **Implementation of lessons learnt by the UK nuclear industry following the Japanese earthquake and tsunami**

K.18. Good progress has been made on the programme to implement enhancements from lessons from the Fukushima accident at all major nuclear licensed sites, including those for the management of spent fuel and radioactive waste, and those in the process of decommissioning.

K.19. The UK carefully considered implications from the Fukushima accident for its nuclear industry, documented the findings in a suite of published reports and has closely monitored progress in implementing the identified actions. These include the CNI's Report (September 2011), Stress Tests for UK Nuclear Power Plant (December 2011), Stress Tests for UK Non-power Generating Nuclear Plants (May 2012) and National Action Plan (December 2012). Further details are provided in paragraphs A.2.70 to A.2.83.

K.20. The National Action Plan included a commitment that the UK nuclear industry would implement the most significant improvements arising from lessons learnt from Fukushima by the end of 2014. Many practical enhancements have been made and no major improvements are outstanding. However, some projects require ongoing focus due to their long-term nature and, by necessity, will take several years to deliver in full. Updates have been provided in ONR CNI's reports and ONR's annual reports.

K.21. ONR will continue to monitor and assess the progress made by the UK industry on the longer-term Fukushima-related projects until it is satisfied that all significant lessons learnt have been adequately discharged and will, if necessary, use its regulatory powers to ensure that all reasonably practicable improvements are implemented.

### **Periodic reviews of nuclear safety**

K.22. All existing spent fuel management and radioactive waste management facilities in the UK when the Joint Convention came into force were licensed and considered to meet appropriate safety standards. All facilities on nuclear licensed sites have to comply with licence conditions and in respect of the review of safety, the licensee is required to undertake periodic safety reviews for all safety-related facilities. LC15 (Periodic Review) ensures that the licensee reviews the safety case

for its spent fuel management and reprocessing facilities every 10 years against an agreed programme. In addition, for operating nuclear power stations and those reprocessing plants for which a start-up Consent is required following an outage for maintenance or inspection, the continuing validity of the safety cases are reviewed at shorter intervals, about every two or three years, prior to granting the start-up Consent.

### **Periodic reviews of discharge authorisations**

K.23. There is a formal requirement for periodic, or regular, reviews of environmental permits under EPR10 and authorisations under RSA93 as amended by the Energy Act 2004. The Environment Agency and NRW implemented this requirement through establishing annual reviews of authorisations. Environmental permits and authorisations for discharges are placed on public registers, where they are open to inspection, and discharge limits are published in various documents, for instance the annual RIFE report. RIFE now includes data from all government environmental monitoring results and is published jointly by the Food Standards Agency, Environment Agency, NRW, SEPA and NIEA. The regulatory bodies carry out checks on the actual discharges made, in terms of activity and radionuclide composition, and have powers of enforcement, including prosecution under EPR10 if the terms of environmental permits are breached, or under RSA93 if the terms of authorisations are breached.

# Section L

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## **Annex L.1 – Spent Fuel Policy, Practices, Facilities and Inventories**

### **Categorisation of spent fuel, plutonium and uranium**

L.1.1. UK government policy on the status of spent fuel, plutonium and uranium is that the decision on whether to categorise the material to be a radioactive waste is a judgment for the material's owner, subject to regulatory requirements.

L.1.2. The UK Government's preliminary policy on civil separated plutonium is that the plutonium should be re-used in new fuel within civil nuclear reactors, where it is cost-effective and affordable to do so.

L.1.3. CoRWM has consulted widely on whether some or all of these materials may be classified as wastes in the future, and what impact that would have on the long-term management plans for them. CoRWM has concluded that such materials could be disposed of with HAWs via geological disposal.

L.1.4. In the future it is highly likely that some spent fuel, plutonium and uranium for which there is no foreseeable economic use, will be immobilised and then treated as waste.

### **Spent fuel management and reprocessing policy**

L.1.5. The Government accepts that spent fuel should not be categorised as waste while the option of reprocessing remains open and a future use for the fuel is foreseen. However, the Government is currently not expecting any proposals to reprocess spent fuel from proposed new nuclear power plants in the UK and therefore expects spent fuel from these power stations will be designated as HAW in due course.

## **Spent fuel management and reprocessing practices**

### **Spent Magnox fuel**

L.1.6. Following its removal from a reactor, spent Magnox fuel is initially stored on the power station site. At most UK Magnox power stations this storage took place in water-filled cooling ponds, the exception being Wylfa which is equipped with a dry store. Initial storage for a minimum of 90 days allows for radioactive decay of short-lived isotopes within the spent fuel. Splitter blades (external thin metallic vanes which form part of the fuel cladding) are removed before the spent fuel is dispatched to Sellafield in purpose designed flasks, initially by road to a railhead local to each power station, and then by rail. The flasks laden with spent Magnox fuel are then received into the Fuel Handling Plant (FHP) at Sellafield. The fuel is stored under water in FHP to allow further radioactive decay, prior to removal of the remaining cladding. The bare uranium metallic fuel rods are then loaded into heavily shielded containers for transfer across the Sellafield site to the Magnox reprocessing facilities.

### **AGR Spent fuel**

L.1.7. The first step in management of spent AGR fuel is dry buffer storage, followed by storage under water for at least 100 days at the respective power station site. The fuel is then transported by rail to Sellafield, using purpose designed flasks. As is the case with spent Magnox fuel, on receipt at Sellafield spent AGR fuel is stored under water in the FHP to cool before being dismantled and transferred, either for interim storage or directly to THORP for reprocessing.

L.1.8. EDF Energy has contracts in place for the potential reprocessing of approximately 5,500te of its spent AGR fuel at Sellafield. Rather than being reprocessed, spent AGR fuel in excess of this contracted quantity will be stored under water in the THORP Receipt and Storage Ponds in the near term. Under the

current contracts, NDA is obligated to reprocess 4,758te, with an additional 800te optional. If EDF achieves a stated objective of extending the life of the UK AGR fleet by an average of five years, the THORP Receipt and Storage Ponds are expected to store between 5,500te and 6,000te of spent AGR fuel.

### Sizewell B Spent PWR fuel

L.1.9. Spent civil PWR fuel from Sizewell B power station in southeast England is currently being stored in the station's pond, prior to being transferred to a new Dry Store on the site. Further information is provided in Paragraphs L.1.20 to L.1.26.

### Other fuels

L.1.10. In the past, spent Prototype Fast Reactor (PFR) fuel was reprocessed at Dounreay but the plant is now closed. Options for relocation of the remaining Dounreay spent fuels to Sellafield are under consideration by DSRL, Sellafield Ltd, NDA and the regulators.

L.1.11. The majority of spent Dounreay Fast Reactor (DFR) 'driver' fuel was reprocessed at Dounreay. The UK Government and NDA have agreed that the remainder should be transported and reprocessed as part of the Magnox Operating Plan at Sellafield. Shipment to Sellafield and reprocessing of the breeder fuel commenced in late 2012.

L.1.12. The spent fuel from the high temperature gas-cooled reactor known as DRAGON was previously stored adjacent to the reactor at Winfrith, but has since been transferred to RSRL's other UK licensed nuclear site at Harwell.

L.1.13. Spent low irradiated GLEEP (Graphite Low Energy Experimental Pile) fuel is packaged and stored at Harwell.

L.1.14. Spent low irradiated ZEBRA (Zero Energy Breeder Reactor Assembly) fuel has been returned to the UK from Cadarache in France and sent to Dounreay, where it is currently stored.

L.1.15. Spent lightly-enriched uranium fuel from the Windscale AGR (WAGR) and the Steam Generating Heavy Water Reactor (SGHWR) at Winfrith is currently stored at Sellafield. The current plan is for both these types of spent fuel to be reprocessed in THORP.

L.1.16. There is an opportunity to relocate the DRAGON fuel from Harwell to another site for treatment and interim storage pending a national disposal option as part of NDA's updated strategy.

### Spent fuel management facilities

#### Storage of spent fuel at reactor sites

##### **Magnox reactor sites**

L.1.17. Other than at Wylfa, the Magnox power stations had storage ponds where spent fuel was held under water for a short cooling period, before shipment to Sellafield for reprocessing. One reactor at Wylfa is still in the operational phase. At the cut off date for this report of April 2014, 3 Magnox power stations were undergoing defueling – Oldbury, Sizewell A and Calder Hall. Bradwell, Chapelcross, Dungeness A, Hinkley Point A, Hunterston A, Trawsfynydd and Berkeley have all been completely defuelled.

L.1.18. Wylfa has three primary spent fuel dry store cells, plus two secondary dry store cells. The spent fuel from Wylfa is dispatched to Sellafield for reprocessing after a short cooling period. Wylfa Reactor 2 ceased its operational phase in April 2012, Reactor 1 will continue to operate until at least September 2014. The continued operation of Reactor 1 is supported by a programme of transferring partially

irradiated fuel from Reactor 2. A possible extension to the operational life of Reactor 1 to December 2015 is subject to approval of a Periodic Safety Case review by ONR.

### **AGR Sites**

L.1.19. Each AGR station has one fuel storage pond. After a short period of dry storage immediately after removal from the reactor, then a cooling period under water, the spent fuel is dispatched to Sellafield for reprocessing or long-term storage.

### **Sizewell B**

L.1.20. Based on current estimates the existing spent fuel storage pond at Sizewell B will be full to its available capacity during 2015. If no additional spent fuel storage capacity were provided, the station's operations would be constrained from 2017. For accounting purposes Sizewell B has a lifetime of 40 years, which equates to an assumed closure date of 2035, but with the prospect of a further lifetime extension to 2055 subject to the normal regulatory approvals. To meet the shortfall in spent fuel storage capacity, work is progressing to construct a Dry Store to accommodate the station's anticipated lifetime spent fuel arisings, including the spent fuel already stored in the pond.

L.1.21. A planning consent process and public consultation was initiated by EDF in 2009, with the target of making a Dry Store available from 2015. Loading of the initial seven laden spent fuel containers into the Dry Store is planned for completion in early 2017.

L.1.22. Proprietary multi-purpose containers, designed and fabricated by Holtec, will be used to store the spent fuel within the Dry Store. Each container holds 24 PWR spent fuel assemblies. A station operational life of 40 years would create arisings of 2,280 spent fuel assemblies, which equates to a required Dry Store capacity of 95 containers. A further 48 containers will be required if the station's operational life is extended to 60 years.

L.1.23. Each container will be stored within a shielded over-pack. The containers will be progressively purchased, filled with spent fuel, and moved to the store in discrete campaigns from 2016 to 2040.

L.1.24. The transfer of the spent fuel that is presently stored in the station pond to the Dry Store will be facilitated by a range of transport and handling equipment and associated ancillary components including a purpose-built flask.

L.1.25. The fuel containers will maintain an inert gas atmosphere around the spent fuel assemblies for the full duration of storage in the Dry Store. Decay heat will be dissipated through the external surface of the containers and cooling of the building will be achieved by natural convection.

L.1.26. The station's entire lifetime arisings of spent fuel will be progressively switched to dry storage by 2045. Thereafter, the Dry Store will operate until fuel is retrieved at a date dependent on the availability of a final disposal route, which is currently planned to be the proposed national GDF. For planning purposes, the transfer of fuel to the GDF has been assumed by EDF to commence in circa 2080 with decommissioning of the Dry Store over a two-year period commencing in 2100.

### **[Storage of spent fuel at other sites](#)**

#### **Dounreay**

L.1.27. A shielded cave that was previously used for the examination of irradiated fuel is being used for handling and temporary storage of spent fuel at Dounreay, while options are being fully developed for relocation of the fuel to Sellafield.

## **Sellafield**

L.1.28. The original Windscale reactor pond built between 1948 and 1952 was later modified to handle Magnox fuel from the Calder Hall reactors, which it did until 1960.

L.1.29. A second pond operated from 1960 until 1986 as a receipt, storage and de-canning facility for spent fuel from the Magnox power stations UK-wide. An adjacent pond has operated since 1965 for the storage of oxide fuel, comprising receipt facilities, services and storage pond with bays built between 1965 and 1982. It also stores empty high-integrity multi-element bottles used in LWR fuel transport and storage prior to their disposal.

L.1.30. A further separate pond has operated at Sellafield since 1982 for the storage of AGR fuel received directly from the power stations or from FHP. Fuel is stored prior to processing, after which dismantled fuel is dispatched to THORP Receipt and Storage ponds in internal transit flasks.

L.1.31. The FHP pond that opened in 1984 comprises three bays, two of which are currently used for Magnox fuel storage and one for AGR fuel. Magnox fuel is typically stored for six months to allow radioactive decay of short-lived isotopes. It is then transferred to one of two de-canning caves where the Magnox cladding is removed from the fuel rod, which is sent for reprocessing. The cladding debris (known as swarf) is transported to another plant where it is placed into drums and encapsulated in a cement matrix then placed into storage. AGR fuel is stored for some years before being sent to THORP for reprocessing. Storage arrangements are carefully designed to eliminate the potential for criticality events and to maintain the fuel's integrity.

