THE UNITED KINGDOM's
FOURTH NATIONAL REPORT
ON
COMPLIANCE WITH
THE CONVENTION ON NUCLEAR SAFETY
OBLIGATIONS

September 2007

Contributors to the United Kingdom's National Report

The Health and Safety Executive prepared this report in consultation with and incorporating contributions from:

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Department for Transport
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Environment Agency
Food Standards Agency
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Magnox Electric Ltd.
Nuclear Decommissioning Authority
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Foreword

This report has been prepared by the United Kingdom (UK) to meet the requirement of Article 5 of the Convention on Nuclear Safety. It considers each of the Convention's obligations and explains how the UK addresses them.

The report only covers land based civil nuclear power plant as defined in Article 2 of the Convention. The safety of other UK nuclear facilities that fall outside the scope of this Convention are also regulated to the same standards, so as to ensure that they are operated in a manner that maintains a high level of safety.

Within the UK nuclear safety system, there have been no significant corrective actions necessary to comply with the Convention. The UK's nuclear safety licensing regime has proved to be effective which, together with the high priority given to safety by the UK nuclear utilities, has stood the country well in times of great change. Furthermore, the periodic safety review 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. This activity will continue in the future. This is not to say that the UK is complacent, far from it. Safety challenges remain especially in dealing with the ageing of facilities and legacy issues.

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Section 1 - Introduction

Structure of the report

1.1. This report explains how the nuclear installations in the United Kingdom (UK) achieve the high safety standards required by the Convention on Nuclear Safety (the 'Convention'). Each Article of the Convention is addressed separately in the main text of this, the UK's fourth, report. This report does not consider matters related to the safety of those nuclear installations that have been addressed by the UK's submissions for the review meetings of the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management ('Joint Convention') or which are outside the scope of either of these Conventions.

1.2. For the purpose of this report, the term 'the Government' means the UK Government and/or the Devolved Administrations, as appropriate.

Basis of the report

1.3. In addition to the Convention itself and three documents providing guidelines for the Convention national reports (International Atomic Energy Authority (IAEA) INFCIRC 449 and INFCIRC/571, 572 and 573 respectively), a number of information sources have been used to inform the structure and development of this report. These include:

(a) 'The Convention on Nuclear Safety Third Review Meeting of Contracting Parties', April 2005, Report of the President of the Review Meeting' CNS-RM-2005/09 Final.

(b) The report of the IAEA Secretariat to the Contracting Parties to the Convention on Nuclear Safety 'Synopsis of the relevant IAEA Safety Requirement statements reflecting the issues addressed by Articles 6 to 19 of the Convention on Nuclear Safety'. CNS_Compiled_Synopsis_FINAL, dated May 18 2006.

(c) The Rapporteur's report for the United Kingdom, Country Group 4, based on the presentation on 13 April 2005 to the Convention on Nuclear Safety.

(d) The questions raised on UK's last Report in 2005 and the answers provided.

(e) The 'National Report Format Discussion Document', CNS 2005 RM NatRep/DD Rev 02, Dec 2006, and associated 'Update on Continuity / National Report and Review' document.

(f) The 'Report of the IAEA Secretariat to the Fourth Review Meeting of the Convention on Nuclear Safety', February 2007, regarding major issues and trends in nuclear safety identified from IAEA safety service reviews.

1.4. All of these documents, (a) – (f), have been independently assessed and suggestions for technical improvements in the UK report have been implemented in the text where applicable.

1.5. Regarding the Report of the President (a) and the IAEA 'Synopsis' (b), the latter, at the request of the Contracting Parties, provides a link between the President's Report and the relevant IAEA Safety Requirements statements. Those issues identified from the President's Report in the 'Synopsis' are addressed specifically in Section 4 of this report. The Safety Requirement references identified in the 'Synopsis' have been used to assist in preparing the fourth UK report.

1.6. Noting the proposals for restructuring national reports (e), the fourth UK report against each Article of the Convention remains very similar to previous reports. The reason for this is that the UK considers that the current structure provides continuity to assist the reader and to enhance its use as a stand alone document for wider use. However, to inform reviewers and to identify key changes since the third UK report,

there are comprehensive introductory sections highlighting where significant developments and issues have arisen both in national policy and infrastructure, and at nuclear installations. These also identify, where applicable to UK, the safety issues of interest identified at the Third Review Meeting – as relevant to Articles 6 to 19, the Rapporteur's feedback at the Third Review meeting, and the 'Major Issues and Trends' identified by the IAEA on behalf of the Convention.

1.7. In the main report against each Article, where compliance with the Convention is demonstrated in a way that has substantially changed since the third UK report (i.e. in a way that has implications for the Convention obligations) then this will be noted at the beginning of the Article or Annex.

1.8. Regarding the IAEA document reporting on significant issues, developments and trends in enhancing nuclear safety (f) - the UK has, where appropriate, addressed the issues identified in the preparation of this report.

1.9. As in previous UK reports, where it seems to be appropriate, more detailed information and data has been placed in Annexes at the end of the report. References to sources of the information used are identified thus: [XX] and listed at the end of this report.

1.10. The IAEA Standards used are as follows:

- GS-R-1: Legal and Governmental Infrastructure for Nuclear, Radiation, Radioactive Waste and Transport Safety (2000)
- GS-R-2: Preparedness and Response for a Nuclear or Radiological Emergency (2002)
- GS-R-3: The Management System for Facilities and Activities (2006)
- SS115: International Basic Safety Standards for Protection against Ionising Radiation and for the Safety of Radiation Sources (1996)
- NS-R-1: Safety of Nuclear Power Plants: Design (2000)
- NS-R-2: Safety of Nuclear Power Plants: Operation (2000)
- NS-R-3: Site Evaluation for Nuclear Installations (2003)

Section 2 – General Overview and Summary of Significant Developments Since Last Report

Policy and infrastructure

National policy towards nuclear activities

2.1. The Government's Department for Business, Enterprise and Regulatory Reform (BERR) (formerly the Department of Trade and Industry) sponsors the civil nuclear industry in the UK. Two private sector companies, British Energy Generation Ltd (BEGL) and Magnox Electric Ltd (MEL), carry out commercial nuclear power generation. BEGL operates the Pressurised Water Reactor (PWR) and five Advanced Gas-cooled Reactor (AGR) stations in England and two AGR stations in Scotland. BEGL is a wholly owned subsidiary of the holding company British Energy Group plc. MEL manages five operating and five decommissioning Magnox stations in England and Wales on behalf of the owner, the Nuclear Decommissioning Authority (NDA). MEL is wholly owned by Energy Solutions (who acquired the business from state-owned British Nuclear Fuels plc in June 2007). In addition, one public sector company, Sellafield Ltd., a wholly owned subsidiary of British Nuclear Fuels plc., manages one Magnox station on behalf of the NDA. The Health and Safety Executive (HSE) is the UK's nuclear installation licensing authority and regulates safety at all nuclear installations in the UK (see Article 8).

2.2. The Government's energy policy is to ensure secure, diverse and sustainable energy at competitive prices. The Government frequently reviews a number of policy areas (for example, energy sources for power generation and utility regulation) to ensure that these continue to contribute to that broader objective.

2.3. During 2006, (the latest date for which a figure is available in the Digest of United Kingdom Energy Statistics 2007[1]) nuclear power provided 13.2% of the installed electricity generating capacity in the UK. In terms of actual electricity generated, nuclear power accounted for 18.9% of the UK's electricity output.

National Policy Issues

Energy Review

2.4. The Government announced on 29 November 2005 that it would hold an energy review. The Department of Trade and Industry (DTI) launched, on 23 January 2006, a consultation exercise in support of this review. The consultation document[2] stated:

> *'As part of its role in monitoring health and safety in many areas of the energy sector, the Government will be calling on the Health and Safety Executive (HSE) to provide an expert report during the course of the Review. This is necessary for the Government to make informed decisions in bringing forward future proposals.'*

2.5. The HSE published report in response to this request[3] covers health and safety issues associated with a range of energy developments, and looks at the potential role of pre-licensing assessments of nuclear reactor designs, should the Government decide to look further into new nuclear electricity generation. The Environment Agency (EA) in England and Wales, at the Government's request, also published a report on the role of pre-authorisation assessment of candidate designs for nuclear power stations[4].

2.6. The Government's report on the Energy Review[5] was released on 11 July 2006. This indicates that this work was aimed to put the UK in a position to meet the two major long-term challenges in its energy policy, these being the need to:

- tackle climate change by reducing carbon dioxide emissions; and

- deliver secure, clean energy at affordable prices, as we move to increasing dependence on imported energy.

2.7. Regarding the replacement of nuclear power stations the Energy Review noted that:

- nuclear power is currently an important source of low carbon electricity in the UK;
- the existing fleet of nuclear power stations will close in the years ahead; and
- higher projected fossil fuel prices and the introduction of a carbon price to place a value on CO_2 have improved the economics of nuclear as a source of low carbon generation.

2.8. The Government report therefore concluded that new nuclear power stations would make a significant contribution to meeting our energy policy goals. However, it would be for the private sector to initiate, fund, construct and operate new nuclear plants and to cover the full cost of decommissioning and their full share of long-term waste management costs. But in view of the potential benefits for our public policy goals, the Government proposed to address potential barriers to new nuclear build. These included:

- Requesting HSE and EA, working together, to develop their processes and guidance on pre-licensing / authorisation assessments of potential nuclear power stations.
- Using the report of the Committee on Radioactive Waste Management (CoRWM) to provide the basis for a decision on the long-term management of radioactive waste.
- Setting out a proposed framework for considering the relevant issues and context in which planning inquiries should be held.

2.9. The Energy Review report was accompanied by a consultation document on the policy framework for new nuclear build. Since that time, DTI has been involved in a Judicial Review with Greenpeace on work which led up to that consultation. Following the Court's judgment, the Secretary of State made a written statement to the House on 22 February 2007, in which he said "We shall therefore conduct a new consultation endeavouring to meet the court's requirements." This is addressed below.

Energy White Paper

2.10. On 23 May 2007, the then Secretary of State for Trade and Industry published a White Paper on 'Meeting the Energy Challenge'[6] that identifies two long-term energy challenges (as noted in the Energy Review):

- tackling climate change by reducing carbon dioxide emissions both within the UK and abroad; and
- ensuring secure, clean and affordable energy as we become increasingly dependent on imported fuel.

2.11. In response to these challenges, the White Paper proposed a strategy within which the key elements are:

- Establish an international framework to tackle climate change.
- Provide legally binding carbon targets for the whole UK economy, progressively reducing emissions.
- Make further progress in achieving fully competitive and transparent markets.
- Encourage more energy saving through better information, incentives and regulation.
- Provide more support for low carbon technologies.

- Ensure the right conditions for investment.

2.12. Regarding nuclear power the White Paper notes that the UK is approaching the point where significant amounts of our existing generating capacity will need replacing; that there are uncertainties that make it difficult to predict the future need for and use of energy in the UK; and that, over the long timeframes involved, nuclear power could have a role to provide security of supply and reduced carbon emissions.

2.13. The White Paper identifies that there would be a risk of higher costs to the UK economy by excluding nuclear as an option, and that modelling indicates that meeting our carbon emissions reduction goal would be more expensive.

2.14. It also recognises that, as with all generation technologies, there are advantages and disadvantages with new nuclear power. But having reviewed the evidence and information available the Government believes that the advantages outweigh the disadvantages and that the disadvantages can be effectively managed.