L.1.32. The THORP Receipt and Storage ponds opened in 1988 and act as a temporary store for AGR fuel and LWR fuel en route to reprocessing.

### **Reprocessing facilities**

L.1.33. The first reprocessing plant at Sellafield operated from 1952 to 1964. This reprocessed defence fuel from the Windscale Piles and fuel from the first Magnox reactors. This plant was modified to gain experience in oxide fuel reprocessing and performed that function from 1969 to 1973 on spent fuels from WAGR, SGHWR and foreign reactors.

#### **Sellafield – the Magnox Reprocessing Plant**

L.1.34. Commissioned in 1964, the Magnox Separation Plant is where the separation of Magnox fuel rods into basic chemical components takes place.

L.1.35. Liquid effluents from the stages of reprocessing are treated in separate plants according to their level of radioactivity. Fission products are concentrated by evaporation, then interim stored and vitrified. Discharges of liquid and gaseous effluents take place in conformity with environmental permits under EPR10. The licensee must demonstrate application of BAT to minimise the environmental impact of these discharges.

#### **Sellafield – Thermal Oxide Reprocessing Plant**

L.1.36. Commissioned in 1994 THORP reprocesses irradiated oxide fuel, primarily from AGR and LWR reactors. After a cooling period in the main storage pond, the fuel is monitored and sheared into short pieces that are dissolved in nitric acid using a batch dissolution process. Insoluble stainless steel or Zircalloy fuel cladding pieces (hulls) are removed from the fuel solution and transferred to another plant for encapsulation within drums in a cement matrix.

L.1.37. The remaining fuel solution contains two types of particulate materials: cladding fines (resulting from the mechanical shearing action), and the insoluble fission products. The fines settle in the base of the THORP dissolver, are extracted

and packed together with the hulls. The insoluble fission products and any remaining fines are separated. Solvent extraction is then used to separate the clarified liquid solution into a uranium-bearing stream, a plutonium-bearing stream and the waste fission products.

L.1.38. The effluents from the various stages of the reprocessing operation are treated in separate plants according to their level of activity. Fission products from the fuel are concentrated by evaporation, interim stored and then vitrified. Metal cladding 'hulls', fines, barium carbonate and centrifuge cake are encapsulated in cement. Discharges of liquid and gaseous effluents take place in conformity with environmental permits under EPR10. The licensee must demonstrate application of BAT to minimise the environmental impact of these discharges.

## Inventory of Spent Fuel

**Article 32.2 – This report shall also include:**

**(ii) an inventory of spent fuel that is subject to this Convention and that is being held in storage and of that which has been disposed of. This inventory shall contain a description of the material and, if available, give information on its mass and its total activity;**

### **Spent fuel inventory in the UK as at 1 April 2013**

L.1.39. No spent fuel has been disposed of in the UK to date.

L.1.40. The UK's current stock of spent fuel consists mainly of Magnox, AGR and PWR fuels, but also includes small stocks of various spent experimental fuels. Spent fuels designated as a waste are reported alongside other waste streams in the UK Radioactive Waste Inventory. Notably, this includes GLEEP fuel, Dragon fuel and Zenith fuel, small quantities of irradiated thorium and PFR mixed breeder sections. As a result, these spent fuels are not included within the figures stated in Table L.1.1, which account for those fuels not yet designated as a waste.

L.1.41. A summary of the inventory follows in Table L1.1.

**Table L.1.1 UK Spent Fuel Inventory<sup>(1)</sup> (as of 1 April 2013)**

Location	Description	Approximate quantity UK-owned irradiated fuel (tonnes) <sup>(2)</sup>	
		In reactor	In storage
Dounreay	Various	32	21
Magnox Power Stations <sup>(3)</sup>	Magnox fuel	~2,500	~180
Sellafield	Magnox fuel		820
	AGR fuel		2,900
	SGHWR fuel		120
	WAGR fuel		20
	Other fuel		740 <sup>(4)</sup>
EDF Energy	AGR and PWR fuel <sup>(5)</sup>	~1,700	~510
Others	Various		~10 <sup>(6)</sup>

(1) Data reported is consistent with the report 'Radioactive Wastes and Materials Not Reported in the 2013 UKRWI'.

(2) Fuel 'In reactor' is that in reactor cores; fuel 'In storage' has been removed from reactor cores to storage facilities.

(3) Includes Calder Hall on the Sellafield site.

(4) Includes 1.6tHM DFR breeder fuel transferred from Dounreay.

(5) From data provided by EDF Energy and from best available public domain information.

(6) Comprises mainly low irradiated fuels including Zero Energy Breeder Reactor Assembly (ZEBRA) fuel as plutonium and natural uranium oxide plates on loan to Cadarache in France and other fuels at Harwell.

## Annex L.2 – Radioactive Waste Policy, Practices, Facilities and Inventories

L.2.1. Within the UK, responsibilities for radioactive waste management are allocated as follows.

L.2.2. The Government maintains and continues to develop a policy and regulatory framework which ensures that:

- radioactive wastes are not unnecessarily created;
- the wastes that are created are safely and appropriately managed and treated; and
- such wastes are then safely disposed of, at appropriate times and in appropriate ways.

L.2.3. Policy also aims to safeguard the interests of existing and future generations and the wider environment, in a manner that commands public confidence and takes due account of issues.

L.2.4. The regulators, including the environment agencies, have a duty to implement properly the policy and regulatory framework in accordance with their statutory powers.

L.2.5. Within the framework, the producers and owners of radioactive waste are responsible for developing their own waste management strategies, consulting the Government, regulatory bodies and disposal organisations as appropriate.

L.2.6. They are also responsible for bearing the costs of managing and disposing of the waste, including the costs of regulation and of related research undertaken both by themselves and by the regulatory bodies.

### Definition of radioactive waste

L.2.7. Radioactive waste in the UK is defined in Schedule 23 of EPR10 and Section 1 of RSA93. The approach taken is that for a substance to be classed as radioactive waste it first has to fall within the definition of waste, which is as follows:

“..... ‘waste’ includes any substance which constitutes scrap material or an effluent or other unwanted surplus substance arising from the application of any process, and also includes any substance or article which requires to be disposed of as being broken, worn out, contaminated or otherwise spoilt.”

L.2.8. If waste contains artificial radionuclides or naturally occurring radionuclides used for their radioactive, fertile or fissile properties it is categorised as radioactive waste if the concentration of these radionuclides exceeds radionuclide-specific threshold values published in the legislation. Threshold values are specified for solids and certain liquids and are the same as those published in the EC Document RP122 (Refs. 191 and 192), which are based on a dose criterion of 10 $\mu$ Sv per year to members of the public. For aqueous liquids and gases there are no threshold values and all such liquids and gases are considered to be radioactive waste, irrespective of the radionuclide concentration.

L.2.9. There are separate criteria for wastes containing naturally occurring radionuclides that are **not** used for their radioactive, fertile or fissile properties. These are that the waste must originate from a specified NORM industrial activity and the concentrations of radionuclides in the waste must be greater than specified values. Values are specified for solids, aqueous liquids and gases; the values are based on a dose criterion of 300 $\mu$ Sv per year to members of the public.

L.2.10. Substances containing only ‘background’ levels of artificial radionuclides and those that are contaminated as a result of authorised discharges are excluded from the definition of radioactive waste.

L.2.11. Radioactive waste is defined in the Transfrontier Shipment of Radioactive Waste and Spent Fuel Regulations 2008 as:

“radioactive material in gaseous, liquid or solid form for which no further use is foreseen by the countries of origin and destination, or by a person whose decision is accepted by these countries, and which is controlled as radioactive waste by a regulatory body under the legislative and regulatory framework of the countries of origin and destination”.

L.2.12. Further information on the definition of radioactive waste is available in detailed government guidance on the scope of the radioactive substances legislation in England and Wales (Ref. 193).

## Categorisation of Radioactive Waste

L.2.13. In the UK, historically, radioactive waste has been classified under the following broad categories, according to its heat-generating capacity and activity content:

### High-level waste

High-level waste (HLW) is waste in which temperature may rise significantly as a result of its radioactivity, so that this factor has to be taken into account in designing storage or disposal facilities.

### Intermediate-level waste

Intermediate-level waste (ILW) is waste with radioactivity levels exceeding the upper boundaries for low-level waste (LLW), but which does not require heating to be taken into account in the design of storage or disposal facilities.

### Low-level waste

Within the UK, LLW is now defined as radioactive waste having a radioactive content not exceeding 4gigabecquerels per tonne (GBq/te) of alpha and/or 12GBq/te of beta/gamma activity. This general definition does not directly equate to the waste acceptance criteria in place at specific disposal sites for LLW.

### Very-low-level waste

Very Low Level Waste (VLLW), a sub-category of LLW is defined as:

#### in the case of low volumes ('dustbin loads') – low-volume VLLW:

“Radioactive waste which can be safely disposed of to an **unspecified** destination with municipal, commercial or industrial waste ('dustbin' disposal), each 0.1m<sup>3</sup> of waste containing less than 400kilobecquerels (kBq) of total activity or single items containing less than 40kBq of total activity.”

for wastes containing carbon-14 or hydrogen-3 (tritium):

- in each 0.1m<sup>3</sup>, the activity limit is 4,000kBq for carbon-14 and hydrogen-3 (tritium) taken together; and
- for any single item, the activity limit is 400kBq for carbon-14 and hydrogen-3 (tritium) taken together.

Controls on disposal of this material, after removal from the premises where the wastes arose, are not necessary.

#### or, in the case of bulk disposals – high-volume VLLW:

“Radioactive waste with maximum concentrations of 4megabecquerels per tonne (MBq/te) of total activity which can be disposed of to specified landfill sites. For waste containing hydrogen-3 (tritium), the concentration limit for tritium is 40MBq/te. Controls on disposal of this material, after removal from the premises where the wastes arose, will be necessary in a manner specified by the environmental regulators.”

The principal difference between the two definitions of VLLW is the need for controls on the total volumes of VLLW in the second (high-volume) category being deposited at any one particular landfill site.

### Higher-activity waste

In the UK, HAW is defined by UK Government as the collection of: HLW, ILW, and the relatively small proportion of LLW that is not currently suitable for disposal in existing LLW disposal facilities (due to some chemical, physical or radiological property that is incompatible with the extant waste acceptance criteria).

## Consideration whether to regulate radioactive materials as radioactive waste

L.2.14. In the UK it is the decision of the owner of any radioactive material as to whether there is any foreseen use for that material, and hence whether it is, or is not, categorised as a radioactive waste.

L.2.15. The UK Government keeps such issues under review and its assessment of waste management options includes not only materials currently classified as waste, but also considers the consequences of providing for other materials which may have to be managed as waste in the future. This includes some separated civil plutonium and uranium, as well as some spent nuclear fuel.

L.2.16. The future management options for the UK's civil plutonium include its possible use in reactors via a completed fuel cycle. However, up to 5% of the stock may be so contaminated that, even though it may also be technically possible to treat and use this amount for fuel, it might prove uneconomic to do so. In order to advise the UK Government, NDA undertook a study of the possible options for the management of UK-owned civil stocks. In February 2011, the UK Government published, for public scrutiny and consultation, its proposed approach to the long-term management of civil plutonium. This proposed approach recognises that, in view of the non-proliferation and security concerns in relation to plutonium, the UK Government has a duty to develop a long-term vision for its future handling. The UK's current policy is for long-term storage in safe and secure purpose-built facilities, pending a final decision on the best management solution. The UK Government's preliminary view is that the best prospect of delivering a long-term solution for plutonium management is through reusing the plutonium to make MOX fuel. This preliminary view is conditional. Before the UK Government is in a position to take a final view, it will have to be tested to show that it is affordable, deliverable and offers value for money, taking into account safety and security requirements.

L.2.17. More generally, the UK Government urges the other owners of these materials, on a voluntary basis, to put in hand procedures now that would allow them to identify those materials that may not be reusable economically.

L.2.18. A portion of the UK's civil stock of plutonium is presently stored safely and securely at Dounreay, but NDA is in the process of consolidating these stocks at Sellafield. The plutonium NDA owns is largely derived from Magnox reprocessing. NDA also manages plutonium that is owned by customers, and has been largely but not exclusively derived from reprocessing in THORP. DECC has agreed to NDA exchanging plutonium material with European utilities under commercial terms, to avoid the need to transport separated plutonium and to enable the repatriation of MOX fuel to these European utilities. This policy was the subject of a written Ministerial Statement in July 2012 (Ref. 194).