2.15. On this basis, the Government's preliminary view is that it is in the public interest to give the private sector the option of investing in new nuclear power stations. This view is subject to the consultation they have launched on this issue alongside the White Paper[7]. However the White Paper states that, if the Government confirms this preliminary view, it would be for the private sector to fund, develop, and build new nuclear power stations in the UK, including meeting the full costs of decommissioning and their full share of waste management costs. The consultation will be closed on 10 October 2007.

2.16. This will enable the Government to make a decision on nuclear power in the UK later on in the year. Further details on the outcome of the consultation decision will be reported at the Review Meeting of the Convention on Nuclear Safety in April 2008.

Regulating potential new build

2.17. Following the Energy Review, the Government asked HSE and the other principal nuclear regulators (the Environment Agency (EA), the Scottish Environment Protection Agency (SEPA), and the Office for Civil Nuclear Security (OCNS)) to implement a 'pre-authorisation' system for candidate reactor designs. The regulators refer to this as Generic Design Assessment (GDA), which would allow generic designs to be assessed in advance of any application to build a nuclear power station at a particular location.

2.18. As a result, a suite of guidance material on the generic assessment of potential new nuclear power station designs was published on 11 January 2007[8], which is explained in more detail in Annex 11.

2.19. The guidance provides advice on the processes needed to be followed and information that will be required by the regulators during the generic design assessment process.

2.20. The guidance envisages a four step process for generic design assessment:

- Design and safety case submission.
- Fundamental Safety Overview of the reactor design (a short review of the acceptability of the proposed reactor design).
- Overall design safety review (a more in-depth HSE safety assessment of the case submitted).
- Detailed assessment leading to potential design acceptance (examining all relevant aspects of the submission, including inspection of an applicant's procedures and records and some verification analysis).

2.21. The new process will also ensure that generic reactor design assessments are not only rigorous and robust but also conducted in an open and transparent manner.

2.22. At the end of the generic assessment, the regulators will provide a view on the acceptability of a new nuclear power station design. If an application is made to build this design of reactor at a specific site, the regulators will follow their existing licensing / permissioning processes but, in addition, would take full account of the generic assessment work that has been carried out. The safety, security and environmental regulators would work in close partnership throughout both generic and site specific assessments.

2.23. Alongside the nuclear consultation (described in more detail in Annex 11), as part of the Energy White Paper, the Government is proceeding, on a contingent basis, with a range of facilitative actions to reduce regulatory and planning risks to prepare for the possibility that the Government concludes that it is in public interest to allow private sector companies the option of investing in new nuclear power stations. Details are set out in the consultation document.

2.24. One of these facilitative actions is for the nuclear regulators to pursue a process of generic design assessment of industry preferred designs of nuclear power stations to complement the existing licensing processes. This would consist of an assessment of the safety and security of power station designs and their radiological discharges to the environment.

2.25. The Energy White Paper consultation document set out criteria for and invited applications from vendors of nuclear reactors interested in having their designs assessed. It allowed them until 22 June 2007 to nominate the design they wish to be put through the GDA process. By that date four vendors had nominated designs: Toshiba-Westinghouse (AP1000); Areva (EPR); GE-Hitachi (ECBWR); and AECL (ACR1000). BERR has advised that all four are suitable for GDA and has confirmed that they all conform to the criteria set out in their consultation document.

2.26. If successful in the fundamental overview step of the GDA, a design may be able to progress to the more in-depth assessment stages. But, this will be subject to the outcome of the consultation on the principle of new nuclear power stations.

2.27. It is likely that the number of designs to be considered during the more in-depth assessment will be reduced from four to three due to time constraints and resource constraints of the regulators. Entry into the GDA process does not necessarily guarantee that a design will complete the full GDA process.

2.28. This is a developing situation in UK and this report has been closed in August 2007. Developments subsequent to this date will be reported at the Convention Review Meeting in 2008.

Committee on Radioactive Waste Management

2.29. The UK Government and the devolved administrations set up an independent committee (Committee on Radioactive Waste Management (CoRWM)) in November 2003 to assist the Managing Radioactive Waste Safely (MRWS) programme. CoRWM was to oversee a review of options for the long-term management of high and intermediate level radioactive wastes in the UK and to recommend the option or combination of options that can provide a long-term solution.

2.30. Although the activities of CoRWM are more relevant to the requirements of the Joint Convention, their work has been included in this report for the sake of completeness and in view of the implications of their work on the life cycle of nuclear power reactors in the UK.

2.31. The review of options was carried out in an open, transparent and inclusive manner and the Committee published its recommendations on 31 July 2006[9].

2.32. Two key elements of the CoRWM recommendations were that the waste should be managed by means of geological disposal and that implementation should be based on the principles of voluntarism and partnership between communities and implementers. CoRWM has prepared further advice for Government on putting these two principles into practice. Its report '*Implementing a partnership approach'*, together with other CoRWM reports, is available on the CoRWM website http://www.corwm.org.uk/.

2.33. Following CoRWM's recommendations, the then Secretary of State's response to Parliament on 25 October 2006 accepted CoRWM's key recommendations on geological disposal of higher activity radioactive waste and safe and secure interim storage, and undertook to consult further on how to achieve them.

2.34. Proposals for the way in which a site will be chosen for the long-term disposal of higher activity radioactive waste were published on 25 June 2007 for public consultation. The consultation document entitled "Managing radioactive waste safely: a framework for implementing geological disposal"[10] seeks views on the technical aspects of developing a geological disposal facility and on the process and criteria to be used in deciding where the future facility should be located. The Environment Minister said that the Government was proposing an entirely new approach based on the concept of voluntarism, in which communities are invited to express an interest in taking part in the process. The document also sets out modified terms of reference for a reconstituted CoRWM, to ensure strong independent scrutiny of the proposals, plans and programmes to deliver geological disposal. It is planned that the reconstituted committee will be in place in Autumn 2007. The consultation will run until 2 November 2007.

Nuclear Decommissioning Authority

2.35. The Nuclear Decommissioning Authority (NDA) is a non-departmental public body, set up in April 2005 under the Energy Act 2004 to provide a UK-wide strategic focus on cleaning-up nuclear sites. It has been fully operational since April 2005. Its mission is to deliver a world class programme of safe, cost-effective, accelerated and environmentally responsible decommissioning of the UK's civil nuclear legacy in an open and transparent manner and with due regard to the socio-economic impacts on communities.

2.36. NDA published it's first Strategy on 30 March 2006[11] covering the years 2006 - 2011. It is required to review its Strategy at least once every five years.

2.37. The nuclear legacy inherited by NDA represents about 85% of the UK's civil nuclear liabilities and is wholly the responsibility of the Government. It includes:

- the nuclear sites and facilities which were developed in the 1940s, 1950s and 1960s to support the Government's research programmes, and the wastes, materials and spent fuels produced by these programmes; and
- the Magnox fleet of nuclear power stations built in the 1960s and 1970s and plant and facilities at Sellafield used for the reprocessing of Magnox fuel; and all associated wastes and materials.

2.38. Responsibility for funding and strategic direction of the decommissioning of all these sites lies with the NDA. NDA contracts with the operators of the sites, the Site Licence Companies (SLCs), within its portfolio to carry out decommissioning work. These SLCs are the enduring entities which are subject to regulation by HSE and EA. In due course, the NDA will compete the ownership of these SLCs as a way of bringing in new strategic approaches and innovation to decommissioning.

2.39. In 2007, the Government updated its policy on low level waste management and gave responsibility to the NDA for developing and maintaining a national strategy for the handling of low level nuclear waste. This will include identifying additional disposal capacity because the UK's existing facility will not provide enough capacity

for the expected waste from the decommissioning of the existing UK nuclear power stations.

2.40. In its response to CoRWM's recommendations in October 2006, the Government also decided that responsibility for securing geological disposal of higher activity radioactive waste should fall to the NDA.

2.41. The NDA already has statutory responsibility, under the Energy Act 2004, for the disposal and the safe and secure interim storage of waste on designated civil nuclear sites. Bringing these two roles together has created a single national organisation with a single point of responsibility for managing higher activity radioactive waste in both the shorter- and longer-term. This arrangement has the advantage of allowing one organisation to take an integrated view across the waste management chain, thereby enabling both long and short-term issues to be addressed in planning and strategy development.

2.42. In the past Nirex played an important role in maintaining and developing the UK's knowledge on long-term waste management options. For more than twenty years, Nirex was the nuclear industry's and latterly the UK Government's expert body on the long-term management of some higher activity radioactive waste.

2.43. Following its response to CoRWM's recommendations, the Government transferred its shares in Nirex to the NDA. Since when the majority of Nirex staff have been successfully integrated into the NDA. The integration was completed in April 2007 and the NDA now performs the functions previously undertaken by Nirex.

2.44. As a result of the integration, a new NDA Directorate – the Radioactive Waste Management Directorate – has been established. This Directorate will assume responsibility for all aspects of the long-term management of radioactive waste – both higher and low activity waste – including the planning and development of a geological disposal facility for higher activity waste.

Safety Developments

IAEA Integrated Regulatory Review Service

2.45. In January 2006, following the announcement of a review of energy policy, DTI asked the HSE to contribute an expert report on some specific health and safety risks arising from recent and potential energy developments and on the HSE's approach to ensure that risks arising from these are sensibly managed by industry. The report[3] was to include a review of HSE's approach to regulating potential new nuclear build, especially the potential role of pre-licensing assessments of candidate designs.

2.46. In this context, an IAEA Integrated Regulatory Review Service (IRRS) team was invited to conduct a review between 26 March - 03 April 2006 to assess how HSE intends to go about the appraisal of reactor designs. The review focused on the following IRRS topics: Organisation; Authorisation; and Review and Assessment. Three further IRRS topics were reviewed to ensure that the team had an appreciation of the UK's legal system and its approach to nuclear safety regulation. These topics were: Legislative and Governmental Responsibilities; Authority, Responsibilities and Functions of the Regulatory Body; and Regulations and Guides.

2.47. The final report of the IAEA mission[12] is based on the combined expertise of the team with reference to IAEA standards.

2.48. HSE welcomed the results of this independent review and the chance to interact with world experts as part of its strive for better regulation of the UK nuclear industry. HSE's initial response to each of the mission findings have been collated into a table[13]. Further detail is provided at Annex 10.

Safety Assessment Principles

2.49. HSE's Safety Assessment Principles (SAPs) provide guidance to its nuclear installations inspectors when assessing a safety case and its supporting documentation. This includes guidance on proportionality and the completeness of a safety case and what to look for when judging whether a duty holder has done sufficient to meet regulatory requirements.

2.50. It was decided that the SAPs published by HSE in 1992 needed reviewing to:

- bring them up to date with health and safety legislation;
- bring them up to date with regard to HSE's Nuclear Directorate assessment practice;
- add SAPs for assessment areas that were not previously covered, including the remediation and decommissioning activities of the nuclear industry; and
- facilitate harmonisation between the SAPs and IAEA safety standards and those of other western European regulators.

2.51. In reviewing and revising the principles, HSE has taken into account the technical interests and comments of others through inviting early comment on specific technical topic areas, and undertaking wider consultation via stakeholder engagement. The stakeholder engagement was not a legal requirement since it was not a consultation on new legislation, but was carried out to give assurance that the SAPs are understood by the industry and other relevant stakeholders.

2.52. The 2006 revision of the SAPs[14] has now been finalised and is available, together with supporting information including the stakeholder engagement process. Further information is provided at Annex 8.

Criterion for delicensing nuclear sites

2.53. The HSE published a policy statement in August 2005[15] that provides a basis for the considerations that need to be made in order to delicence the whole or part of a nuclear licensed site, licensed by HSE under the Nuclear Installations Act. It attempts to achieve broad consistency with current scientific thinking, relevant guidance and other published material including the Radioactive Substances Act 1993 (and the exemption orders made under it), Article 5 of the Basic Safety Standards Directive, and the IAEA Safety Guide "Application of the Concepts of Exclusion, Exemption and Clearance".

2.54. This matter is dealt with in greater detail in the UK report to the Joint Convention 2006[16].

Organisational Restructuring

Health Protection Agency

2.55. The Health Protection Agency (HPA) was established on 1 April 2005 under the Health Protection Agency Act 2004[17] as a non-departmental public body. It replaced the HPA special health authority and the National Radiological Protection Board (NRPB), and has radiation protection as part of its health protection remit.

Office for Civil Nuclear Security and UK Safeguards Office join HSE

2.56. With effect from 2 April 2007, the Office for Civil Nuclear Security (OCNS), the Government's security regulator for the civil nuclear industry, became a part of the HSE having previously been a part of DTI. The operational nuclear safeguards work of the DTI (UK Safeguards Office) has also become part of HSE with effect from the same date, the staff in both areas having transferred to the HSE together with their work.

2.57. The aim of these arrangements was to consolidate the safety, security and safeguards activities of the Government in a single organisation, consistent with the

thrust of the recommendations of the 2005 Hampton Report[18], so as to enable more effective and better coordinated regulatory activities and oversight of the industry, and to enable the more effective deployment of resources. BERR will remain responsible for security policy and the HSE operates under a Memorandum of Understanding with BERR on security issues.

2.58. To reflect these changes and the wider portfolio of work being undertaken by HSE – nuclear safety, security and safeguards - the Nuclear Safety Directorate was renamed the Nuclear Directorate (ND) as of 2 April 2007.

2.59. In summary, these changes mean that HSE will act as the single point of contact for all operational matters concerning nuclear safety, security and safeguards. More information is available in Annex 6 and on the HSE website at www.hse.gov.uk/nuclear/ocns.htm.

BNFL sells the Reactor Sites business to Energy Solutions

2.60. On 7 June 2007 British Nuclear Fuels plc. announced the sale of its Reactor Sites Management company (including control of Magnox Electric Ltd) to the US company Energy Solutions. Magnox Electric Ltd. holds the contracts and licences to operate 10 nuclear reactor sites in the UK on behalf of the NDA.

Department for Business, Enterprise and Regulatory Reform

2.61. On 28 June 2007 a new Department for Business, Enterprise and Regulatory Reform (BERR) was established with responsibilities for creating the conditions for business success, developing deeper and more effective engagement with business, and with the ability to promote the competitiveness agenda across critical areas of Government policy.

2.62. BERR brings together functions from the former Department of Trade and Industry, including responsibilities for enterprise, business relations, regional development, fair markets and energy policy, with the Better Regulation Executive, previously part of the Cabinet Office.

Proposed merger of the Health and Safety Commission and Health and Safety Executive

2.63. The Health and Safety Commission and Health and Safety Executive (HSC/E) have been in existence for over thirty years. The governance structure originally envisaged has stood the UK health and safety system in good stead. The balance involved in the tri-partite nature of the Commission has made a significant contribution to the trust invested by the public in the HSC/E as a risk regulator. Additionally, the Commission is rightly valued for its independence.

2.64. It was considered wrong, however, to accept that the existing structures could not be improved upon. There is evidence that many people do not make any distinction between the Commission and Executive. Indeed, it is possible that public statements from two separate government bodies may reduce the impact of key messages.

2.65. Against this background the Commission and Executive decided to look more closely at its governance framework. In a Consultative Document - "A Stronger Voice for Health and Safety"[19], they sought views on merging the Commission and Executive into a single body.

2.66. The document

- describes the origins of HSC/E, the role of Local Authorities and the existing governance arrangements.
- sets out the case for merging the Commission and Executive and elaborates and seeks views on a set of principles that underpin the proposed framework for establishing a single authority for health and safety at work.

- outlines the objectives for an improved governance structure and invites comments on how it is proposed to achieve it.
- summarises the legislative options for merging HSC and HSE and timescales for transition.

2.67. The consultation closed on 5 March 2007. If the outcome suggests support for the changes proposed, HSC/HSE will seek to put in place the new arrangements as soon as possible. However, it is unlikely that the necessary legislative changes could be made until around the middle of 2008.

2.68. Significant developments will be reported at the Conventions Review Meeting in April 2008.

Section 3 - Nuclear Safety Issues at UK Nuclear Installations

3.1. The UK has no nuclear installations where significant corrective actions were necessary to comply with the requirements of this Convention. This is because of the effectiveness of the UK's nuclear safety licensing regime, the high priority given to safety by the UK nuclear utilities and the good safety culture in the industry. Furthermore, the periodic safety review 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. This activity will continue in the future.

3.2. This section of the report is in two parts. The first part addresses Significant Ageing issues that have arisen at UK nuclear power plant and the second part reports briefly on the status of each of the UK nuclear power stations.

Significant and/or ageing issues

General observations

3.3. The closure of all the Magnox reactors with steel pressure vessels has obviated one of the major ageing issues confronting the UK nuclear power programme. These issues were the integrity of pressure vessels due to radiation embrittlement, and the integrity of the gas ducts that formed part of the primary circuits.

3.4. Nevertheless, UK has an ageing fleet of reactors and this inevitably gives rise to safety related ageing issues that need to be addressed. Some ageing issues can be controlled and managed by maintenance and replacement of components. Other issues, such as the degradation of the graphite core, affect items that cannot be replaced and therefore need to be closely scrutinised to ensure safety is maintained and, when appropriate, to determine when ageing could lead to the end of life of a reactor.

3.5. HSE has recently completed its assessment of the Periodic Safety Reviews (PSRs) for Hinkley Point B and Hunterston B – the oldest AGR reactors. Although a number of significant shortfalls were identified, the review has been accepted on the basis of a substantial amount of work committed by the licensee to be completed against a declared programme. Some of the ageing issues that form part of this programme are addressed below.

AGR boiler tubes

3.6. In the 2006 statutory outages, a higher number of defects than expected were found in the Hunterston B and Hinkley Point B boiler tubes. These reactor vessels are of similar design. The boilers (steam generators) are located within the reinforced concrete pressure vessel. Hunterston B and Hinkley Point B are twin reactor power stations and one reactor at each underwent a scheduled statutory outage in 2006. However evaluation of the inspection findings led BEGL to shut down the operating reactors so that their boiler tubes could also be inspected. All four reactors were shut down by October 2006.

3.7. A programme of boiler tube inspection and repair was undertaken at both power stations. The number of defects found in boiler bifurcations and tailpipes was much greater than anticipated. Consequently in-vessel inspections and repairs required a much larger dose burden than originally planned (although well within the statutory requirements). Restart of the reactors was delayed pending production of an adequate return to service safety case.

3.8. The defects in the boiler tubes were caused by creep damage induced as a consequence of operation at a high temperature for a long period. A safety case for return to service was produced by the licensee and submitted for assessment by HSE. HSE gave permission to start up in May 2007. All four reactors were returned

to service at 70% full power and at a reduced boiler steam outlet temperature. This will significantly reduce further creep damage to the boilers.

Graphite integrity

3.9. Graphite reactor cores suffer from potential problems of both weight loss and graphite cracking. UK operates two types of reactor with graphite moderated cores. The Magnox reactors are fuelled with natural or slightly enriched uranium metal fuel clad in a Magnox can, whilst the AGRs are fuelled with enriched uranium oxide in stainless steel cans. In both cases, the graphite core provides a lattice which allows the movement of control rods and the passage of carbon dioxide to cool the fuel. The fuel construction and gas flow are different in the two designs. The AGR design is much less sensitive to the effects of graphite brick cracking as the fuel is contained in an integral sleeve which maintains gas flow through the fuel even if the fuel channel graphite itself contains cracks. Cracking in Magnox reactors could lead to gas coolant bypass if wide enough cracks were to develop in the fuel channels. Loss of graphite mass leads to a loss of strength which, combined with the build up of stresses due to irradiation, increases the likelihood of brick cracking as the reactor cores get older. Unlike the AGRs, where cracking has been found in the graphite bricks, no significant cracking has been seen in any of the Magnox reactor cores.

3.10. It should be noted that only two Magnox power stations are currently operating. These are the twin reactors sites at Oldbury and Wylfa. All four of these reactors have prestressed concrete pressure vessels. The “lead reactors” regarding graphite integrity are those at Oldbury. These reactors have undergone major graphite inspection and analysis. The strategy is that those with the most at risk cores have had their outages extended until sufficient information has been collected and analysed to give confidence to allow them to return to service.

3.11. The UK licensees have taken a multi legged approach to managing the potential cracking problem that consists of: predictions of component and core condition; assessing the tolerance of the core safety functions to any predicted damage; assessing the consequences of core damage for safety function; monitoring of core condition during plant operation; and inspection and sampling during reactor outages to ensure that the core is behaving as predicted. The precise limit criteria that would bring about an end to reactor operation would be based on an overall judgement about the strengths of the various legs of the safety case and the confidence that HSE has in further safe operation.

AGR boiler closure units

3.12. Hartlepool and Heysham 1 reactors are of similar design. They have reinforced concrete pressure vessels and the boilers (steam generators) are contained within the pressure vessel. There are penetrations through the pressure vessel for feed water and for steam. The Hartlepool and Heysham 1 boilers each have a primary restraint comprising 48 studs, each approximately 2m long and situated within vertical guide tubes disposed around the perimeter of the boiler closure units.

3.13. In early 2005 an inspection, originally at Heysham 1 Reactor 1 during its statutory outage, revealed that some of the guide tubes contained standing water (thought to result from known pressure vessel cooling water leaks), and there were signs of corrosion. This raised questions regarding the adequacy of the safety case. The inspections were extended to Reactor 2 at Hartlepool which was shutdown for refuelling. BEGL developed a case for resuming operation. This was built on inspecting all studs on these shut down reactors. The inspection involved using ultrasonic non destructive examination, as part of the case to address the potential for stress corrosion cracking. Restraints were also fitted to prevent stud ejection. The case for the continued operation of the un-inspected operating reactors, Reactor

2 at Hartlepool and Reactor 1 at Heysham 1, revolved around available inspection data and structural integrity analysis. Shutdown reactors were returned to service in late 2005.

3.14. In early 2006, further inspection and monitoring was carried out on the boiler closure units at Heysham 1 and Hartlepool during refuelling outages. This further underpinned confidence in the integrity of the boiler closure units.

3.15. The boiler closure unit itself is a concrete cylinder which is pre-stressed by a series of wires wrapped around its circumference. The wires sit in a chamber which is filled with a thermal insulation material. As well as affecting the studs the cooling water leaks have also affected the chamber containing the pre-stressing wires. The wires were greased during construction to protect them from moisture. HSE has challenged the licensee to provide adequate assurance that the pre-stressing wires will not deteriorate due to the presence of the water. The licensee has instituted a programme of extra work to provide ongoing assurance about the integrity if the boiler closure units. This programme has included the development of inspection techniques which allow the licensee to confirm that there are no signs of damage or displacement to the pre-stressing wires.