## Decommissioning

### Objectives of decommissioning

L.2.19. The objective of decommissioning is to reduce progressively the hazard that a facility poses. Decommissioning operations should be carried out as soon as reasonably practicable, taking all relevant factors into account.

### Decommissioning strategies

L.2.20. Each operator is expected to produce and maintain decommissioning strategies and plans for its sites. The UK Government expects that those strategies and plans will take into account the views of stakeholders (including relevant local authorities, the public and stakeholder groups), as well as all relevant factors. These should be assessed and presented in a transparent way and underpinned by objective information and arguments. These include:

- ensuring worker and public safety;
- maintaining site security;
- minimising waste generation and providing for effective and safe management of wastes created;
- minimising environmental impacts including reusing or recycling materials whenever possible;
- maintaining adequate site stewardship;
- using resources effectively, efficiently and economically;
- providing adequate funding;
- maintaining access to an adequate and relevant skills and knowledge base;
- using existing best practice wherever possible;
- conducting research and development to develop necessary skills or best practice; and
- consulting appropriate public and stakeholder groups on the options considered, and the contents of the strategy.

L.2.21. The future use of the site, once decommissioning has been safely completed, could be a significant factor in determining decommissioning operations. The objective should be to reach the best solution overall, taking into account the needs of the environment and the safety of workers and the local community.

L.2.22. Strategies should:

- harness the general benefits of radioactive decay, while avoiding the problems to which it may give rise in certain areas;
- seek to avoid the creation of radioactive wastes in forms which may foreclose options for their safe and effective long-term waste management; and
- minimise (by the use of BAT or BPM) the volumes of radioactive wastes which are created, particularly the volume of ILW.

L.2.23. The UK Government intends that operators should continue to process HAW that arises from decommissioning, where appropriate, in accordance with the RWM 'Letter of Compliance' arrangements (see paragraphs B.82 to B.84) and Joint Regulatory guidance on the management of HAW (see paragraphs L.2.37 to L.2.41).

L.2.24. Where short-term increases in discharges of some radionuclides are unavoidable, the relevant environment agency will need to be satisfied that they represent the optimal result from appropriate option studies, and reflect the application of BAT or BPM in implementing the ALARA principle (see paragraphs B.31 to B.35).

L.2.25. Operators should review their strategies when changes in circumstances, including relevant government policies, make this necessary.

### **Funding of decommissioning operations**

L.2.26. The UK Government expects that all operators will take the steps necessary to ensure that their decommissioning work is adequately funded.

### **Regulation**

L.2.27. The Government expects that the nuclear regulators will ensure that the level of regulation is proportionate to the level of the risk to safety, the environment or security posed by the site.

### **Access to skills and development and spread of best practice**

L.2.28. Operators should maintain the knowledge base, records and skills necessary for their decommissioning operations and management of associated wastes. NDA is fulfilling its skills obligation through its People Strategy, and is investing significantly in defining skills demands, building infrastructure, developing appropriate qualifications and provision, as well as encouraging recruitment into the industry and using world-class benchmarks against other industries. To date, initiatives are being developed and implemented with partners and stakeholders, including: standard resource code definitions; Site Licence Company skills strategies; the Dalton Cumbria Facility; National Skills Academy for Nuclear and its delivery centres; a national graduate scheme; and community apprenticeships in the supply chain. NDA published its Skills and Capability Strategy in April 2011 and refreshed it in April 2014, which defines the skills demands and puts forward a proactive action plan for future implementation.

### **Designing new nuclear facilities to take account of decommissioning**

L.2.29. Any new facility should be designed and built to minimise decommissioning and associated waste management operations and costs.

### **Application of ALARA, ALARP, BAT and BPM in UK regulation**

L.2.30. UK health and safety law is broadly based on the concept that risks should be ALARA. This is translated into three broadly equivalent terms in various legislation: so far as is reasonably practicable or SFAIRP in safety legislation and BAT or BPM in the legislation concerned with environmental protection. SFAIRP is synonymous with ALARP.

### **Determining that risk has been reduced ALARP**

L.2.31. HSE has published five documents relevant to the management of spent fuel and radioactive wastes that provide guidance to industry and ONR's staff. This guidance is used by ONR to judge whether a proposal from a UK nuclear licensee will reduce risks to health and safety to a level that is ALARP:

- 'Reducing Risks Protecting People' (Ref. 152) explains the basis for regulatory decisions regarding the degree and form of regulatory control of risk from occupational hazards;
- 'Policy and Guidelines to assist the HSE in its judgments that dutyholders have reduced risk as low as reasonably practicable' (Ref. 195) sets out in plain terms what HSE believes the law requires;
- 'Assessing compliance with the law in individual cases and the use of good practice' (Ref. 196) identifies what HSE means by good practice;
- 'Policy and Guidance on reducing risks as low as reasonably practicable in design' (Ref. 197) recognises the importance of taking account of health and safety in design; and
- 'Demonstration of ALARP' (Ref. 198) is used by ONR as guidance to its inspectors on how to apply the principle of ALARP to nuclear facilities and operations.

L.2.32. The fundamental essence of a demonstration that risks have been reduced ALARP is to show that the 'costs' (sacrifice) of further improvements to safety would be grossly disproportionate to the benefits that would accrue from implementing any further improvements or change to the status quo. This does not mean that a detailed analysis is necessary; the emphasis must be on an analysis that is fit for purpose. Neither does it mean that a quantitative argument based on risk estimates is always

necessary, as qualitative features such as a demonstration of sound, deterministic engineering principles are often sufficient in making a case.

L.2.33. However, ONR requires a probabilistic safety assessment, in addition to deterministic analysis, for systems where there are significant hazards and complexity. Assessing an ALARP demonstration is essentially a consideration of whether an adequate argument has been made that a reduction in risk would not be feasible at a reasonable cost, given the magnitude of the risk. However, where there are several risks that interact, whether arising from a single hazard or from different connected hazards, there may be a need for balancing between them to achieve the best overall solution.

L.2.34. Demonstration of ALARP requires the licensee to evaluate the risks and to consider whether it would be reasonably practicable to implement further safety measures beyond the initial proposals or what is currently in place. This ought to include the consideration of a number of options to identify which reasonably practicable option or collection of options will give the best safety benefit, and to make this consideration transparent. In reality, there may only be a limited number of options for dealing with a particular health and safety issue.

L.2.35. Deciding what is reasonably practicable involves the exercise of judgment and enforcing authorities will generally expect relevant good practice to be followed. Where relevant good practice in particular cases is not clearly established, health and safety law effectively requires dutyholders to establish explicitly the significance of the risks to determine what action needs to be taken. Where it is not possible to demonstrate ALARP by good practice features and risk estimates alone, the benefits of risk-reducing measures should be compared with their costs. Sometimes it is helpful to use a common unit, which is generally money, so that the analysis may become a form of cost benefit analysis (CBA). The degree of quantification is case dependent, but must be sufficient to make the case fit for purpose. In particular, a CBA alone is unlikely to be considered an adequate argument to demonstrate ALARP.

### Comparison of costs and risk reduction

L.2.36. If the ALARP demonstration employs a comparison of costs and risk-reduction benefits to rule out an improvement, it must be shown that the costs of the improvement would be 'grossly disproportionate'. The ONR has not formulated an algorithm that can be used to determine the proportion factor for a given level of risk. The extent of the bias must be argued in the light of all the circumstances. It may be possible to come to a view in particular circumstances by examining what factor has been applied in comparable circumstances elsewhere to that kind of hazard or in that particular industry.

### Waste management – Regulators' joint guidance

L.2.37. In February 2010, the UK safety regulator and environment agencies published revised Joint Guidance on management of HAW on nuclear licensed sites (Ref. 154). The guidance applies to the whole process of managing radioactive waste from its generation to (but not including) its disposal. The Joint Guidance consists of:

- Overview and glossary
- Part 1 – The regulatory process
- Part 2 – Radioactive waste management case
- Part 3a – Waste minimisation, characterisation and segregation
- Part 3b – Conditioning and disposability
- Part 3c – Storage of radioactive waste
- Part 3d – Managing information and records relating to radioactive waste

L.2.38. The Joint Guidance is supported the by the 'Fundamentals of the management of radioactive waste: an introduction to the management of higher-level radioactive waste on nuclear licensed sites' published in 2007 (Ref. 199). This introductory document provides background information for those who may not be familiar with the subject of radioactive waste management on nuclear licensed sites.

L.2.39. The main aims of the Joint Guidance are to:

- provide a comprehensive source of information that can be used by nuclear site licensees and the regulators' staff, and referred to by other stakeholders; and
- advise licensees on how to obtain regulatory acceptance of their proposals for radioactive waste management.

L.2.40. The Joint Guidance should assist licensees by providing:

- a clear and transparent regulatory process involving early dialogue between the nuclear industry, the regulators, NDA and other stakeholders;
- much greater business certainty at a time when the nuclear industry is committing significant resources to radioactive waste management; and
- a clear, auditable document trail of the basis for current regulatory decisions.

L.2.41. The joint guidance complements ONR's existing guidance to inspectors, and is used by ONR when dealing with nuclear safety cases (Ref. 200) and radioactive waste management issues (Ref. 201) The regulators are committed to undertaking regular reviews, to continuously improving the guidance in light of experience and to ensuring the guidance remains fully relevant. The first such review was completed in 2014.

## Radioactive waste management facilities

**Article 32.2 This report shall also include:**

**(iii) a list of the radioactive waste management facilities subject to this Convention, their location, main purpose and essential features;**

### **Sellafield (including Calder Hall)**

L.2.42. The radioactive waste management facilities at Sellafield are the most extensive of any site in the UK, the most important of which are:

#### Waste Management and Compaction Plant

L.2.43. This plant receives solid LLW for treatment from around the UK, but principally from within the Sellafield site. The waste is compacted, and placed into containers for shipment to the LLWR where it is grouted and placed into a near-surface, concrete-lined vault.

#### Waste Treatment Complex (WTC)

L.2.44. WTC processes Plutonium Contaminated Material (PCM), including historical legacy wastes and arisings from ongoing work activities at Sellafield. Drums with a capacity of 200-litres are filled with PCM and super-compacted. Typically an average of six of the resulting compacted 'pucks' are placed in larger, 500-litre capacity stainless steel drums, which are then in-filled with a cement grout, before being transported to a dedicated store.

#### Magnox Encapsulation Plant (MEP)

L.2.45. MEP receives metallic cladding debris (swarf) produced during the de-canning of Magnox fuel at Sellafield. It has also received legacy Magnox cladding material that had previously been stored in bulk underwater in large silos elsewhere on the Sellafield site. Cladding from either source is tipped into 500-litre capacity stainless steel drums, which are then in-filled with a cement grout matrix and placed in dedicated stores.

#### Waste Encapsulation Plant (WEP)

L.2.46. WEP encapsulates waste fuel cladding and slurries that arise from the reprocessing of oxide fuels in THORP. Similar to the process employed in MEP, the waste cladding is placed in 500-litre capacity stainless steel drums, then in-filled with cement grout and placed in dedicated stores.

#### Waste Processing and Encapsulation Plant (WPEP)

L.2.47. Flocs generated by the actinide liquid effluent clean-up plant are encapsulated in WPEP using the same in-drum mixing technique used in WEP and a similar 500-litre drum design.

#### Sellafield Liquid Effluent Treatment Plants

L.2.48. Management of radioactive liquid effluents at Sellafield takes place in a suite of treatment plants including; the Enhanced Actinide Removal Plant (EARP), the Solvent Treatment Plant (STP), the Salt Evaporator Plant (SEP), the Separation Area Lagoon, the Medium Active Liquor Tank Farm and the Segregated Effluent Treatment Plant.

L.2.49. The Site Ion Exchange Plant (SIXEP) uses a combination of filtration and ion exchange beds to remove suspended fine solids, soluble radioactive caesium and strontium from pond water prior to discharge. SIXEP has dedicated stores for the solid waste generated from its own processes and also helps maintain the thermal conditions of the pond water in the Fuel Handling Plant.

#### Future Sellafield treatment plants

L.2.50. A number of new treatment plants are under construction at Sellafield, principally to support the retrieval of legacy wastes from LP&S. These include:

- Sludge Packaging Plant for ILW Magnox pond sludges;
- Silo Direct Encapsulation Plant for Magnox swarf, and;
- Box Encapsulation Plant for miscellaneous ILW solids;

#### Engineered storage for conditioned wastes

L.2.51. Sellafield features a series of modern stores for: conditioned PCM wastes; miscellaneous solids; vitrified HAL; encapsulated Magnox swarf; THORP hulls and sludges, and; encapsulated waste from the on-site effluent treatment plants. Further additions to this suite of stores will be provided as required.

#### Interim PCM drum storage, unconditioned waste

L.2.52. A significant quantity of unconditioned PCM is currently stored in modern standard stores at Sellafield pending conditioning in a waste treatment plant and transfer to the engineered drum stores described above.