AGR top dome temperatures

3.16. The under hotbox dome surface temperature of all four reactors at Heysham 1 and Hartlepool has increased progressively since operations commenced. All four reactors continued to comply with the average dome temperature limit imposed by Technical Specifications. However, recent analysis has revealed that a single thermocouple on Heysham 1 Reactor 2 was recording a temperature above the original design limit. In October 2006 the station took the decision to reduce power to lower the temperature and secure a margin against the design. Reactor 2 is currently operating at 84% feed flow and the station has prepared an Engineering Change, which justifies sustained operation at reduced load. If the station wishes to increase reactor power such that top dome temperatures exceed the original design limit then they are required to justify this in a separate Engineering Change.

Hartlepool buried cast iron emergency cooling water main failure

3.17. The Emergency Cooling Water (ECW) system comprises two segregated circuits, ‘A’ and ‘B’, and provides seawater cooling to the following systems:

- Reactor Ancillaries Cooling Water
- Turbine House Ancillaries Cooling Water
- Pressure Vessel Cooling Water
- Additional Fuel Storage Facility

3.18. The pipe failure event occurred on 26 September 2006. The buried Cast Iron ECW ‘A’ Main fractured close to the Turbine Hall and Reactor Building. The resulting liquefaction of the soil around the ‘A’ supply main damaged the cable trench which carries 11kV cables from the Gas Turbine house to the boards in the Turbine Hall, and Gas Turbines 5 and 6 were declared unavailable. Because a number of essential services had been undermined both reactors were shut down for several months whilst ground stabilisation took place and a by-pass pipe was installed.

3.19. The cause of the failure was ground settlement around the pipe, exacerbated by poor original construction. In this instance graphitic corrosion, which has resulted in an ongoing cast iron replacement programme at both Heysham 1 and Hartlepool, was not a contributory factor.

Site specific issues

3.20. The following paragraphs summarise the key issues that have arisen at each of the UK's nuclear power stations since the previous report on the Convention. Technical details on the reactors at each site are shown at Annex 1.

Reactors outside of Convention since last report

3.21. The Bradwell and Hinkley Point A Magnox reactors are now defuelled and in decommissioning. As such, they are no longer nuclear installations for the purposes of this Convention. The safe management of the fuel is addressed separately in the UK report to the Joint Convention.

Reactors defuelling

Calder Hall (Four Magnox Reactors)

3.22. This station is no longer operating. Since the end of electricity generation in March 2003, Calder Hall has continued to implement the modifications to its fuel routes that are necessary to begin defuelling the reactors. Due to issues at the reprocessing plant at Sellafield, the start of defuelling has been postponed and the time taken to defuel is likely to be extended. There are approximately 10,000 fuel elements in each of the four reactors.

Chapelcross (Four Magnox Reactors)

3.23. The decision to permanently cease generation at Chapelcross took effect on 29 June 2004 and the site is now preparing for defuelling, following significant safety upgrading of the fuel route. The licensee will be seeking regulator agreement for active commissioning of Reactor 3 fuel route prior to asking permission for routine defuelling of all four reactors. This may be delayed due to reprocessing problems at Sellafield. There are approximately 10,000 fuel elements in each of the four reactors.

Dungeness A (Two Magnox Reactors)

Dungeness A operated at power for 40 years and ceased generation in December 2006. A Post-Operation and Defuelling Safety Case was developed between 2004 and 2006 to supersede the operational safety case at the end of generation. A further Periodic Safety Review was completed in March 2006 to justify plant safety post generation. A major refurbishment of the fuel route was completed approximately 5 years ago and further modifications have been undertaken to support defuelling. A trial defuelling campaign of 5te per reactor has commenced. Bulk defuelling may be delayed due to reprocessing problems at Sellafield. There are approximately 28,000 fuel elements in each of the two reactors.

Sizewell A (Two Magnox Reactors)

3.24. Sizewell A operated at power for 40 years and ceased generation in December 2006. A Post-Operation and Defuelling Safety Case was developed between 2004 and 2006 to supersede the operational safety case at the end of generation. A further Periodic Safety Review was completed in March 2006 to justify plant safety post generation. Refurbishment of the fuel route has been completed to support defuelling. A trial defuelling campaign of 5te per reactor is planned to take place in 2007. Bulk defuelling, however, is not planned to commence in the near future. There are approximately 30,000 fuel elements in each of the two reactors. In January 2007, failure of a pipe resulted in the leakage of a significant volume of cooling pond water. However, no discharge limits were exceeded. A comprehensive review of the safety case for the pond and its associated equipment is being carried out.

Operating reactors

Oldbury (Two Magnox Reactors)

3.25. Oldbury has been operating for nearly 40 years and is planned to cease generation in 2008. There are redundant and diverse safety provisions such that the design basis faults can be tolerated. During the past two years, safety-related activities have focussed on the end-of-life management of the graphite reactor cores, with the preparation of significant and complex new safety cases being required. The need to prepare these safety cases has resulted in the ability to generate electricity being constrained. The generic graphite ageing issue is addressed above.

Wylfa (Two Magnox Reactors)

3.26. Wylfa has been operating for more than 35 years and is planned to cease generation in 2010. Magnox Electric has implemented many safety improvements following a Long Term Safety Review in the 1990s and a Periodic Safety Review that was completed in 2003. There are redundant and diverse safety provisions such that the design basis faults can be tolerated. Some follow up work to the Periodic Safety Review continues, particularly with respect to fire-related hazards.

Dungeness B (Two Advanced Gas-cooled Reactors)

3.27. Dungeness B has experienced problems with the fuel route. The main issue is justification of the integrity of fuel plug units, especially those that were manufactured early in the station's life. The problem is caused by potentially defective welds. This has significantly extended the refuelling programmes and hence reduced the station output. A review of the safety case has resulted in changes in operation and a requirement to inspect, modify and replace certain components.

Hartlepool (Two Advanced Gas-cooled Reactors)

3.28. Hartlepool, and its twin station Heysham 1, have had safety issues associated with boiler closure units. This is addressed as a significant issue above. In September 2006, an underground safety-related pipe failed. The failure was due to a combination of original installation issues and ground movements. The pipework was repaired and the plant returned to service with a commitment to replace the other areas of the pipework system. This is addressed as a significant issue above.

Heysham 1 (Two Advanced Gas-cooled Reactors)

3.29. An area of thermal insulation within the reactor is degrading (slowly) and Reactor 1 is operating at about 90% of full power as a result. The root cause of the degradation is still being investigated. See significant issues above.

Heysham 2 (Two Advanced Gas-cooled Reactors)

3.30. Each reactor has independent and segregated reactor seawater cooling systems that provide cooling for the pressure vessel cooling system, reactor auxiliaries and gas circulator auxiliaries. In November 2006, there was a fully circumferential through thickness failure in a section of Glass Reinforced Plastic (GRP) to one reactor. Inspection revealed cracking in other areas of the pipe and also in the pipe to the other reactor. It is probable that the shear failure occurred due to ground settlement and degradation of the pipework.

3.31. All accessible GRP pipework on one reactor was removed during the 2007 outage and replaced with High Density Poly-Ethylene pipes. Similar GRP pipework on the other reactor will be replaced at the next outage.

Hunterston B (Two Advanced Gas-cooled Reactors)

3.32. In August 2006, inspections of the main boiler tubes at Hunterston Reactor 3 revealed higher than expected levels of defects in certain boiler components. This

finding resulted in protracted shutdown at the two Hunterston B reactors to carry out inspections and repairs, and make a safety case for continued operation. The reactors have been approved to return to service by the regulator with temperature (and hence power) restrictions. This is discussed under significant issues above.

Hinkley Point B (Two Advanced Gas-cooled Reactors)

3.33. In August 2006, inspections of the main boiler tubes at Hunterston Reactor 3 revealed higher than expected levels of defects in certain boiler components. As the Hinkley Point B reactors are of similar design to those at Hunterston B, this finding also resulted in protracted shutdown at the two Hinkley Point B reactors to carry out inspections and repairs and make a safety case for continued operation. The reactors have been approved to return to service by the regulator with temperature (and hence power) restrictions. This is discussed under significant issues above.

Torness (Two Advanced Gas-cooled Reactors)

3.34. There was an unplanned power increase on Torness Reactor 2 on 30 December 2005. Operators responded to the event by taking corrective action to restore normal core reactivity levels. HSE requested BEGL to provide details of the cause of the event and corrective measures they proposed to address the areas for improvement identified from their investigations. Both the power station and BEGL carried out investigations, and these identified that improvement to the training of operators covering reactivity fundamentals was appropriate. Consequently BEGL has developed a programme of remedial work to address the findings from investigations across all of its sites.

3.35. On the 2 August 2006 a significant amount of seaweed caused a complete blockage of the main cooling water intake drum-screens. The event resulted in supplies of cooling water being impaired and both reactors being promptly shut down. The station took corrective action to improve the plant material condition, review and revise station procedures and provide additional training for staff responding to similar events in the future.

Sizewell B (One Pressurised Water Reactor)

3.36. In line with worldwide practice, the Reactor Pressure Vessel Head was replaced during the refuelling outage in mid 2006. This was a major project. The project went well and there were no significant issues with the acceptance of the RPV head for service, reinforcement of the lifting and load paths, the disassembly of the old head and the reassembly of the control rod drive mechanisms (CRDMs) onto the new head. Commissioning of the CRDMs and other instrumentation went to plan. The licensee chose to re-use the existing CRDMs and that increased the dose burden for this project. However through careful control, Sizewell B's head exchange was completed with one of the lowest dose burdens within the PWR community. The old RPV head has been put into medium term shielded storage on site pending final disposal when activity levels have reduced.

Section 4 - Safety Issues of Interest Identified at the Third Review Meeting Relevant to Articles 6 to 19

4.1. The Report of the President of the Third Review Meeting held in April 2005 identified a number of specific and general issues to be addressed in countries' fourth reports. These were linked to specific Articles in the IAEA document "Synopsis of the relevant IAEA Safety Requirement statements reflecting the issues addressed by Article 6 to 19 of the Convention on Nuclear Safety", (reference CNS_Compiled_Synopsis_Final), dated 18 May 2006. Those applicable to the UK are considered below. The relevant paragraphs from the 2005 Report of the President are repeated in the boxes below.

Article 6

78. Further and more detailed information on the status of safety improvement programmes would be expected at the Fourth Review Meeting

4.2. The UK's main tools for achieving safety improvements are described under Article 6.

Article 7

15. The establishment and maintenance of strong legislative and regulatory frameworks are essential for global nuclear safety. While many Contracting Parties reported on improvements that have been made in their national legislation or frameworks over the last three years, some countries still need to complete their nuclear legislation. Other Contracting Parties continue to improve their domestic rules and standards on nuclear safety or are in the process of modernizing them. Contracting Parties indicated that priority should be given to this activity.

18. A number of European Contracting Parties reported on their programmes in the WENRA framework for upgrading and harmonizing their legislative and regulatory framework using the IAEA safety standards and national best practices as a basis for common reference levels. Reports on these developments from involved European Contracting Parties would be expected at the Fourth Review Meeting.

4.3. The UK has developed and published revised Safety Assessment Principles (SAPs) as described in Section 2 and Annex 8. Their development has taken full account of WENRA and IAEA safety standards.