#### Ponds (excluding fuel storage)

L.2.53. The earlier fuel ponds at Sellafield contain, in addition to any remaining fuel and fuel debris, sludges and solid waste accumulated over the years. Plans are being developed to recover this material and condition it for storage in engineered stores.

#### ILW silos

L.2.54. Two silos on the site have been used to store cladding material from Magnox fuel and other miscellaneous solid waste. Plans are being developed to recover this material and condition it for storage in engineered stores.

#### ILW tanks

L.2.55. Liquid and sludge wastes are stored in a number of tanks and vessels on the site. These either form part of existing waste treatment processes or hold historic wastes awaiting a treatment process. In all cases, treatment plants exist or are planned to condition the waste into a solid form for storage in engineered stores.

#### Miscellaneous stores

L.2.56. There are a number of other smaller-scale storage locations around the Sellafield site, typically used for radioactive wastes such as fuel assembly components, filters, sources and miscellaneous scrap.

#### Highly-active liquid wastes and vitrification

L.2.57. Sellafield concentrates and stores the Highly-Active (HA) raffinates that arise from the reprocessing of nuclear fuel. New evaporative capacity was being constructed at the time of this report being published. The allowable quantity of HAL in storage at Sellafield at any given point in time is governed by an ONR Specification, which requires Sellafield Ltd to reduce the waste inventory to a low steady state level whilst not unduly constraining reprocessing operations. Sellafield Ltd has to coordinate the operations of WVP and HALES to deliver compliance with the requirements of ONR's Specification.

#### Contaminated ground and groundwater

L.2.58. The Sellafield site has experienced serious leakage to ground of radioactive liquids. An extensive programme of work is in hand to characterise the extent of contaminated land, to model the movement of radioactivity in groundwater, and to identify appropriate remediation and treatment processes.

## **Windscale**

L.2.59. The Windscale portion of the Sellafield site features the following waste management facilities:

### Active Handling Building

L.2.60. The Active Handling Building remains an operational post-irradiation examination facility for nuclear reactor fuel, which is also used for the treatment and packaging of LLW and ILW, and the handling of redundant sources.

### WAGR Packaging Plant and Box Store

L.2.61. The WAGR Box Store provides interim storage for shielded boxes of waste from the decommissioning of WAGR. LLW is held pending transfer to the LLWR for disposal, and the ILW (and some LLW that is unsuitable for disposal to the LLWR) is stored pending an alternative long-term strategy or availability of a GDF. An improvement in waste packing efficiencies achieved by the WAGR project has made spare capacity available within the store. Options to utilise the available space for other types of ILW are being assessed to maximise the utilisation of this capacity.

## **Low Level Waste Repository**

L.2.62. The waste treatment and storage facilities at the LLWR comprise:

### Grouting Facility

L.2.63. This plant receives ISO-freight containers laden with solid LLW from waste consignors around the UK. The containers are in-filled with a cement grout to produce a monolithic waste form, before being disposed of or stored in the LLWR vaults.

### Trenches

L.2.64. LLWR features a series of seven clay-lined trenches where virtually all the UK's solid LLW arisings between the 1950s and 1988 were disposed of by tumble-tipping in a manner similar to conventional landfill. The trenches are now full to capacity and have been capped to minimise water entry.

### Vaults 8 and 9

L.2.65. In recent years the LLW consigned to LLWR has been placed into concrete-lined surface-level engineered vaults that accept grouted ISO-freight containers laden with conditioned LLW. Vault 8 is currently permitted for disposal and Vault 9 for storage. The process of environmental permitting and planning approval which would allow Vault 9 to be used for waste disposals is ongoing. Historically some ad-hoc large waste items, such as redundant fuel transport flasks, were placed in Vault 8 and grouted in situ.

### Magazine Retrieval and Decommissioning Facilities

L.2.66. LLWR historically stored PCM wastes in a series of magazines, which have since been emptied and the PCM transferred to Sellafield. Five magazine retrieval facilities provided the arrangements to access the magazines to enable their decontamination, clean-up and decommissioning. These facilities have also been used to retrieve and package the secondary PCM waste that arose from the magazine decommissioning process.

### PCM Assay Facility

L.2.67. This facility received drums containing PCM waste for assay purposes.

### PCM Drum Store

L.2.68. The building was used to hold waste drums prior to their transfer to Sellafield for long-term storage.

## **Magnox power stations (operational and decommissioning)**

L.2.69. Across the UK Magnox power stations, the principal waste storage facilities are:

- underground vaults;
- above-ground vaults;
- reactor voids;
- tanks; and
- packaged ILW storage facilities.

L.2.70. The wastes stored in these facilities are of three general types:

- solid (and some potentially mobile) ILW, which are activated and/or contaminated;
- wet wastes, such as sludges and resins, which are stored in tanks or in lined vaults; and
- wastes that have been encapsulated in a cementitious form.

L.2.71. Generally, the Magnox power stations are equipped with stores that have adequate capacity to contain the respective site's lifetime arisings. In some instances, where operational wastes have been conditioned into passive-safe solid forms as part of decommissioning, new storage facilities have been constructed to accommodate the conditioned wastes.

## **Dounreay**

L.2.72. The main facilities for the management of radioactive wastes at Dounreay comprise:

### Dounreay Cementation Plant for Immobilisation of ILW Liquors

L.2.73. This plant processes historical liquid wastes that arose from reprocessing of Materials Test Reactor fuel. These liquors are being emptied from storage tanks and immobilised in a cementitious matrix within 500-litre drums for long-term interim storage and future disposal. Options for the treatment of the remaining historical liquid waste that arose from the reprocessing of spent fuel from the Dounreay Fast Reactor and Prototype Fast Reactor are being reviewed.

### Dounreay Wet Silo

L.2.74. The wet silo is an engineered store that contains long-lived solid ILW, stored under water together with the sludge resulting from operations and material degradation. The wet silo closed for the receipt of solid waste in 1998. Plans are being developed to retrieve the solid waste and sludge waste for processing for long-term interim storage.

### Dounreay shaft

L.2.75. The 65m-deep Dounreay shaft was originally excavated in order to remove spoil during the construction of a sub-sea effluent discharge tunnel. It was subsequently used for the disposal of solid ILW arisings from historical fuel-cycle operations during the period 1959 to 1977. The shaft has been isolated by a grout curtain to minimise the ingress of groundwater, in preparation for the retrieval of solid waste for encapsulation and the sludge waste for processing for long-term interim storage.

### Low-level liquid effluent treatment plant

L.2.76. This plant consists of: an underground effluent receipt tank; buffer tank; two main effluent holding tanks, and; final filtration equipment. The main purpose of the plant was to adjust the pH of incoming low-active effluent and to settle the resulting sludge before discharging the effluent to sea.

#### Low-level waste receipt assay and characterisation and supercompaction facility

L.2.77. This facility undertakes the assay and volume reduction of 200-litre drums of solid LLW. After super-compaction, the compacted drum pucks are loaded into half-height ISO containers for subsequent storage and disposal.

#### Unconditioned Solid Remote-handled ILW 200-litre drum store

L.2.78. This facility stores arisings of solid remote-handled ILW. These arisings are being progressively transferred to the combined conditioned ILW 500-litre drum store and raw solid remote-handled ILW 200-litre drum store. Once all the waste has been treated and transferred, this store will be decommissioned.

#### Unconditioned Solid Contact-handled ILW 200-litre drum store

L.2.79. This facility is currently used for storing arisings of plutonium-contaminated material, uranium-contaminated waste and thorium-contaminated waste, collectively known as contact-handled ILW.

#### Combined conditioned ILW 500-litre drum store and raw solid RHILW 200-litre drum store

L.2.80. Used for storing immobilised liquors that arose from reprocessing of spent fuel from the Material Test Reactor and historical arisings of solid remote-handled ILW.

#### Interim store for containerised LLW

L.2.81. Arisings of solid LLW are being stored in ISO containers within three stores on site. This waste is destined for transfer to a recently constructed LLW disposal facility located close to the nuclear licensed site and expected to be available in 2014.

#### Liquid ILW storage facility

L.2.82. This facility provides tank storage for liquors from reprocessing of spent fuels from the Material Test Reactor, Dounreay Fast Reactor and Prototype Fast Reactor.

#### Solvents and oil storage facility

L.2.83. This facility includes tanks holding ILW-contaminated solvent resulting from PFR fuel reprocessing, and bulk storage containers for low-level contaminated oils.

### **Harwell**

L.2.84. The key waste management facilities at Harwell are:

#### Solid waste complex

L.2.85. The solid waste complex provides facilities for the retrieval, processing and repacking of remote-handled ILW and a processing / packing area for contact-handled ILW and LLW operations, including decontamination. It also includes stores for remote-handled ILW, contact-handled ILW and drums of waste originally intended for sea disposal. A waste encapsulation plant is currently being constructed in the solid waste complex for the purpose of processing the remote-handled ILW into a passive safe form.

#### Active handling facility

L.2.86. This facility was previously used for post-irradiation examination and consists of two concrete cell lines. The facility is in a regime of care and maintenance.

#### Radiochemical building

L.2.87. This building contains an interim store for contact-handled ILW and a stainless steel-lined cell-line, which is being used in the short term for radium-bearing remote-handled ILW requiring additional treatment before it is packaged in the Solid Waste Complex.

### Liquid effluent treatment plant

L.2.88. This plant consists of tanks for the storage of legacy sludges, a plant for immobilising the legacy sludges, facilities for the treatment of operational liquid effluent and the storage / conditioning of the resulting operational sludges. The volume of raw liquid effluent arising at Harwell is diminishing, and by 2015 it is foreseen that the solid waste complex will be the major producer of liquid effluent. A replacement liquid effluent treatment plant is being developed within the solid waste complex to contain and evaporate fresh arisings prior to solidification and disposal to LLWR. The current liquid effluent treatment plant will be decommissioned once existing stocks of historic sludges are processed and disposed of.

### **Winfrith**

L.2.89. The key waste management facilities at Winfrith are:

#### Treated Radioactive Waste Store

L.2.90. This store is a shielded engineered store providing long-term storage for the waste encapsulated in 500-litre drums. There is an opportunity to re-categorise the encapsulated sludge for disposal to the LLWR currently being progressed by RSRL.

#### Steam-Generating Heavy Water Reactor (SGHWR)

L.2.91. SGHWR is undergoing decommissioning. Parts of the facility have been used in the processing of legacy solid decommissioning wastes generated from across the Winfrith site. Typical processing activities include size-reduction and surface decontamination.

#### Tradebe Inutec

L.2.92. Tradebe Inutec currently operates a complex of facilities dedicated to the management of radioactive wastes from a broad selection of UK nuclear sites, as a tenant of the Winfrith site licensee, RSRL. Amongst other specialist waste management services, Tradebe Inutec offers treatment of contaminated metals as part of the LLWR framework, which includes a link to the smelter at Siempelkamp in Germany accessed via transfrontier shipments.

### **EDF Energy (formerly British Energy Generation Ltd)**

L.2.93. The EDF Energy power stations feature the following principal radioactive waste storage facilities:

- voids – integral to the AGR reactor civil structures and generally used for storage of redundant reactor and fuel assembly components;
- wet waste storage tanks – either stainless steel or lined concrete cells;
- desiccant storage – provided by vaults at two AGRs and in-drum storage on other sites; and
- storage of spent ion exchange resins.

L.2.94. The wastes on EDF Energy sites are of the following general types:

- AGR fuel stringer debris – a product from dismantling of spent fuel assemblies prior to dispatch of elements to Sellafield. These wastes are almost all metallic and are stored in the integral voids described above.
- Other dry wastes – miscellaneous contaminated or activated components. These are significantly less radioactive than fuel stringer debris, but are still likely to remain ILW for many decades.
- Spent resins and sludges – ion exchange resins are used to manage the quality of water in fuel storage ponds. At Sizewell B resin is more extensively used than on the AGRs, due to the need to keep the primary circuit coolant water within tight chemical limits.

- Desiccants – used to minimise moisture within the primary circuits of AGRs. A process has been developed to treat desiccants to remove their principal contaminant (tritium) at Winfrith, following which they are encapsulated and disposed of to the LLWR.

## **GE Healthcare**

L.2.95. GE Healthcare produces isotopes for use in medicine, scientific research and industry.

L.2.96. The company previously managed three nuclear licensed sites in the UK, but ceased operations on its section of the Harwell site, decommissioned its facilities there and surrendered its site licence in 2012. The vacated plot is now subject of RSRL's nuclear site licence – GE Healthcare has no remaining nuclear liabilities on the Harwell site.

L.2.97. GE Healthcare has radioactive wastes stored at its two remaining UK licensed sites: the Grove Centre near Amersham and the Maynard Centre near Cardiff.