19. Contracting Parties have recognized the importance of international peer review and enhancing their self-assessment capabilities to identify strengths and weaknesses as well as indicate areas for improvement of the necessary legislative and regulatory frameworks. The IAEA's International Regulatory Review Team (IRRT) methodology has proven to be an effective tool as reported by some Contracting Parties. Other Contracting Parties indicated that they have requested or are considering requesting IRRT missions, and will report on the experience at the Fourth Review Meeting.

4.4. The UK received the first of a series of modular IAEA IRRS missions in 2006. This is described in Section 2 and Annex 10.

Article 8

25. While many Contracting Parties reported that they had begun the process of implementing quality management systems within their regulatory bodies, many also noted the challenges in these tasks. Accordingly, the implementation of quality management systems within regulatory bodies is expected to be reported upon at the Fourth Review Meeting.

4.5. Insofar as this issue is applicable to the UK, this is described under Articles 13 and 14.

26. Some Contracting Parties still face the challenge of clearly defining the responsibilities between more than one regulatory authority or governmental organization involved in the licensing process (e.g., relationships between nuclear and environmental authority).

4.6. This concern is not considered to be applicable to UK. Independence of, and relationships between, regulatory authorities is described under Article 8 and in Annex 6.

27. Some Contracting Parties noted, as in previous Review Meetings, the important role of technical support organizations (TSOs) performing safety assessments at the request of regulatory bodies. In some cases, Contracting Parties have concerns with regard to overdependence on TSOs.

4.7. The role and use of TSOs is described under Article 8.

29. As was reported at the Second Review Meeting, questions remain as to the effective independence of regulatory bodies in some Contracting Parties. The effective independence of regulatory bodies is considered an essential element in nuclear safety. All Contracting Parties need robust means to ensure that there is no undue pressure or interference on their regulatory bodies. Many regulatory bodies of Contracting Parties appeared to act in a clearly independent way in a de facto sense, relying on well established management policies. Nevertheless it was noted that in several cases, it remains desirable to further improve the de jure independence of the regulatory body.

4.8. This concern is not considered to be applicable to UK. Independence of, and relationships between, regulatory authorities is described under Article 8 and in Annex 6.

60. Several Contracting Parties reported on the challenges posed by the introduction of risk informed decision making. Experience with the implementation of risk-informed decision making can be expected at the Fourth Review Meeting.

4.9. Insofar as this issue is applicable to the UK, this is described under Article 14. UK has a non-prescriptive approach to regulation, inspection and assessment efforts are re-assessed annually, and inspections and regulatory activities are targeted to the higher-risk facilities and activities.

Article 10

4. With almost sixty-five percent of the world's operating nuclear power plants more than twenty years old, decisions are being made on their future status. Programmes on ageing management and maintenance and motivation of the work force are important to maintain the safety of nuclear power plants throughout their entire life cycle.

4.10. UK plant ageing issues are highlighted in Section 3.

5. In some countries, there have been decisions to close nuclear power programmes or specific facilities due either to political decisions or concerns with the safety or economic viability of nuclear plants. In these cases, priority to the maintenance of safety and the motivation of the workforce are important, from the announcement of the closure date through to the end of decommissioning activities.

4.11. In the UK, nuclear installations have not been closed for political reasons. They have been closed because of the normal ageing process and when licensees have considered that it is no longer is a viable option to invest in maintenance or meeting regulatory requirements. However, the UK recognises the importance of ensuring the motivation of the workforce during the latter stages of operation. The regulatory system will continue to ensure compliance with the Site Licence conditions before and after closure. For example, Periodic Safety Reviews are a requirement on plant being decommissioned. The licensees' commitments to safety are addressed under Article 10.

43. Into the future, the Contracting Parties are committed to ensuring that comprehensive safety management processes and self-assessments are undertaken by operating organizations. Many safety culture assessment tools and safety management systems, which will be reported at the Fourth Review Meeting, remain under development.

4.12. The development of Safety Performance Indicators is addressed in Section 5.

Article 12

44. As recent operating experience continues to show, human performance and the interface between humans and machines/equipment/components and instrumentation (also known as "man-machine" interface) as well as the interaction between humans play an important role in nuclear safety. Therefore, it continues to be an area of focus under the Convention on Nuclear Safety.

47. Methodologies for analyzing human factor events are being further improved and reports on these improvements may be expected at the Fourth Review Meeting.

4.13. Both of these human factors issues are addressed under Article 12.

Article 13

43. Into the future, the Contracting Parties are committed to ensuring that comprehensive safety management processes and self-assessments are undertaken by operating organizations. Many safety culture assessment tools and safety management systems, which will be reported at the Fourth Review Meeting, remain under development.

4.14. Insofar as this issue is applicable to the UK, this is addressed under Article 12 and in Section 5 paragraphs 5.17 - 5.20.

Article 14

4. With almost sixty-five percent of the world's operating nuclear power plants more than twenty years old, decisions are being made on their future status. Programmes on ageing management and maintenance and motivation of the work force are important to maintain the safety of nuclear power plants throughout their entire life cycle.

60. Several Contracting Parties reported on the challenges posed by the introduction of risk informed decision making. Experience with the implementation of risk-informed decision making can be expected at the Fourth Review Meeting.

65. Contracting Parties will report on their experience with PSAs at the Fourth Review Meeting.

78. Further and more detailed information on the status of safety improvement programmes would be expected at the Fourth Review Meeting.

4.15. All of these issues are addressed, insofar as they relate to the UK, under Article 14. In particular paragraphs 14.52 - 14.59 address HSE's inspection strategy.

Article 15

56. Some Contracting Parties did report relatively high collective doses. In most instances, these were connected with intensive inspection programmes, maintenance or extensive back fits to older nuclear power plants. These Contracting Parties undertook to reduce the collective doses arising from long periodic inspections and extensive maintenance activities. This remains an important area for reporting at future Review Meetings, particularly as Contracting Parties continue to upgrade their nuclear power plants.

4.16. This concern is not directly applicable to UK as there is a good history of low doses at gas-cooled reactors. Doses arising from work at nuclear power plant is described under Article 15.

Article 16

53. Many Contracting Parties reported on further measures that they will be undertaking to enhance their emergency preparedness programmes, including modernizing emergency management centres and conducting broader emergency exercises. Contracting Parties were also encouraged to include in their National Reports to the Fourth Review Meeting how, in case of an emergency, information is transmitted in an expeditious manner to neighbouring and potentially affected countries.

4.17. Emergency preparedness programmes and communication with other countries is addressed under Article 16 and in Annex 9.

Article 19

4. With almost sixty-five percent of the world's operating nuclear power plants more than twenty years old, decisions are being made on their future status. Programmes on ageing management and maintenance and motivation of the work force are important to maintain the safety of nuclear power plants throughout their entire life cycle.

74. Some Contracting Parties expressed the view that, in some important cases, the use of international OEF has not been effective. Therefore, there is a need to improve the sharing and use of international experience in this area.

75. Progress on operational experience feedback can be expected at the Fourth Review Meeting.

76. Programmes for severe accident management are in various stages of development and implementation in many Contracting Parties. It was noted that different approaches are being considered to respond and mitigate beyond design basis events. Further information on the development and implementation of severe accident management programmes (SAMP) would be welcomed at the Fourth Review Meeting.

4.18. These issues are addressed, insofar as they relate to the UK, under Article 19.

Section 5 - Rapporteur Feedback at the Third Review Meeting

5.1. At the third review meeting the country group rapporteur summarised the key challenges and planned measures to improve safety identified in the UK presentation. Where appropriate, progress on these matters have been addressed within this report. Key issues, as identified by the Rapporteur, are summarised in the boxes below.

Challenges for UK

'Considering the ageing workforce, the UK continues to be challenged with maintaining a competent regulator and operator. Recruiting from other technical industries that deal with hazards may be part of the strategy going forward.'

5.2. Although at present there are no major difficulties in the UK, there could be significant future problems, particularly if there is a decision to build new nuclear installations. There is already recruitment of personnel from non-nuclear high hazard industries, but this in itself is not likely to be the solution to the difficulty. There are several initiatives in the UK to try and remedy this situation:

- At the national level, the Government has responded to the recommendations from the Nuclear Skills Group, which was set up in response to an OECD report. Responsibility for implementing the necessary changes to the nuclear sector's skills has been given to the Cogent Sector Skills Council.
- A National Skills Academy for Nuclear has been established to address the demand for nuclear skills.
- At the 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 and there has been an increase in the number of students taking up places on these courses.
- Manchester University is setting up a Nuclear Centre which will offer a range of courses and research on nuclear (fission and fusion) topics.

5.3. Further more detailed information can be found in the response under Article 19.

'UK recognised that their safety performance indicators could be improved. They began a pilot in 2004 using indicators based on IAEA recommendations, British Energy's own key performance indicators, and indicators from other organisations. It was also noted in the discussion that there could be benefit in grouping related indicators to provide additional insights. Safety culture indicators are part of this pilot.'

Licensee safety performance indicators

5.4. Licensee safety performance indicators (SPIs) are measurements that relate to licensees' staff, plant and procedures which provide information on safety performance. Many international nuclear regulatory authorities use licensees' SPI information as an input to prioritising their regulatory intervention strategies and for allocating their resources.

5.5. In 2004, HSE started a pilot project with BEGL to examine how safety performance indicators could be developed for mutual benefit to deliver improved safety performance. This pilot study was successfully completed in 2006. In July 2006, HSE set up a project to develop licensee SPIs for use across HSE's Nuclear

Directorate. Its objective was to extend the SPI approach piloted with BEGL to other licensees and to other types of nuclear installations. This would involve consultation with licensees and other stakeholders.

5.6. Further drivers for this work arose from the Hampton Review[18], in particular, the Consultation on the Regulators' Compliance Code recently published by the Cabinet Office Better Regulation Executive[20]. This states that regulators should target effort and resources to areas where they would be most effective and involve those regulated and other interested parties. The Code also states that regulators should keep such processes under review and publish details.

5.7. The first step towards developing an SPI system was to decide on which areas need to be measured. To facilitate this, an SPI Framework was developed in consultation with licensees and other stakeholders, based on IAEA TEC DOC 1141 "Operational Safety Performance Indicators for Nuclear Power Plants, May 2000". This framework sets out three high level attributes:

- Sustained excellence of operation;
- Control of hazards;
- Positive safety culture.

5.8. Each of these attributes was linked to sets of overall indicators which, in themselves, are not easily measured. However, they do provide a reference to HSE Nuclear Directorate's Strategic Goals[21] and can be linked to strategic indicators for which one or more measurable SPIs can be identified.

5.9. A one-year SPI implementation study started in April 2007. The aim is to use data already collected by licensees to inform our regulatory processes and to agree SPIs for areas where there are gaps.

Regulator performance indicators

5.10. Licensee safety performance indicators provide a useful tool to assist the regulator focus its attention and resources on those areas that warrant priority. The licensee SPIs also give a year-on-year indication of safety improvement (or degradation) in key areas. However, at present, they do not provide a reliable means of identifying a Regulatory Authority's specific contribution to changes in the SPIs.

5.11. In common with all Government departments, HSE has Public Service Agreement Targets with government. For HSE Nuclear Directorate the target is to reduce the number of events reported by licence holders, which are judged to have the potential to challenge a nuclear safety system by 7.5%.

5.12. For the time being this will remain in place but we are currently investigating, together with HSE Statistical experts, how the work on licensee SPIs can be used to provide a more meaningful target.

'Unique reactor designs present some challenges with respect to sharing operational experience and benchmarking due to lack of peers. However, the UK has benefited from peer exchanges of information on non-technologically specific topics such as regulatory structure, use of PSA, safety culture etc.'

5.13. UK continues to participate in the sharing of information with countries with which we have bilateral arrangements. We also continue to participate fully in the activities of International Organisations such as IAEA, OECD-NEA and WANO. HSE has recently hosted an IAEA IRRS Mission (see below). The potential new build programme in UK reinforces the need to continue to exchange views with other countries.

'Improved Human factors tools have been factored into more recent PSAs. Insights from these PSAs have been used in revisions of operating procedures?'

5.14. UK licensees continue to factor human factors into PSAs. These provide quantitative assessments of the risk to safety arising from plant designs and operations. The PSAs highlight significant contributors to risk, and take into account the impact of human actions on safety. Further information can be found under Article 12.

'Degradation mechanisms for graphite moderators were identified as a challenge. The safety cases were reconfirmed after establishing additional inspections and analyses.'

5.15. Graphite reactor cores suffer from potential problems of both weight loss and graphite cracking. UK operates two types of reactor with graphite moderated cores. The Magnox reactors are fuelled with natural or slightly enriched uranium metal fuel clad in a Magnox can, whilst the AGRs are fuelled with enriched uranium oxide in stainless steel cans. It should be noted that only two Magnox power stations are now operating. These are the twin reactors sites at Oldbury and Wylfa. The "lead reactors" regarding graphite integrity are those at Oldbury. The UK strategy continues to be one of inspection and analysis. Those reactors with the most at-risk cores have had their outages extended until sufficient information has been collected and analysed to give confidence to allow them to return to service.

5.16. More detailed information can be found in Section 3 of this report.

Planned measures to improve safety

'The UK is developing tools to measure safety culture. The contracting parties would appreciate the UK sharing any experience gained from this activity at the next review meeting.'

Safety culture monitoring processes

5.17. HSE recognises the importance of a strong safety culture to the safe and reliable operation of nuclear facilities. HSE has therefore developed a number of processes to gather data about licensee safety culture, which can then be used to help HSE better understand and influence key elements of a licensee's arrangements for managing safety and sustaining a positive safety culture. These processes include:

The development of a safety culture monitoring framework.

5.18. This framework is based on guidance produced by IAEA for the assessment of safety culture. It consists of a series of questions designed to elicit information about a set of safety culture attributes. The framework has been piloted on one facility, with information being gathered using a variety of approaches including interview, focus group, document review and plant tour. The pilot demonstrated that the framework can provide useful insights into licensee safety culture. However, the methodology used in this pilot is resource-intensive for a large multi-facility site and may best be used where there are indications of a deteriorating safety culture, or where a need is perceived to give a prominent signal of regulatory interest in this area.

Interviews with licensee Directors and Senior Managers.

5.19. HSE acknowledges that licensee Directors and Senior Managers are instrumental in setting the vision and values of an organisation. Consequently, HSE has conducted interviews with the Directors and Senior Managers of a licensee to gather information about their approach to leadership and promoting a positive safety culture. The interview questions drew upon the safety culture framework and HSE's revised SAPs, which now set out HSE's expectations of a licensee in terms of its management for safety, including leadership, decision-making, learning from experience and organisational capability. Guidance on corporate governance was also used. The interviews have provided insights into the views and behaviours of the licensee's Directors and Senior Managers, and helped to provide HSE with assurance that these individuals have a manifest commitment to nuclear safety.

Gathering of safety culture information during site inspection.

5.20. HSE is currently piloting an approach whereby information about aspects of safety culture is gathered by site inspectors during their routine interactions with the licensee. Depending on the outcome of this pilot, HSE will consider extending this approach to other licensees and formalising it within the regulatory process.

Sharing international experience

5.21. In May 2007, HSE organised and hosted an IAEA/OECD-NEA workshop on regulatory approaches to maintaining oversight of licensee safety culture. That workshop confirmed the need for regulatory bodies to engage with licensees to monitor, and promote their development of a positive, safety culture. Different approaches to doing this were discussed, and the outcomes of the workshop are being used to further inform and refine the approach that HSE is taking to monitor licensee safety culture.

> *'Safety Culture is not directly regulated but an assessment of safety culture will be required for future PSRs. UK's experience would be of interest to contracting parties.'*

5.22. For the recent PSRs for Sizewell B and Hunterston B/Hinkley B, the licensees included reviews of safety culture. These were carried out by external consultants and broadly followed IAEA guidance and the methodology described above. Under Article 12 the human factors assessment carried out by HSE as part of the PSR process is described.

> *'The UK believes strongly in the value of benchmarking and would consider an IRRT in the future.'*

5.23. An IAEA Integrated Regulatory Review Service (IRRS) team was invited to conduct a review in Spring 2006 to assess how HSE intends to carry out appraisals of potential new reactor designs. The review focused on the following IRRS topics: Organisation; Authorisation; and Review and Assessment. Three further IRRS topics were reviewed to ensure that the team had an appreciation of the UK's legal system and its approach to nuclear safety regulation. These topics were: Legislative and Governmental Responsibilities; Authority, Responsibilities and Functions of the Regulatory Body; and Regulations and Guides. Further details can be found in Section 2 and Annex 10 to this report.

'In regards to the Nuclear Decommissioning Authority and its decommissioning activities, the contracting parties would appreciate the UK sharing any experience gained at the next review meeting.'

5.24. Section 2 above provides a comprehensive review of the work and responsibilities of the NDA since it came into operation in April 2005.

Article 6 - Existing Nuclear Installations

Each Contracting Party shall take the appropriate steps to ensure that the safety of nuclear installations existing at the time the Convention enters into force for that Contracting Party is reviewed as soon as possible. When necessary in the context of this Convention, the Contracting Party shall ensure that all reasonably practicable improvements are made as a matter of urgency to upgrade the safety of the nuclear installation. If such upgrading cannot be achieved, plans should be implemented to shut down the nuclear installation as soon as practically possible. The timing of the shutdown may take into account the whole energy context and possible alternatives as well as the social, environmental and economic impact.

Under this Article, compliance with the Convention is demonstrated in a way that has not substantially changed since the third UK report (i.e. in a way that has implications for the Convention obligations). A final paragraph has been added on reactor decommissioning applications.

Nuclear installations in the UK

6.1. The UK's nuclear licenced sites with nuclear power plants (NPPs) are listed below. This includes those sites with reactors that have shut down, are defuelling or are decommissioning. With the exception of Sizewell B, which is a pressurised water reactor (PWR), all the UK's nuclear power plants use gas-cooled technology. The first generation ('Magnox' reactors) use natural uranium with magnesium alloy cladding. The second generation, Advanced Gas-cooled Reactors (AGRs), use uranium dioxide fuel with stainless steel cladding. All Magnox reactors in steel pressure vessels were safely shut down by the end of 2006.

(i) Magnox Electric Ltd and Sellafield Ltd:

Berkeley	2 Reactors (Magnox)	Decommissioning
Hunterston A	2 Reactors (Magnox)	Decommissioning
Trawsfynydd	2 Reactors (Magnox)	Decommissioning
Calder Hall	4 Reactors (Magnox)	Shut Down
Chapelcross	4 Reactors (Magnox)	Shut Down
Bradwell	2 Reactors (Magnox)	Decommissioning
Dungeness A	2 Reactors (Magnox)	Shut Down
Hinkley Point A	2 Reactors (Magnox)	Decommissioning
Oldbury	2 Reactors (Magnox)	
Sizewell A	2 Reactors (Magnox)	Shut Down
Wylfa	2 Reactors (Magnox)	

(ii) British Energy Generation Ltd:

Dungeness B	2 Reactors (AGR)
Hartlepool	2 Reactors (AGR)
Heysham 1	2 Reactors (AGR)
Heysham 2	2 Reactors (AGR)
Hinkley Point B	2 Reactors (AGR)
Hunterston B	2 Reactors (AGR)
Torness	2 Reactors (AGR)
Sizewell B	1 Reactors (PWR)

Further details and key parameters for the operational nuclear installations are given in Annex 1.

6.2. The UK's first nuclear installations, the Magnox reactors, started operation between 1956 and 1971. These are carbon dioxide gas-cooled, graphite moderated reactors that use natural (or in some cases very slightly enriched) uranium fuel in a magnesium alloy cladding. The first nine installations had steel reactor pressure vessels, but the last two stations at Oldbury and Wylfa had prestressed concrete reactor pressure vessels. These later designs had significant safety advantages over the steel pressure vessels since a sudden and unexpected failure of the main pressure vessel boundary was deemed to be virtually impossible. However, the use of natural uranium with magnesium alloy cladding limited the development of the Magnox technology regarding increasing power density and gas outlet temperature.

6.3. The second generation of gas-cooled reactors were the AGRs. Seven stations were commissioned between 1976 and 1988 each with 2 reactors. AGRs use enriched uranium oxide fuel in stainless steel cladding. This, together with the prestressed concrete pressure vessel, allowed gas outlet temperatures of over 600 degrees centigrade and gas pressures of over 30 bar.

6.4. The UK's gas-cooled reactors do not need secondary containment. For design basis loss of coolant accidents, the reactor transient does not precipitate large scale fuel failure. The plant is designed to be capable of retaining the bulk of the radioactive material that might be released from the fuel for the entire range of accidents considered in the design. In contrast, containment buildings are required for Pressurised Water Reactors (PWR) and Boiling Water Reactors because a design basis loss of coolant accident results in significant fuel failure and release of radioactive fission products.

6.5. The last nuclear power plant to be built in the UK is the PWR at Sizewell B. This became operational in 1995. This reactor uses enriched uranium oxide fuel clad in Zircalloy and pressurised water as the coolant.

6.6. The above paragraphs demonstrate that UK has a wide range of nuclear plant with a range of designs that span nearly 50 years. Although not specifically an issue for this Convention, the unique designs of the UK plant has required the development of fuel manufacture and reprocessing facilities as well as research organisations. It was essential therefore that the UK had regulatory processes in place to ensure that all plants continued to be safe and were upgraded as necessary to meet current safety standards as well as fulfilling the requirements of Article 6 of this Convention. The following paragraphs demonstrate how UK meets the requirement of this article.

Safety reviews and upgrading of nuclear installations in UK

6.7. The safety of UK’s nuclear power plants is assured by the process of routine regulation and inspection (as addressed under Article 8 and 14 of this Report) and by the process of Periodic Safety Reviews (PSRs).

6.8. The main PSRs are carried out every 10 years. However intermediate reviews are carried out at more frequent intervals and any identified necessary upgrading measure are implemented.

6.9. Each nuclear power reactor is required to shut down for inspection and maintenance every two or three years (depending upon the particular NPP design). After these shutdowns, the licensee must apply for a Consent (see Annex 2) to restart the reactor. Consents are granted by the regulator, HM Nuclear Installations Inspectorate (NII) which is part of HSE’s Nuclear Directorate (ND), following a satisfactory review of the licensee's inspection and maintenance programme, the operational performance of the station since the previous start-up Consent and a satisfactory review of the safety case. These start-up reviews give the NII the

opportunity to review specific aspects known to have safety significance. In addition, Consent for start up is not granted until NII is sufficiently confident that the reactor is safe to operate for the period up to the next shut down for inspection and maintenance.