L.2.98. The Grove Centre has a long history of handling radioactive materials in numerous facilities since around 1940. The site manufactured radiopharmaceutical products, but throughput has reduced significantly in recent years as a result of a high proportion of the company's manufacturing business being transferred overseas. Many of the facilities at the Grove Centre have consequently been decommissioned, with resultant ILW placed within a purpose-built on-site store mainly inside 500-litre stainless steel drums. The store has sufficient capacity for all anticipated operational and decommissioning wastes. The site is implementing a decommissioning plan that will result in further generation of ILW for on-site storage pending ultimate disposal options. The strategy for radioactive wastes at Amersham is based on: treatment and prompt disposal wherever possible; decay storage (for later disposal via authorised routes); or conditioning and long-term on-site storage to await availability of the proposed GDF.

L.2.99. The Maynard Centre was opened in 1980 for the manufacture of radiochemical products featuring Carbon-14 and Tritium. Manufacturing at the site ceased in 2010, since when the facilities have been substantially decommissioned and removed. The site will continue to manage and store ILW, making use of disposal routes to reduce the stored inventory over the coming years. The approach to dealing with some of the legacy wastes was determined following options studies and development of Radioactive Waste Management Cases as follows:

- disposal of carbon-14-bearing wastes via incineration; and
- decay storage of tritium-bearing wastes, followed by disposal via incineration and/or landfill

## **Studsvik Metal Recycling Facility**

L.2.100. Studsvik MRF was brought into operation in September 2009. All nuclear licensed sites in England and Wales are able to consign unlimited quantities of metallic waste for recycling to the MRF. Sites in Scotland can also apply to SEPA for an authorisation to have their metallic wastes treated at the MRF. The purpose of the facility is to reduce the volumes of metallic waste needing disposal at the LLWR, while recovering valuable uncontaminated metal for recycling. The site processes low-level radioactive metals using a range of techniques including size reduction and shot blasting. Studsvik can also co-ordinate trans-frontier shipment of radioactive metallic wastes to facilities in Sweden for treatment by melting.

## **National Nuclear Laboratory**

L.2.101. NNL provides services covering the complete nuclear fuel cycle from fuel manufacture and power generation, through reprocessing and waste treatment to

disposal. It includes defence, new nuclear build and security, supported by a range of links with international research organisations, academia and other national laboratories. It has facilities at Sellafield, Springfields, Windscale and Workington.

L.2.102. The Shareholder Executive undertook a strategic review of the NNL in 2012. This recommended that the NNL's mission be amended and re-stated, with renewed emphasis on its primary function of carrying out R&D to support UK national programmes, particularly the decommissioning of the UK's nuclear legacy.

L.2.103. The NNL's role was clarified and restated in the Government's Nuclear Industrial Strategy in March 2013, with NNL's work to support major Government nuclear programmes explicitly recognised as a key part of its mission. NNL then issued a new mission statement, highlighting support to the UK's decommissioning programme alongside electricity generation from existing nuclear power stations. NNL is now a Government-owned, Government-operated organisation (GoGo).

L.2.104. In relation to the future development of nuclear energy, the Government is looking to commercial nuclear operators to deploy existing technology and expects therefore that further R&D will not be necessary in the near-term. NNL has an R&D strategy through which it covers key research areas important for the organisation's growth and provides a focus for skills maintenance, which is a DECC objective.

## Radioactive waste inventory in the UK

<b>Article 32.2 This report shall also include:</b>	
(iv)	<b>an inventory of radioactive waste that is subject to this Convention that:</b>
a.	<b>is being held in storage at radioactive waste management and nuclear fuel cycle facilities;</b>
b.	<b>has been disposed of; or</b>
c.	<b>has resulted from past practices.</b>
<b>This inventory shall contain a description of the material and other appropriate information available, such as volume or mass, activity and specific radionuclides;</b>	

L.2.105. A summary of the 2013 UKRWI is given in Tables L.2.1–L.2.3 below (see also [www.nda.gov.uk/ukinventory/](http://www.nda.gov.uk/ukinventory/))

**Table L.2.1 Radioactive wastes from all sources in stocks from 2013 inventory**

Packaged and not yet packaged volumes (m<sup>3</sup>)

Waste type	At 1.4.2013	Volume (m <sup>3</sup> ) <sup>(1)</sup>
HLW	<b>Total</b>	<b>2,030</b>
	Packaged	1,100
	Unpackaged	931
ILW	<b>Total</b> <sup>(2)</sup>	<b>104,000</b>
	Packaged	37,300
	Unpackaged	66,900
LLW	<b>Total</b> <sup>(3)</sup>	<b>69,600</b>
	Packaged	50,000
	Unpackaged	19,700
VLLW	<b>Total</b>	<b>5,410</b>
	Packaged	0
	Unpackaged	5,410

(1) The packaged waste volume is the displacement volume of the containers in which the waste is conditioned. All volumes are given to three significant figures.

(2) Can be categorised as 755m<sup>3</sup> of LLW and 104,000m<sup>3</sup> of ILW.

(3) Can be categorised as 1,370m<sup>3</sup> of ILW, 64,700m<sup>3</sup> of LLW and 3,650m<sup>3</sup> of mixed LLW/VLLW.

**Table L.2.2 Expected total waste volumes from existing facilities to end of life – volumes when packaged<sup>(1)</sup>**

Waste type	At 1.4.2013	Future arisings (m <sup>3</sup> )	Total (m <sup>3</sup> )
HLW	1,550	-137 <sup>(2)</sup>	1,410
ILW <sup>(3)</sup>	151,000	311,000	462,000
LLW <sup>(4)</sup>	68,000	1,080,000	1,150,000
VLLW	4,570	3,100,000	3,110,000
<b>Total</b>	<b>225,000</b>	<b>4,490,000</b>	<b>4,720,000</b>

(1) The packaged waste volume is the displacement volume of the containers in which the waste is conditioned. All volumes are given to three significant figures.

(2) Volume is net of HLW exports to overseas customers (hence negative figure).

(3) Can be categorised as 449,000m<sup>3</sup> of ILW and 13,500m<sup>3</sup> LLW.

(4) Can be categorised as 9,230m<sup>3</sup> of ILW and 1,127,000m<sup>3</sup> of LLW and 14,700m<sup>3</sup> of mixed LLW/VLLW.

**Table L.2.3 Annual disposals of LLW (2008–13)<sup>(1)</sup>**

Year	Total volume (m <sup>3</sup> )
2008	8,600
2009	7,000
2010	4,830
2011	6,700
2012	4,820

(1) Approximately 32,800m<sup>3</sup> LLW has been packaged and stored in vaults 8 and 9 of the LLWR.

### Decommissioning facilities

**Article 32.2 This report shall also include:**  
**(v) a list of nuclear facilities in the process of being decommissioned and the status of decommissioning activities at those facilities.**

L.2.106. A list of the main UK nuclear facilities that are in the process of being decommissioned, and the status of decommissioning activities at those facilities, is shown below.

#### **Sellafield**

Facility	Date of closure	State of decommissioning
First reprocessing plant	1973	In progress. Priority is being given to removal of the ventilation stack on top of this facility. This stack currently supports Magnox reprocessing. A new stack and ventilation system is under construction to enable the old stack to be isolated and removed.
Solvent purification plant	1973	Plant and equipment removed.
Analytical facilities	c.1960s	In progress.
Pilot reprocessing plant	1980s	Removed.
Fast reactor fuel plant	1988	In progress.
MOX fuel demonstration plant	2003	In progress.
Calder Hall power station	2003	Reactors undergoing defuelling.
Solid waste store	c.1970s	Material being recovered and repacked for modern stores.
Pile chimneys	1957	One significantly reduced in height. Work on the second chimney is underway.
Plutonium purification plants (several)	Various	Most plant and equipment removed, some buildings removed.

<b>Facility</b>	<b>Date of closure</b>	<b>State of decommissioning</b>
Uranium purification plant.	1990s	Plant, equipment and building removed.
Magnox sludge settling facility	1984	Sludge removed, plant and equipment being removed
Pile Fuel Storage Pond (PFSP)	1960	The collection and movement of sludge to an in-pond corral is underway with new-build storage plant nearing commissioning. Preparations are advanced for the transfer of fuel to improved storage conditions.
Pile Fuel Cladding Silo	1967	Work to implement waste retrieval is in the design stage. Preliminary construction work for new facilities have been completed.
First Generation Magnox Storage Pond	1990	Commissioning of new sludge buffer tanks is well advanced and sludge transfers are planned to start in 2014/15. The transfer of Magnox fuel to more modern storage facilities is planned to start in 2016/17.
Magnox Sludge Storage Silo	1990	Successful transfers of silo liquor are now routine and are transferring soluble mobile inventory to the SIXEP plant for capture on ion-exchange media. The first waste retrieval machine is planned to be in place and operating in 2016.

### **Dounreay**

<b>Facility</b>	<b>Date of closure</b>	<b>State of decommissioning</b>
Materials Test Reactor	1969	Reactor Stage 2 decommissioning complete and now in care and maintenance. Associated pond emptied and decommissioned. Associated cave for post-irradiation examination activities ready for final demolition. ILW packages have all been removed from the remote-handled ILW storage area and this is ready for final demolition.
Experimental Dounreay Fast Breeder Reactor	1977	Destruction of the liquid metal coolant from the primary circuit was completed in 2012. Development is continuing of techniques for removal of sodium potassium residues from the internal surfaces of the reactor and associated equipment. The Breeder Fuel Removal facility has been constructed and is going through a full commissioning schedule prior to operations.
Prototype Fast Reactor	1994	Stage 1 decommissioning is in progress. The bulk sodium from the core, secondary circuits and irradiated fuel cell has been removed and destroyed. The secondary circuits have completed Stage 3 decommissioning. Plant design for removal of residual sodium from the internal surfaces of the reactor and associated equipment is underway.
Range of analytical and metallurgical	Part	Decommissioning of the fume cupboard and glove-box shielded labs has been completed. Decommissioning

<b>Facility</b>	<b>Date of closure</b>	<b>State of decommissioning</b>
laboratories and fuel examination facilities	operational	of the remaining shielded labs will commence at the cessation of operations in 2014.
Facility for handling and examination of irradiated fuel	2006	Stage 2 decommissioning completed on the redundant cells and currently progressing through Stage 3 decommissioning.
Post-irradiated examination (PIE) facility	1993	Stage 2 decommissioning completed on redundant cells and now prepared for commencement of Stage 3 decommissioning.
Plutonium-handling building	1963	Decommissioned and demolished.
Shaft and Silo disused ILW storage facilities	1977 and 1999 respectively	The shaft has been hydraulically isolated from surrounding bedrock by cementitious grouting via a matrix of boreholes. Design work being progressed on the retrieval facility. Waste will be retrieved from the ILW Shaft and Silo at the earliest practicable date.
Plants for the reprocessing of mixed-oxide fuels, and associated facilities	2001	Stage 1 decommissioning underway.
Fuel reprocessing plant	1998	Stage 1 decommissioning completed and currently undergoing Stage 2 decommissioning.
MTR fuel fabrication facility	2005	Facility now decommissioned and demolished.
Uranium processing facility	2006	Redundant areas have completed Stage 2 decommissioning. Stage 1 decommissioning of the remaining plant has commenced.
LLW treatment plant	2004	Decommissioned and demolished.

### **Harwell**

<b>Facility</b>	<b>Date of closure</b>	<b>State of decommissioning</b>
Low-energy, graphite reactor	1990	Reactor fully decommissioned. Graphite core incinerated at an off-site facility.
Experimental graphite reactor	1968	Stage 2 decommissioning complete. Reactor in care and maintenance.

<b>Facility</b>	<b>Date of closure</b>	<b>State of decommissioning</b>
Materials testing reactors	1990	Stage 2 decommissioning largely complete. Reactors in care and maintenance.
Radiochemistry laboratory	Facility largely in a state of care and maintenance	Majority of former operational areas cleared and decontaminated. Facility is in a state of care and maintenance with the exception of an existing cell line which is used to encapsulate radium-bearing wastes generated by the retrieval and treatment of ILW. The facility is used to store CHILW generated during decommissioning.
PIE concrete-shielded cells	Facility largely in a state of care and maintenance	Stage 1 decommissioning complete. Facility in a state of care and maintenance with the exception of an existing cell line which is retained for the receipt of higher activity sealed sources collected as waste from around the UK.
PIE lead-shielded cells	Progressive closure completed in 1995	Fully decommissioned.

### **Low Level Waste Repository**

<b>Facility</b>	<b>Date of closure</b>	<b>State of decommissioning</b>
Magazine 4	2007	All decontamination, decommissioning and clean-up activities complete. Waiting to be demolished.
Magazines 3, 5, 9 and 10	2007	Undergoing decontamination, decommissioning and clean-up activities prior to demolition.