6.10. Any safety concern on one reactor may have implications for other reactors on the site or indeed for the family of reactors with similar features. If such concerns are raised either during a maintenance outage or during normal operation, the HSE has powers to require the operators of the reactor, or similarly affected reactors, to take remedial action including shutting down if this is appropriate. In this latter situation the operator must again apply to NII for a Consent to restart. Further information concerning the statutory requirements and the operation of NII are given under Articles 7 and 8.

6.11. In addition to the continual day-to-day regulatory inspection and assessment of licensees' activities and the shutdowns, there are PSRs where reappraisals are done not only to confirm continued safe operation but also to examine plant safety in the foreseeable future. The UK approach to PSRs is covered in the following section.

Periodic safety reviews

6.12. The UK has been undertaking safety reviews of the UK's civil nuclear installations for many years as part of the regulatory process. There has been a requirement for PSRs since the introduction of the standard nuclear site licence in 1990. All nuclear installations are required to undertake a major safety review every 10 years.

6.13. The rationale for selecting ten years as the review period was chosen by many Member States, on the basis of experience, as striking a balance between a period long enough to capture significant developments important to safety and any longer period where the loss of experienced staff by the operating and regulating organisations would lead to loss of continuity. This rationale is elucidated in the IAEA Safety Guide 'Periodic Safety Reviews of Nuclear Power Plants', NS-G-2.10. The legal basis for PSRs in the UK is embodied in the conditions that are attached to the nuclear site licence. Licence Condition 15 (Periodic Review) requires licensees to "make and implement adequate arrangements for the periodic and systematic review and reassessment of safety cases".

6.14. The programme for the UK's nuclear installations' PSRs is given in Table 6.1 below. The outcome of the first of the AGR PSRs, for the Hinkley Point 'B' and Hunterston 'B' nuclear power stations, was reported by HSE in 1997. This was followed by the PSRs for Dungeness 'B' in 1998, Heysham 1 and Hartlepool in 1999 and Heysham 2 and Torness in 2002. Finally, the findings of NII's assessment of the Sizewell B PSR were published in 2006. The second round of PSRs for the BEGL stations is now under way and the findings for Hinkley Point B and Hunterston B were published in May 2007. The reports of all of these assessments are published on the HSE website[22].

6.15. Although all Magnox steel pressure vessel stations were closed down by 2006, the requirement for a PSR still remains to cover post-operational safety. The second operational stage PSRs for the concrete pressure vessel Magnox reactors at Oldbury and Wylfa were carried out in 1998 and 2004. As indicated in Table 6.1 below, both of these stations are scheduled for closure by 2010.

Table 6.1 - Status of Periodic Safety Reviews

	STATION STARTED OPERATION	FIRST REVIEW	SECOND REVIEW	THIRD REVIEW
Magnox Installations				
Calder Hall/ Chapelcross	1956 - 1959	1982	1996	Closed
Bradwell	1962	1987	1992	Closed
Berkeley	1962 - 1963	1988	Closed	
Hunterston A	1963	1988	Closed	
Trawsfynydd	1964	1992	Closed	
Hinkley Point A	1965	1990	1995	Closed
Dungeness A	1966	1994	1996	Closed
Sizewell A	1996	1994	1996	Closed
Oldbury	1968	1995	1998	Closes in 2008
Wylfa	1971	1996	2004	Closes in 2010
AGR/PWR Installations				
Hinkley Point B	1976	1996	2006	
Hunterston B	1976	1996	2006	
Dungeness B	1982	1997	2007	
Heysham 1	1983	1998	2008	
Hartlepool	1984	1998	2008	
Heysham 2	1989	1999	2009	
Torness	1989	1999	2009	
Sizewell B	1995	2005		

Note: The first safety reviews were called Long Term Safety Reviews and were undertaken at about 25 years of operational life. These were followed by PSRs, which are now undertaken at approximately 10 yearly intervals.

6.16. Prior to any new nuclear installation being authorised to operate, the licensee must have a valid safety case, which is essentially a written demonstration that the intended operation of the plant will be adequately safe. The safety case therefore confirms that all credible hazards have been identified, appropriate standards have been set and met, adequate safety features are in place, all significant assumptions have been identified, verified and validated, and that all instructions, limits and conditions required to maintain operations within specified margins for safety have been identified.

6.17. As an installation matures, modifications are made to the plant, ageing effects take place, some components may become obsolete and need replacing and plant operating instructions may be changed as a result of experience. During all this time the safety case must remain valid. The PSR process is designed to ensure that a thorough and comprehensive review is made of the safety case at regular intervals throughout a nuclear power station's life. The reviews have become a well-established feature in the licensing requirements for nuclear plant, and are intended to be more wide ranging than a restatement of the safety case. They complement

the normal day-to-day operational monitoring of safety, which is further underpinned by thorough inspections and assessment of the condition of the plant during normal maintenance and testing as well as during the planned periodic reactor shutdowns.

6.18. The objectives of the PSRs are:

- To review the total current safety case for the station and confirm that it is adequate;
- To compare against current standards for new plant, evaluate any deficiencies and implement any reasonably practicable improvements to enhance plant safety;
- To identify any ageing process which may limit the life of the plant; and
- To revalidate the safety case until the next PSR, subject to the outcome of routine monitoring by the licensee and regulation by HSE.

6.19. In reviewing the total current safety case, which is the first objective, the licensee reaffirms the validity of the original safety case, reflecting on factors such as:

- The original safety standards to which the plant was built;
- The various engineering improvements introduced during the operational lifetime which have enhanced safety; and
- The numerous safety assessments undertaken during the station's life.

6.20. The second objective, to compare against current standards for new plant, is not straightforward. Advances in scientific and engineering knowledge, coupled with experience during operation of all types of plant, generally contribute to improvements in safety standards and practices. In many cases, this will be beneficial to existing plant. For example, advances in scientific knowledge may be used to provide greater confidence in the continued safe operation of a plant. Therefore the review addresses all relevant advances in safety standards and practices. Any significant shortcomings should be identified, and any improvements, which are reasonably practicable, should be introduced.

6.21. Another essential element of the review is for all structures, systems, or components susceptible to ageing or wear-out to be examined, and failure mechanisms, together with any life-limiting features, identified. These various factors then have to be evaluated, particularly for aspects that may eventually result in unacceptably reduced levels of safety, and ultimately dictate the safe working life of the nuclear installation.

6.22. Finally, the PSRs confirm that the safety case will remain valid until the time of the next review, which is normally set at ten years. As stated above, the PSRs complement the normal operational monitoring of safety, which is also regulated by HSE. Therefore, although the PSRs may conclude that the safety case is adequate for another ten years, this will be dependent upon continuing satisfactory results from routine inspections. Should any safety related factor emerge in the interim period that may throw doubt upon the continuing validity of the safety case, this would require the licensee to resolve the matter to HSE's satisfaction.

6.23. The PSRs review the analysis of faults that could evolve into accidental sequences (initiating faults) and the defences available at the plant to mitigate the consequences. The analysis includes the two complementary approaches of deterministic and probabilistic assessment. A comprehensive fault schedule, which includes both internal initiating events as well as internal and external hazards, is the starting point of both deterministic and probabilistic safety analyses. The deterministic approach is used in the analysis of design basis accidents (DBAs) to demonstrate the capability of the safety systems. Analyses are also undertaken of more severe faults outside the design basis, which could lead to large releases of radioactivity. This includes: analysis of the potential failures of the physical barriers

to the release of radioactivity; analysis of the magnitude and characteristics of the releases; identification of the accident management strategies to reduce the risk, together with the necessary equipment, instrumentation and accident management procedures. Level 2 PSAs were produced as part of the first PSRs (where PSAs did not already exist). Although regulatory decisions are unlikely to be made on the basis of probabilistic analysis alone, the PSA provide an important aid to judging the relative importance of identified potential engineering shortcomings.

6.24. The results of the PSRs have produced, and continue to produce, worthwhile improvements to safety. So far they have revealed no factors seriously prejudicial to the continued operation in the foreseeable future of any operating nuclear installation. The first reviews however, identified many areas where improvements were both necessary and practical. In some cases the licensees chose to close down the plant rather than invest in an upgrading programme. The continuing programme of reviews is however a vital part of HSE's monitoring of an operator's performance, and an essential input to any agreement by the HSE to the continued operation of any nuclear installation.

Reactor decommissioning applications

6.25. Under the Nuclear Reactors (Environmental Impact Assessment for Decommissioning) Regulations 1999 (EIADR99)[23], as amended by Nuclear Reactors (Environmental Impact Assessment for Decommissioning) (Amendment) Regulations 2006, HSE has received an application for consent to carry out a decommissioning project at Oldbury NPP, together with an Environmental Statement which forms a written report of an assessment of the environmental impacts of the project.

6.26. Previously HSE has granted consent to carry out decommissioning projects under the regulations to Magnox Electric Ltd., as the licensee of:

- Dungeness A NPP on 13 July 2006
- Sizewell A NPP on 23 May 2006
- Chapelcross NPP on 26 September 2005
- Hinkley Point A NPP on 10 July 2003
- Bradwell NPP on 5 December 2003.

and to British Nuclear Group Sellafield Ltd, as the licensee of:

- Calder Hall NPP on 21 June 2005.

6.27. HSE has published decision reports[24] on each application which describes the reasons and considerations for HSE’s decision.

Article 7 - Legislative and Regulatory Frameworks

1. Each Contracting Party shall establish and maintain a legislative and regulatory framework to govern the safety of nuclear installations.

2. The legislative and regulatory framework shall provide for:

(i) the establishment of applicable national safety requirements and regulations;

(ii) a system of licensing with regard to nuclear installations and the prohibition of the operation of a nuclear installation without a licence;

(iii) a system of regulatory inspection and assessment of nuclear installations to ascertain compliance with applicable regulations and the terms of licences;

(iv) the enforcement of applicable regulations and of the terms of licences, including suspension, modification or revocation.

Under this Article, compliance with the Convention is demonstrated in a way that has not substantially changed since the third UK report (i.e. in a way that has implications for the Convention obligations), except in paragraphs 7.9, 7.16, 7.17, 7.33 and 7.42 below.

7.1. The following describes the UK's nuclear safety legislative and regulatory framework applicable to nuclear installations as defined by the Convention. Its content has been informed by relevant IAEA Requirements standards.

National safety requirements and regulations

7.2. The BERR website[25], under the heading of safety, 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
- involvement in international work on nuclear safety.

7.3. The following legal instruments define the regulation of the safety of nuclear installations in the UK.

The Health and Safety at Work etc. Act 1974

7.4. Under the Health and Safety at Work etc. Act 1974 (HSWA74)[26], a general duty is placed on all employers (not just nuclear site licensees) to conduct their undertaking in such a way as 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. This Act also defined two regulatory bodies, the Health and Safety Executive (HSE) and the Health and Safety Commission (HSC) (see under Article 8). Extracts from HSWA74 relevant to this Convention are contained in Annex 3.

Nuclear Installations Act 1965, as amended

7.5. Under the Nuclear Installations Act, as amended, 1965 (NIA65)[27] no site can be used for the purpose of installing or operating a nuclear installation unless a nuclear site licence is currently in force, granted by the HSE. Only a corporate body, such as a registered company or a public body, can hold a licence and the licence is

not transferable. Sections 1, 3 to 6, 22 and 24A of the NIA65 are relevant statutory provisions of the HSWA74 (i.e. these sections of pre-existing law are subject to HSWA74 arrangements for regulation and enforcement). The parts of each of these sections relevant to the Convention are contained in Annex 4.