### **Windscale**

<b>Facility</b>	<b>Date of closure</b>	<b>State of decommissioning</b>
Air-cooled, graphite reactor	1957	Pile 1 is currently in surveillance and maintenance. Work to remove fuel and isotopes from the fire-damaged area of the reactor core has been deferred to focus funding on higher-hazard facility decommissioning.
Air-cooled, graphite reactor	1957	Pile 2 is currently in care and maintenance.
Windscale advanced gas-cooled reactor (WAGR)	1982	Facility is moving into surveillance and maintenance.
Fuel examination facility	1995	Facility is moving into surveillance and maintenance.
Lead-shielded cells, used for PIE of fuel	Part operational	Facility is currently in surveillance and maintenance.

## Winfrith

Facility	Date of closure	State of decommissioning
Experimental high-temperature helium-cooled power reactor (DRAGON)	1976	All fuel has been removed from site. All plant and equipment removed from the secondary containment building. Reactor is currently in care and maintenance pending Stage 3 decommissioning.
Zero energy reactor to support fast reactor core physics (ZEBRA)	1982	Reactor now fully decommissioned.
Steam-Generating Heavy Water Reactor (SGHWR)	1990	All fuel has been removed from site. All plant and equipment in the secondary containment has been removed. Reactor is currently in care and maintenance pending Stage 3 decommissioning.
PIE facility	2001	Fully decommissioned.

## Magnox power stations

The decommissioning strategy being implemented at each Magnox power station site comprises three stages:

**Stage 1:** Preparations for care and maintenance, which involves the removal of much of the conventional plant, retrieval and packaging of the accumulated operational wastes, and decontamination and removal of the ancillary systems.

**Stage 2:** Care and maintenance period (safestore), in which the reactors will be maintained in a safe enclosure while radioactive decay occurs.

**Stage 3:** Final reactor dismantling and site clearance.

Station	Date of cessation of generation	State of decommissioning
Berkeley	1989	<ul style="list-style-type: none"> <li>● Defuelled in 1992 - spent fuel transferred to Sellafield for reprocessing.</li> <li>● All 16 boilers transferred to a Swedish LLW smelting and recycling facility.</li> <li>● Fuel ponds building demolished – all pond equipment disposed of; concrete pond wall demolished (inner contaminated layer was disposed of as LLW to the LLWR).</li> <li>● Reactor buildings placed into Stage 2 (safestore) in 2010.</li> <li>● Construction of ILW Interim Store complete.</li> <li>● Retrieval of ILW from the Chute Silo underway.</li> <li>● Preparations for retrievals of ILW from Vaults 2–4 underway.</li> </ul>
Trawsfynydd	1993	<ul style="list-style-type: none"> <li>● Defuelled in 1996 – spent fuel transferred to Sellafield for reprocessing.</li> <li>● ILW Store constructed by 2008 and commissioned in 2009.</li> <li>● Site was selected for accelerated decommissioning in the Magnox Optimised Decommissioning Plan.</li> <li>● Spent Resin Vaults 1 and 2 emptied.</li> <li>● Fuel element debris retrieval underway.</li> <li>● Fuel ponds drained, pond equipment removed and decontamination of the pond structure is well advanced.</li> <li>● Accumulated operational wastes are being retrieved, processed and packaged.</li> </ul>
Hunterston A	1990	<ul style="list-style-type: none"> <li>● Defuelled in 1995 – spent fuel transferred to Sellafield for reprocessing.</li> <li>● Wet ILW Retrieval and Encapsulation plant constructed and being commissioned.</li> <li>● Solid Active Waste Retrieval plant constructed and being commissioned.</li> <li>● Detailed design of encapsulation facility for solid ILW complete.</li> <li>● Regulatory permission granted for use of the ILW Store.</li> <li>● ILW Store and cross-site transporter commissioned in readiness to accept the first ILW packages.</li> <li>● Ponds draining and cleaning underway, over 75% of the pondwater drained and treated.</li> </ul>

Chapelcross	2004	<ul style="list-style-type: none"> <li>• Defuelled in 2013 – spent fuel transferred to Sellafield for reprocessing.</li> <li>• Pond 1 drained and sealed, work underway on Pond 2.</li> <li>• Redundant cooling towers demolished.</li> <li>• Over 2,000 tonnes of asbestos removed from 16 heat exchangers, 8 turbines and 4 dump condensers stripped of asbestos.</li> <li>• Asbestos removal from the reactor buildings underway.</li> <li>• ILW storage facility construction planned to start in 2014.</li> <li>• Retrieval, processing and packaging of ILW is at the design stage.</li> </ul>
Bradwell	2002	<ul style="list-style-type: none"> <li>• Defuelled in 2005 – spent fuel transferred to Sellafield for reprocessing.</li> <li>• Fuel ponds drained, pond furniture removed and the structure sealed.</li> <li>• Reactor building de-planting well advanced and safestore construction works underway.</li> <li>• ILW retrieval and packaging operations have commenced.</li> <li>• Fuel Element Debris Dissolution Plant constructed, commissioning underway.</li> <li>• ILW ISF completed and commissioned.</li> <li>• Turbine hall de-planted and demolished.</li> <li>• Requirement for off site emergency plan lifted</li> <li>• Plans to enter early care and maintenance are on target.</li> </ul>
Hinkley Point A	2000	<ul style="list-style-type: none"> <li>• Defuelled in 2004 – spent fuel transferred to Sellafield for reprocessing.</li> <li>• Turbine house de-plant completed and void being used for spoil from the Hinkley Point C site ground works.</li> <li>• Asbestos removal completed.</li> <li>• Pond draining underway.</li> </ul>
Calder Hall	2003	<ul style="list-style-type: none"> <li>• Currently being defuelled.</li> </ul>
Dungeness A	2006	<ul style="list-style-type: none"> <li>• Defuelled in 2012 – spent fuel transferred to Sellafield for reprocessing.</li> <li>• Fuel element debris dissolution completed.</li> <li>• Demolition of administration building, canteen and annexes completed.</li> </ul>
Sizewell A	2006	<ul style="list-style-type: none"> <li>• Defuelling well advanced in April 2014 – spent fuel transferred to Sellafield for reprocessing</li> <li>• Configuration control process enacted to enable systematic isolation of redundant plant.</li> </ul>

## Annex L.3. – Regulatory Organisations

L.3.1. This annex provides further information to that supplied under Article 19 on the regulators that enforce the relevant health, safety and environmental laws in the UK.

### Health and Safety Regulation

#### Office for Nuclear Regulation

##### (i) Mandate and duties

L.3.2. The original Nuclear Installations Act, enacted in 1959, set up the Nuclear Installations Inspectorate (NII) in 1960, then called the Inspectorate of Nuclear Installations. The 1959 Act was subsequently replaced by NIA65 which, although amended in some details, retains essentially the same regulatory powers. In 1974, NII was incorporated into HSE, and those parts of NIA65 relating to licensing became relevant statutory provisions of HSWA74. On 1 April 2011, NII became part of the Office for Nuclear Regulation (ONR), an agency of HSE. ONR was established as a statutory corporation in its own right by the Energy Act 2013 and was vested as such on 1 April 2014.

L.3.3. ONR now operates the nuclear site licensing system under the Energy Act 2013 and NIA65 and grants licences to corporate bodies to install or operate a nuclear installation on a particular site. ONR may attach to a nuclear site licence such conditions as appear necessary or desirable in the interests of safety, or such conditions as it may think fit with respect to the handling, treatment and disposal of nuclear matter.

##### (ii) Organisational structure

L.3.4. As of 31 April 2014, ONR was organised into divisions covering:

- regulation of Sellafield;
- regulation of civil nuclear power plants (including the GDA process for proposed new nuclear power stations);
- regulation of sites associated with the Ministry of Defence's nuclear programme;
- regulation of the transport of civil radioactive materials and wastes;
- regulation of other sites whose main business is the management of decommissioning, spent fuel and radioactive wastes, (eg shut-down Magnox power stations, shut-down research sites and the planned GDF);
- the cross-ONR programme which includes regulatory functions that are relevant to a multitude of licensed sites (eg emergency preparedness and response, regulatory intelligence and the UK Safeguards Office);
- regulation of civil nuclear security;
- corporate services; and
- regulatory assurance.

##### (iii) Financial resources

L.3.5. Section 24A of NIA65 enables financial charges to be imposed on the nuclear licensees to recover the expenses incurred through ONR's regulation of nuclear installations. In addition, further expenses are recovered from licensees in respect of a programme of safety research and studies agreed between ONR and the industry. ONR uses a work recording system to identify the effort and expenses of its staff attributable to each licensee.

L.3.6. Additionally, the Fees Regulations are used to recover charges for work on GDA. In 2013/14, ONR's total expenditure was £55 million, of which total nuclear safety expenditure was £47 million.

#### **(iv) Human resources**

L.3.7. As of 1 April 2014, ONR had 242 Nuclear Safety Inspectors in post and seven in training (compared with 218 nuclear inspectors in post and two in training to become Nuclear Safety Inspectors noted in the fourth UK report). ONR has sufficient inspectors in post to carry out its current regulatory duties but it is recognised that recruitment will need to continue at increased rate for several years to address industry developments and inspector retirements. As in many other countries, ONR's age distribution is heavily weighted towards the older end of the spectrum and it currently has many inspectors in post who are beyond the former retirement age of 60 (at present around 16% are over 60 and 26% over 57). However, the Government has removed all age barriers so there is now no upper age limit to employment.

L.3.8. To address these needs, ONR has introduced some new approaches to recruitment. ONR is now recruiting into roles at higher and lower levels compared to its traditional approach, in order to widen access to the available talent pool. These lower-level posts are seen as development posts and are aimed to attract those who have not gained sufficient industry experience to be appointed as Nuclear Safety Inspectors but have the potential to be developed to reach that level over a period of time. ONR are also recruiting graduates to widen its recruitment pool and provide opportunities to 'grow its own'.

L.3.9. Staffing profiles have been prepared for a number of years ahead. These are based on current and anticipated workloads and make various assumptions on the retention of staff beyond the former retirement age of 60.

L.3.10. In addition, each of ONR's programmes has identified current and anticipated staff requirements in terms of technical specialism. As well as identifying current vacancies, this work has identified potential pressure points caused by future retirements.

L.3.11. ONR has also developed an enhanced Technical Support Contract Framework, to provide additional expertise on a short- and medium-term basis as demand arises.

#### **Developing and maintaining staff competences**

L.3.12. The intensive recruitment campaign over the last two years has necessitated a radical revision of the training and assimilation of new inspectors. Recruitment in excess of 30 new inspectors per year means that ONR can no longer just rely on external training courses and ad hoc internal peer group assistance from experienced colleagues. Training and assimilation is resource intensive so it has to be structured, planned, properly resourced and continually evaluated to ensure it meets all needs. ONR has training managers in place and has a significant training budget.

#### **Training of new inspectors**

L.3.13. All inspectors joining ONR have good academic qualifications and several years of experience in a relevant industry such, qualifying them as technical experts in their own discipline. The purpose of the training is to expand and build on this base rather than 'convert' them to acquire another knowledge base. It can be regarded as a 'holistic' approach to training. To achieve this, the initial training is in two main areas:

- training to be a regulator – as few new recruits have prior knowledge of regulation; and

- training to expand recruits' technical expertise to gain a working knowledge of other essential technical disciplines.

### **Competence framework**

L.3.14. In 2008 a new competence framework was developed for nuclear safety inspectors, based on the requirements of 'National Occupational Standards for Nuclear Regulators' (Ref. 202). This is a high-level standard and sets out the basic requirements for all regulators involved in nuclear safety and security, including the environment agencies and transport.

L.3.15. The competence framework was trialled initially and is being refined continuously to reflect feedback. The purpose of the framework is to specify the training need for specific job functions as well as identifying the basic training needs.

### **Training methods**

L.3.16. A new inspector's training programme is developed on a personal basis and is based on a training needs analysis. The delivery of the programmes relies extensively on an interactive tutorial approach rather than formal lectures. Training documentation focuses on providing signposts to where information can be found rather than providing detailed training material.

L.3.17. New recruits also undergo operational training (on-the-job training) where they carry out specific regulatory assignments under close supervision. The effectiveness of all training activities are evaluated initially and again after three months. This gives opportunities for trainees to evaluate training in the context of their job and gives better feedback to those developing the training courses.

### **Continued professional development**

L.3.18. While considerable effort is spent on the training of new recruits, ONR also has a refresher training programme to develop professional competencies for all staff. ONR's policy is that this is not centrally managed but is a matter for individual inspectors to agree with their line managers with advice from senior experts in their technical field. Such training covers topics such as communication, influencing skills, change management and interpersonal skills, as well as the development of technical competencies.

### **Technical support**

L.3.19. The 'expenses' recovered from licensees include the two major cost streams of expenditure associated with ONR's own operational activity (payroll, travel and subsistence, training and other staff-related costs) and the costs of Nuclear Safety Studies (which enables ONR to buy-in technical and scientific support in support of the regulatory function).

## **Environmental Regulation**

### **Environment Agency**

#### **(i) Mandate and duties**

L.3.20. The Environment Agency was created under EA95 with the aim of providing a more integrated approach to protecting and improving the environment of England and Wales as a whole – land, air and water. It is a 'non-departmental public body', sponsored largely by Defra and, until 1 April 2013, the Welsh Government. Its powers and duties relate to environmental protection, flood defence, water resources, fisheries, recreation, conservation and navigation. EA95 sets out the principal aim of the Environment Agency 'in discharging its functions so to protect or enhance the environment, taken as a whole, as to make the contribution towards attaining the objective of sustainable development'.

## **(ii) Structure**

L.3.21. In April 2014, the Environment Agency, following a review and update of its corporate plan, restructured from a three-tier (national, regional and area) to two-tier structure (national and area), removing the regional tier. These changes have not affected the structures in place within the Environment Agency to deliver nuclear regulation. The two specialist groups (North and South) remain and continue to carry out the regulation of radioactive waste disposals from the nuclear industry. Both groups are supported by the Radioactive Substances Regulation Group which works from the Environment Agency's national office to link nuclear regulation to the UK Government's work to support policy development and implementation, as well as to non-nuclear regulation, including support to the collection of disused radioactive sources.

L.3.22. Associated with the North radioactive substances regulation specialist group are two assessment teams providing national support on solid waste disposal and GDA as well as the checking, monitoring and assessment of discharges to the environment. Similarly, associated with the South group, there is a small team providing national support on radiation incident management.

L.3.23. The Radioactive Substances Regulation Group leads on support to Government on national policy development and implementation, including the development of waste strategy, as well as regulatory process development.

L.3.24. The Environment Agency and Food Standards Agency liaise closely to ensure that their environmental monitoring programmes are appropriate. Annual results from these programmes are published jointly by the environment agencies and the Food Standards Agency in annual RIFE reports. The latest report (RIFE-18) was published in October 2013 and contained data from the 2012 environmental monitoring programme.

## **(iii) Financial resources**

L.3.25. The Environment Agency has a total budget for 2014 to 2015 of over £1.3 billion, over half of which is spent on flood and coastal risk management and, in 2013/14, £450 million was spent on environment protection. Income is derived chiefly from three sources:

- income raised from charging for regulation;
- flood defence levies; and
- government grants, which help to finance amongst other things, pollution prevention and control activities.

L.3.26. Section 41 of EA95 provides the Environment Agency with the power to impose financial charges for regulatory activities in order to recover the expenses incurred through regulation. Such expenses include those incurred in respect of a programme of waste and environmental monitoring carried out by the Environment Agency. The Environment Agency uses a work-recording system to identify the effort and expenses of its staff attributable to each licensee.

L.3.27. The Environment Agency charges operators for its nuclear regulatory activities on the basis of a daily rate for inspectors. This rate is reviewed annually. The Environment Agency also recharges operators for the monitoring it carries out. Annual charges for nuclear and non-nuclear regulatory work and monitoring activities in the financial year 2013/14 were approximately £13.5 million.

## **(iv) Human resources**

L.3.28. The Environment Agency has a total of over 10,000 staff, although only a small proportion of these are involved in nuclear regulation. The North and South nuclear regulatory groups have a total of around 70 technical staff, with additional

administrative support. The other groups involved with nuclear regulatory activities, identified above, comprise approximately a further 12 technical staff.

#### **(v) Inspectors' qualifications**

L.3.29. Nuclear regulatory staff recruited by the Environment Agency are required to have a good honours degree in science or engineering, and either several years' experience in a technical or management role in the nuclear industry, or considerable experience in the regulation of radioactive substances within non-nuclear sectors.

#### **(vi) Inspectors' training**

L.3.30. The Environment Agency has established standards of competency for its staff involved with the regulation of radioactive substances. Competence standards for nuclear regulation are separately identified within the overall framework.

L.3.31. The standards are used as a benchmark for all staff, but the need to undergo a structured programme depends on the individual's experience. For more experienced staff, the standards are used informally to better target professional development. For new inspectors, attainment of the competency standards is mandatory and these are used in a formal manner.

L.3.32. Developing the competences of staff is achieved by combination of structured training (eg on legal requirements) and developmental experience (eg on site inspection or issuing Enforcement Notices). The system adopted by the Environment Agency allows for competences to be demonstrated and the standards achieved to be recorded. More experienced staff act as mentors for new staff going through the competences programme.

### **Scottish Environment Protection Agency**

#### **(i) Mandate and Duties**

L.3.33. The Scottish Environment Protection Agency was formed in 1996 to deliver an integrated environmental protection service to Scotland. The Environment Act gives SEPA the statutory purpose of carrying out its functions for the purpose of protecting and improving the environment (including managing natural resources in a sustainable way). SEPA is a non-departmental public body operating at arm's length from the Scottish Government but accountable through the Scottish Ministers to the Scottish Parliament.

L.3.34. SEPA plays an important role in achieving international environmental obligations and provides expert advice to the Scottish and UK Governments and to other partner organisations. As the principal environmental regulator for Scotland, SEPA contributes to formulating legislation and advises on the implementation of EC legislation, the development of government regulations, regulatory policies and guidance and the regulation of industrial and commercial installations. SEPA is responsible for implementing and monitoring compliance with Scottish and UK environmental laws, around 90% of which originate in Europe. Comprehensive information on the laws and directives SEPA implements can be found on the SEPA website.

L.3.35. As Scotland's environment watchdog, SEPA aims to protect the environment and human health by being an excellent environmental regulator and an effective and influential authority on the environment, limiting climate change and preparing Scotland for a sustainable future.

L.3.36. Powers under RSA93 are devolved to the Scottish Government. Using its statutory powers, SEPA issues various permits, licences, consents, registrations and authorisations covering a wide range of commercial and institutional activities that have the potential for adverse impacts on the environment.

L.3.37. SEPA manages a monitoring programme that assesses levels of man-made radioactivity in the environment using a number of environmental indicators. The samples of water, food, soil etc, collected as part of SEPA's programme, act both as indicators of the state of the environment and to verify that the levels of radioactivity present within these commodities have low radiological significance to man.

L.3.38. Results from the environmental monitoring programme are used as the basis for dose calculations to members of the public from consumption of food and exposures of members of the public from waste disposals.

L.3.39. In Scotland, the Food Standards Agency and SEPA liaise closely to ensure that the environmental monitoring programme for radioactivity is appropriate. Annual results from the environmental monitoring programme in the UK are published jointly in the RIFE reports.

## **(ii) Structure**

L.3.40. Legally, the Agency Board constitutes SEPA. The members of the Board are appointed by Scottish Ministers and, as well as appointing the Chairman of SEPA, the Scottish Ministers appoint a member as Deputy Chairman. The Chairman is personally responsible to Scottish Ministers. The Board has responsibility for ensuring that SEPA fulfils the aims and objectives set by Scottish Ministers and membership of the Board includes a Chief Executive to whom is delegated the day-to-day management of SEPA.

L.3.41. The Board has ultimate responsibility for the organisation. It meets regularly and is specifically concerned with:

- establishing the overall strategic direction of SEPA within the policy and resources framework agreed with the responsible minister;
- overseeing the delivery of planned results by monitoring performance of the organisation against agreed objectives and targets;
- demonstrating high standards of corporate governance at all times; and
- ensuring that statutory requirements for the use of public funds are complied with.

L.3.42. SEPA has one specialist team that deals with radioactive waste disposals from nuclear sites in Scotland. The Nuclear Regulation and Radioactive Substances Policy Unit (RS Unit) covers the day-to-day regulatory activities such as issuing authorisations, inspection, enforcement etc and also more strategic matters such as liaison with government or other bodies and influencing the development of forthcoming policy or legislation. This unit is also responsible for managing part of RIMNET in Scotland, and leads on environmental monitoring such as the collection and assessment of samples. In all, around 20 technical staff deal with radioactive substances, the majority of whom have some involvement in matters relating to nuclear sites.

## **(iii) Financial resources**

L.3.43. SEPA's income is derived chiefly from three sources:

- income raised from charging operators for regulation;
- government grant-in-aid, which helps to finance work that is not cost-recoverable through charging schemes; and
- other sources (like financial agreements with NDA).

L.3.44. In the financial year 2012/13, SEPA's total income was £77.7 million, of which £39.2 million was grant-in-aid from the Scottish Government. SEPA charges operators for its nuclear regulatory activities on the basis of a daily rate for an inspector, which includes an appropriate overhead allowance. The prices for all

SEPA charging schemes can be updated annually by up to the Retail Price Index. In the event that SEPA prices have to increase by more than the Retail Price Index, or a scheme requires other changes, a public consultation is held. All changes which have been the subject of consultation have to be approved by Scottish Ministers before SEPA can implement them. SEPA's income from all charging schemes totalled £35.2 million in 2012/13.

#### **(iv) Human resources**

L.3.45. SEPA has approximately 1,000 staff, around 20 of whom are involved directly in nuclear site regulation, either under RSA93 or other environmental regulatory regimes that apply on nuclear licensed sites governing the management of controlled and hazardous wastes.

#### **(v) Inspectors' qualifications**

L.3.46. Nuclear regulatory staff recruited by SEPA are required to have a degree in a relevant discipline.

#### **(vi) Inspectors' training**

L.3.47. SEPA has established standards of competency for its staff involved with the regulation of radioactive substances. Competency standards for nuclear regulation are separately identified within the overall framework.

L.3.48. SEPA's grading structure for regulatory staff starts at trainee Environmental Protection Officer (EPO). Trainee EPOs are required to complete a training programme in order to progress onto Environmental Protection Officer grade. This will include training in general inspection techniques, evidence gathering and enforcement, etc. Thereafter, EPOs can progress to a more general promoted post as Senior EPOs (Specialist 2 grade), or move into a specialist area (Specialist 1 grade).

L.3.49. Specialist staff regulating nuclear facilities, who are normally recruited from outside SEPA, are required to have a minimum of three years' (Specialist 2 grade) technical or scientific professional experience on appointment, but the majority have at least five years (Specialist 1 grade). Staff who enter SEPA at specialist level will be trained in the relevant general inspection techniques, enforcement etc and the more specialised radioactive substances courses, dependent on their existing experience and training.

## **Natural Resources Wales**

#### **(i) Mandate and duties**

L.3.50. NRW is a Welsh Government sponsored organisation established on 1 April 2013, bringing together the responsibilities, assets and staff from Countryside Council of Wales, Environment Agency Wales and the Forestry Commission Wales. The role of NRW is to ensure that the environment and natural resources of Wales are sustainably maintained, sustainably enhanced, and sustainably used, now and in the future. This includes being the enforcing authority for EPR10 in Wales.

L.3.51. NRW is the largest Government Sponsored Body in Wales.

#### **(ii) Nuclear Regulation**

L.3.52. NRW is responsible for the regulation of radioactive substances in Wales and enforcing the requirements of EPR10. This includes supporting the GDA process, responsibility for regulating the disposal of radioactive wastes and for environmental compliance at nuclear installations.

**(iii) Financial resources**

L.3.53. NRW has a total budget for 2014 to 2015 of approximately £180 million, Income is derived chiefly from Government grants, regulatory charge schemes and commercial income.

L.3.54. NRW charges operators for its nuclear regulatory activities on the basis of a daily rate for inspectors. It also recharges operators for the monitoring it carries out. Annual income for nuclear and non-nuclear regulatory work and monitoring activities in financial year 2013/2014 were approximately £1 million

**(iv) Human resources**

L.3.55. NRW has approximately 1,900 staff. To ensure NRW maintains access to the right skills it has a service level agreement with the Environment Agency for activities relating to nuclear regulation in Wales. This is overseen through an intelligent client function within NRW.

## Annex L.4. – List of Primary Website Addresses

Committee on Radioactive Waste Management	CoRWM	<a href="http://corwm.decc.gov.uk/http:///">http://corwm.decc.gov.uk/http:///</a>
Committee on Medical Aspects of Radiation in the Environment	COMARE	<a href="http://www.comare.org.uk">www.comare.org.uk</a>
Department for Energy and Climate Change	DECC	<a href="http://www.decc.gov.uk/">www.decc.gov.uk/</a>
Department for the Environment, Food and Rural Affairs	Defra	<a href="http://www.defra.gov.uk/">www.defra.gov.uk/</a>
Department for Transport	DfT	<a href="http://www.dft.gov.uk/">www.dft.gov.uk/</a>
Dounreay Site Restoration Limited	DSRL	<a href="http://www.dounreay.com">www.dounreay.com</a>
EDF Energy	EDF	<a href="http://www.edfenergy.com/">www.edfenergy.com/</a>
Environment Agency		<a href="http://www.environment-agency.gov.uk/">www.environment-agency.gov.uk/</a>
Food Standards Agency		<a href="http://www.food.gov.uk/">www.food.gov.uk/</a>
GE Healthcare		<a href="http://www3.gehealthcare.co.uk/">www3.gehealthcare.co.uk/</a>
Health and Safety Executive	HSE	<a href="http://www.hse.gov.uk/index.htm">www.hse.gov.uk/index.htm</a>
International Commission on Radiological Protection	ICRP	<a href="http://www.icrp.org/">www.icrp.org/</a>
LLWR Repository Limited	LLWR	<a href="http://www.llwrsite.com/">http://www.llwrsite.com/</a>
Magnox Limited		<a href="http://www.magnoxsites.co.uk">www.magnoxsites.co.uk</a>
Nuclear Decommissioning Authority	NDA	<a href="http://www.nda.gov.uk/">www.nda.gov.uk/</a>
National Nuclear Laboratory	NNL	<a href="http://www.nnl.co.uk">www.nnl.co.uk</a>
Natural Resources Wales	NRW	<a href="http://naturalresourceswales.gov.uk/?lang=en">http://naturalresourceswales.gov.uk/?lang=en</a>
Northern Ireland Environment Agency	NIEA	<a href="http://www.doeni.gov.uk/">www.doeni.gov.uk/</a>
Office for Nuclear Regulation	ONR	<a href="http://www.onr.org.uk/">www.onr.org.uk/</a>
OSPAR Convention for the Protection of the Marine Environment of the North-East Atlantic	OSPAR	<a href="http://www.ospar.org/">www.ospar.org/</a>
Public Health England		<a href="https://www.gov.uk/government/organisations/public-health-england">https://www.gov.uk/government/organisations/public-health-england</a>

Research Sites Restoration Limited	RSRL	<a href="http://www.research-sites.com/">http://www.research-sites.com/</a>
Scottish Environment Protection Agency	SEPA	<a href="http://www.sepa.org.uk/">www.sepa.org.uk/</a>
Sellafield Ltd	SL	<a href="http://www.sellafieldsites.com/">www.sellafieldsites.com/</a>
Scottish Government	SG	<a href="http://www.scotland.gov.uk/Home">www.scotland.gov.uk/Home</a>
Studs vik Metals Recycling Facility		<a href="http://www.studsvik.com/en/Contact-us/UK/Metal-Recycling-Facility/">www.studsvik.com/en/Contact-us/UK/Metal-Recycling-Facility/</a>
Tradebe Inutec		<a href="http://www.inutec.co.uk">www.inutec.co.uk</a>
UK Nuclear Regulators – New Reactors Assessment	GDA	<a href="http://www.onr.org.uk/new-reactors/index.htm">http://www.onr.org.uk/new-reactors/index.htm</a>
URENCO Capenhurst Ltd		<a href="http://www.urengo.com">www.urengo.com</a>
West Cumbrian Sites Stakeholder Group		<a href="http://www.wcssg.co.uk/">www.wcssg.co.uk/</a>
Westinghouse Springfields Fuels		<a href="http://www.nuclearsites.co.uk">www.nuclearsites.co.uk</a>

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## Glossary and Abbreviations

ABWR	Advanced Boiling Water Reactor
AGR	Advanced Gas-cooled Reactor
ALARA	As low as reasonably achievable
ALARP	As low as reasonably practicable
AP1000	The Westinghouse Electric Company's design of pressurised water reactor (PWR) currently being assessed by the UK's Office for Nuclear Regulation
ASN	Autorite de Surete Nucleaire
AWE	Atomic Weapons Establishment
BAT	Best Available Techniques
BMS	Business Management System
BPEO	Best Practicable Environmental Option
BPM	Best Practicable Means
BSO	Basic Safety Objective
BSS Directive	EC Basic Safety Standards Directive 96/29/Euratom
CBA	Cost Benefit Analysis
CHILW	Contact-Handled ILW
CNI	Chief Nuclear Inspector
CNS	Convention on Nuclear Safety
CNS Report	UK's Fifth National Report on Compliance with the Convention on Nuclear Safety
COBR	Cabinet Office Briefing Room
COMARE	Committee on Medical Aspects of Radiation in the Environment
CoRWM	Committee on Radioactive Waste Management
COSHH	Control of Substances Hazardous to Health
CRCE	Centre for Radiation, Chemical and Environmental Hazards, part of the Health Protection Agency
DBA	Design Basis Accident
DCIC	Ductile Cast Iron Container
DECC	Department of Energy and Climate Change
Defra	Department for Environment, Food and Rural Affairs
DFR	Demonstration Fast Reactor (at Dounreay)
DfT	Department for Transport
DGD	Dangerous Goods Division (of DfT)
DoH	Department of Health
DSRL	Dounreay Site Restoration Limited
EA95	The Environment Act 1995
EARP	Enhanced Actinide Removal Plant, located at Sellafield
EC	European Commission
EDRAM	Environmentally Safe Disposal of Radioactive Material
EIA	Environmental Impact Assessment

EIADR99	Nuclear Reactors (Environmental Impact Assessment for Decommissioning) Regulations 1999 (also amended in 2006)
EMM	Enforcement Management Model
ENSREG	European Council's European Nuclear Safety Regulator's Group
EPA90	Environmental Protection Act 1990
EPO	Environmental Protection Officer
EPR	European Pressurised Water Reactor
EPR10	Environmental Permitting Regulations 2010
ESC	Environmental Safety Case
EU	European Union
FDP	Funded Decommissioning Programme
FFI	Fee For Intervention
FHP	Fuel Handling Plant, located at Sellafield
GB	Great Britain
GDA	Generic Design Assessment
GDF	Geological Disposal Facility
gDSSC	Generic Disposal System Safety Case
GLEEP	Graphite Low Energy Experimental Pile
GLO	Government Liaison Officer
GOGO	Government Owned Government Operated
Government	The UK Government and the devolved administrations of Scotland, Wales and Northern Ireland, unless stated otherwise
GRA	Guidance on Requirements for Authorisation
GTA	Government Technical Adviser
HA	Highly-Active
HAL	Highly-Active Liquor
HALES	Highly-Active Liquor Evaporation and Storage plant at Sellafield
HASS	High Active Sealed Sources
HASS Regulations	High-activity Sealed Radioactive Sources and Orphan Sources Regulations 2005
HAW	Higher-Activity Waste, a term used for the collective of radioactive wastes that are expected to require disposal at a UK GDF – inclusive of HLW, ILW and that LLW which is not compatible with the conditions for acceptance at pre-existing LLW disposal facilities
HLW	High-Level Waste
HPA	Health Protection Agency
HSC	Health and Safety Commission – created by HSWA74 and responsible to the Secretary of State for Work and Pensions (and other Secretaries of State) for the administration of the Act. The HSC was merged with HSE in 2008
HSE	Health and Safety Executive – a distinct statutory body with day-to-day responsibility for making arrangements for the enforcement of non-nuclear health and safety legislation
HSWA74	Health and Safety at Work etc Act 1974
IAEA	International Atomic Energy Agency

ICAO	International Civil Aviation Authority
ICRP	International Commission on Radiological Protection
ILW	Intermediate-Level Waste
IMDG	International Maritime Dangerous Goods
IMO	International Maritime Organisation
INES	International Nuclear Event Scale
IPT	Integrated Project Team
IRR99	Ionising Radiations Regulations 1999
IRRS	Integrated Regulatory Review Service
ISFSI	Independent Spent Fuel Storage Installation, under construction at Sizewell B
IWS	Integrated Waste Strategy
Joint Convention	Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management
LC	Licence Condition under the Nuclear Installations Act 1965
LLW	Low-Level Waste
LLWR	Low-Level Waste Repository
LLW Repository Limited	Site Licensee Company for the UK Low Level Waste Repository near Drigg in Cumbria
LoC	Letter of Compliance
LP&S	Legacy Ponds and Silos, located at Sellafield
LTP	Lifetime Plan
LWR	Light Water Reactor
MEP	Magnox Encapsulation Plant, located at Sellafield
MHSW99	The Management of Health and Safety at Work Regulations 1999
microGy	microGray
MoD	Ministry of Defence
MOP	Magnox Operating Programme
MoU	Memorandum of Understanding
MOX	Mixed-Oxide (fuel)
MRDU	Mobile Radiation Detection Unit
MRF	Metals Recycling Facility
MRWS	Managing Radioactive Waste Safely
mSv	milliSievert
MTR	Materials Test Reactor, located at Dounreay
NDA	Nuclear Decommissioning Authority
NEA	Nuclear Energy Agency
NEAF	Nuclear Emergency Arrangements Forum
NEBR	Nuclear Emergency Briefing Room
NEP&R	Nuclear Emergency Planning and Response
NEPLG	Nuclear Emergency Planning Liaison Group
NESA	Nuclear Energy Skills Alliance

NIA65	Nuclear Installations Act 1965 (as amended)
NIEA	Northern Ireland Environment Agency
NII	Nuclear Installations Inspectorate (historically a part of HSE's Nuclear Directorate, which on 1 April 2011 became part of the Office for Nuclear Regulation)
NLF	Nuclear Liabilities Fund
NLFAB	Nuclear Liabilities Financing Assurance Board
NNL	National Nuclear Laboratory
NORM	Naturally Occuring Radioactive Material
NPS	Nuclear National Policy Statement
NRI	Nuclear Research Index
NRN	Nuclear Research Needs
NRW	Natural Resources Wales
NSA	National Skills Academy
NSG	Nuclear Suppliers Group
NSIP	Nationally Significant Infrastructure Project
OCNS	Office for Civil Nuclear Security
OECD	Organisation for Economic Co-operation and Development
OELG	Operational Experience Liaison Group
ONR	Office for Nuclear Regulation (set up on 1 April 2011 as a non-statutory agency within HSE and vested as a public corporation on 1 April 2014)
OSPAR	<u>The Convention for the Protection of the marine Environment of the North-East Atlantic (the 'OSPAR Convention')</u> was open for signature at the <u>Ministerial Meeting of the Oslo and Paris Commissions</u> in Paris on 22 September 1992
PBO	Parent Body Organisation
PCM	Plutonium-Contaminated Material
PFR	Prototype Fast Reactor (at Dounreay)
PIE	Post-Irradiation Examination
PSR	Periodic Safety Review
PWR	Pressurised Water Reactor
QA	Quality Assurance
RCIS	Redgrave Court Incident Suite
RED	Restructuring Effective Date
REPPiR	Radiation (Emergency Preparedness and Public Information) Regulations 2001
REPs	Radioactive Substances Regulation Environmental Principles
R&D	Research and development
RHILW	Remote-handled ILW
RIFE	Radioactivity in Food and the Environment
RIMNET	Radiation Incident Monitoring Network
R2P2	'Reducing risks, protecting people: HSE's decision-making process'
RSA93	Radioactive Substances Act 1993

RSRL	Research Sites Restoration Limited – the Site Licensee Company for Harwell and Winfrith
RWM	Radioactive Waste Management Limited (a wholly-owned subsidiary of the NDA)
RWMC	Radioactive Waste Management Case
SAPs	Safety Assessment Principles
SCC	Strategic Co-ordination Centre
SCG	Strategic Coordinating Group
SEPA	Scottish Environment Protection Agency
SFAIRP	So far as is reasonably practicable
SGHWR	Steam-Generating Heavy Water Reactor
SGoRR	Scottish Government Resilience Room
SIXEP	Sellafield Ion Exchange Plant
SLC	Site Licensee Company
SPRS	Sellafield Product and Residue Store
SSA	Strategic Siting Assessment
TAG	Technical Assessment Guide
THORP	Thermal Oxide Reprocessing Plant, located at Sellafield
TIG	Technical Inspection Guide
TOR	Tolerability of Risk
UCP	URENCO Chemical Plant Limited, at URENCO Capenhurst
UF <sub>6</sub>	Uranium hexafluoride
UK	United Kingdom of Great Britain and Northern Ireland
UKNWM	UK Nuclear Waste Management Ltd
UKRWI	UK Radioactive Waste Inventory
USNRC	United States Nuclear Regulatory Commission
VLLW	Very-Low-Level Waste
WAGR	Windscale Advanced Gas-cooled Reactor
WENRA	Western European Nuclear Regulators' Association
WEP	Waste Encapsulation Plant, located at Sellafield
WPEP	Waste Processing and Encapsulation Plant
WVP	Waste Vitrification Plant, located at Sellafield
ZEBRA	Zero Energy Breeder Reactor Assembly

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