Ionising Radiations Regulations 1999

7.6. The nuclear site licensing regime is complemented by the Ionising Radiations Regulations 1999 (IRR99)[28] that provide for the protection of all workers and members of the public, whether on licensed sites or elsewhere, from ionising radiations. IRR99 implements aspects of the European Council Directive[29] establishing Basic Safety Standards and include the setting of radiation dose limits for employees and members of the public for all activities involving ionising radiation. IRR99 also implements Council Directive 90/641/Euratom[30] on the operational protection of outside workers exposed to the risk of ionising radiation during their activities in controlled areas. Outside workers are persons undertaking activities in radiation controlled areas designated by an employer other than their own. Further information on the application of IRR99 can be found under Article 15.

Electricity Act 1989

7.7. Before building or extending nuclear installations, planning consent under the procedure set out in the Electricity Act 1989[31] is necessary. Under this Act a generating station with a capacity greater than 50 megawatts requires a consent granted by the Secretary of State for Business, Enterprise and Regulatory Reform (for England and Wales) or the Scottish Ministers under section 36 of the Electricity Act 1989 before being constructed, extended or operated. An applicant granted planning consent to use the site will need a licence from HSE to install and operate the nuclear installation.

Radioactive Substances Act 1993

7.8. The operator of a nuclear licensed site must also meet requirements under the Radioactive Substances Act 1993 (RSA93)[32] for prior authorisation to dispose of radioactive waste. Disposal includes the discharge of radioactive effluent to the environment, incineration of solid or liquid waste, burial of solid waste or waste transfer to another site. Conditions in authorisations control the wastes that may be disposed of, the disposal routes that may be used, and impose general requirements to minimise waste creation and the discharges made into the environment. The authorisations set limits on the quantities of waste that may be disposed of, set requirements on management systems, maintenance and monitoring and require records to be kept. RSA93 was amended by the Environment Act 1995 (EA95)[33] to establish the Environment Agency (EA) as the regulatory body for authorisations in respect of premises in England and Wales and the Scottish Environment Protection Agency (SEPA) as the regulatory body for Scotland.

7.9. RSA93 was further amended by the Energy Act 2004[34], which introduced Section 16A into RSA93 allowing the transfer of existing authorisations between operators. Such transfers can only be granted if, inter alia, the environment agencies are satisfied that the transferee will have operational control and is willing and able to ensure compliance with the existing limitations and conditions in the authorisations. Where the transferor will remain a nuclear site operator, for example at another site, the environment agencies must also be satisfied that the remaining entity as a whole is similarly capable of complying with the requirements of its remaining authorisations under RSA93.

7.10. Legal requirements for the keeping and use of radioactive material and authorisation for the accumulation of radioactive waste on a nuclear licensed site are addressed by provisions in the Licence Conditions attached to a nuclear site licence.

The Nuclear Reactors (Environmental Impact Assessment for Decommissioning) Regulations 1999

7.11. The Nuclear Reactors (Environmental Impact Assessment for Decommissioning) Regulations 1999 (EIADR99)[23] implement the requirement for an environmental impact assessment for decommissioning nuclear power stations and nuclear reactors arising from Council Directive 85/337/EEC[35] (as amended by Council Directive 97/11/EC[36] on the assessment of the effects of certain public and private projects on the environment. Before decommissioning or dismantling of a nuclear reactor or power station can take place, a licensee must apply to HSE for consent, undertake an environmental impact assessment and provide an environmental statement. The information to be included in an environmental statement is referred to and specified in Schedule 1 to the regulations. A list of HSE determinations is given under Article 6.

Utilities Act 2000

7.12. The Utilities Act 2000[37] applies to the gas and electricity sectors in Great Britain. It established a single Gas and Electricity Markets Authority with the aim of achieving a fair balance between the interests of consumers and shareholders by setting duties and powers for the Authority. It also established an independent Gas and Electricity Consumer Council. Provisions in this Act enable the gas and electricity sectors to make an appropriate contribution to the Government's social and environmental objectives. Other provisions make regulation more transparent and predictable. This Act also updates the financial regulatory regime for the gas and electricity sectors to take account of, and to facilitate further, competition, and to reflect increasing convergence between the two sectors. It provided the powers needed to bring in electricity trading arrangements.

The Radiation (Emergency Preparedness and Public Information) Regulations 2001

7.13. The Radiation (Emergency Preparedness and Public Information) Regulations 2001 (REPPIR)[38] implemented in Great Britain the articles on intervention in cases of radiation emergency in European Council Directive 96/29/Euratom[29]. It also partly implements Council Directive 89/618/Euratom[39] 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 an event that is likely to result in any member of the public receiving an effective dose of 5 mSv during the year immediately following the emergency.

The Management of Health and Safety at Work Regulations 1999

7.14. The Management of Health and Safety at Work Regulations 1999 (MHSW99)[40] are relevant as they include requirements on employers, and hence nuclear site licensees, to:

(i) make assessments of the health and safety risks of their activities;

(ii) make, give effect to and record the appropriate health and safety arrangements;

(iii) ensure that their employees are provided with appropriate health surveillance;

(iv) appoint an adequate number of competent persons to assist them in complying with health and safety legislation;

(v) establish and give effect to procedures to be followed in the event of serious or imminent danger arising;

(vi) 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;

(vii) co-operate with other employers to enable statutory health and safety obligations to be met, including the provision of health and safety information; and

(viii) ensure that employees, taking into account their capabilities, have adequate health and safety training which is repeated periodically as appropriate.

7.15. MHSW99 is very wide ranging. Where its requirements overlap with other Health and Safety Regulations, compliance with the more specific Regulation is normally sufficient for compliance with MHSW99.

The Energy Act 2004

7.16. The Energy Act 2004[34] established a new Non Departmental Public Body, the Nuclear Decommissioning Authority (NDA), which came in to being in April 2005 to take over the responsibility for decommissioning, and operation via civil contracts with operators pending decommissioning, of designated civil nuclear sites. The creation of the NDA is described in more detail in the Section 2 and has not changed the regulatory framework described above, except for RSA93 (see above).

Health and Safety (Fees) (Amendment) Regulations 2007

7.17. The Health and Safety (Fees) (Amendment) Regulations 2007[41] came in to force on 2 July 2007 and amends the Health and Safety (Fees) Regulations 2007. It provides for the charging of fees for work by HSE in relation to the assessment of a proposal for any new nuclear installation. This includes all matters relating to the installation's construction, commissioning, operation and decommissioning, which are to be assessed by HSE prior to any application for a nuclear site licence under NIA65[27] that may be made based upon the particular design proposal that has been assessed.

The system of licensing nuclear installations

Regulatory body responsibility

7.18. The Nuclear Installations Act 1965 etc. (Repeals and Modifications) Regulations 1974[42] made HSE the nuclear licensing authority for nuclear sites. As a result, under NIA65 no site can be used for the purpose of installing or operating a nuclear installation unless a nuclear site licence is currently in force, granted by the HSE. The authority to grant a nuclear site licence is delegated to Her Majesty's Chief Inspector of Nuclear Installations, who is also the Director of HSE's Nuclear Directorate (ND), which administers this licensing function on the Executive's behalf.

7.19. RSA93 as amended by EA95 makes the EA the regulatory body for authorisations for the disposal of radioactive waste in respect of nuclear licensed sites in England and Wales and SEPA the regulatory body for Scotland. By issue of Directions to the environment agencies, as part of the implementation of the Basic Safety Standards Directive 96/29/Euratom, a number of the environment agencies' existing administrative practices under RSA93 were made legally binding obligations.

Regulatory body independence

7.20. HSE's independence as a regulator is ensured under HSWA74, where HSE is given direct responsibility for the enforcement of the nuclear safety regulatory system. Similarly, the environment agencies are made responsible to provide the environmental protection regulatory system under RSA93.

7.21. There are also governmental mechanisms in place to maintain the regulatory independence. HSE is sponsored by the Department for Work and Pensions (DWP),

which has no role in promoting nuclear technology or responsibilities for facilities or activities. However, the Secretary of State for Business, Enterprise and Regulatory Reform is answerable to Parliament for nuclear safety in Great Britain. In this respect HSE can provide factual information to this Minister on matters of nuclear safety regulation, but this Minister is not responsible for HSE's nuclear regulatory actions. In addition, HSE maintains good lines of communication with the Department of the Environment, Food and Rural Affairs (Defra), notably the Radioactive Substances Division, to ensure that the nuclear safety implications of environmental policy and vice versa are properly considered. Defra again has no role in promoting nuclear technology or responsibilities for facilities or activities.

7.22. EA is sponsored by Defra and the Welsh Assembly Government (WAG). On radioactive waste matters, it works closely with the Radioactive Substances Division of Defra, the Department of Health (DoH) and the WAG. It also maintains good lines of communication with BERR.

7.23. SEPA is sponsored by the Scottish Executive. On radioactive waste matters, it works closely with the Environmental Quality Directorate of the Scottish Executive, the Radioactive Substances Division of Defra and the DoH. It also maintains good lines of communication with BERR.

7.24. The BERR 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 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.

7.25. In carrying out its responsibilities, BERR will, when appropriate, seek technical factual information on safety related matters from HSE and advice on environmental issues from the environment agencies through Defra.

7.26. Concordats or Memoranda of Understanding (MoUs) exist between the regulators and the Food Standards Agency. In addition, the Food Standards Agency acts as statutory consultee to both EA and SEPA under RSA93. Regular liaison meetings take place between EA and SEPA and the Food Standards Agency.

The legislative and regulatory framework for inspection and assessment of compliance and enforcement

Regulatory body authority

7.27. HSWA74 enables HSE to appoint inspectors and give them regulatory powers (see Article 8) of assessment and inspection. Extracts of HSWA74 relevant to this Convention are contained in Annex 3. Similarly, EA95 enables the environment agencies to appoint 'authorised persons' with regulatory powers to carry out similar duties and inspections.

7.28. The HSE's Nuclear Directorate (ND) is one of HSE's operational Directorates. Her Majesty's Nuclear Installations Inspectorate (NII) is that part of ND to which the day to day exercise of the Executive's nuclear licensing function is delegated. In particular, the Executive has delegated to the HM Chief Inspector of Nuclear Installations the authority to carry out on its behalf certain functions under the HSWA74 and NIA65. Thus the Chief Inspector has the powers to grant or vary Nuclear Site Licences, to attach, vary or revoke Conditions of the Licence. Deputy Chief Inspectors have the powers to Direct the shutdown of operations or issue Consents to allow reactors to commence operation after statutory shutdowns. Annex 2 lists HSE's powers under a Nuclear Site Licence.

Regulatory body staffing

7.29. HSE controls the budget for the recruitment of nuclear installations inspectors. HM Chief Inspector of Nuclear Installations bids for resources from HSE based on reviews of staffing requirements in the foreseeable future. After this process HSE appoints suitably qualified and experienced inspectors under Section 19 of the HSWA74 see Annex 3. Inspectors have letters of authorisation specifying the powers conferred on them under:

(i) sections 20, 21, 22, 25 and, in England and Wales, 39 of the HSWA74 (see Annex 3);

(ii) any health and safety regulation; and

(iii) the provisions of the Acts mentioned in Schedule 1 to the HSWA74.

7.30. Current staff numbers are given under Article 8 and more detail is provided in Annex 6.

Regulatory body financial resources

7.31. Section 24A of the NIA65 enables HSE to impose a financial charge on the nuclear licensees to recover the expenses incurred through its regulation of nuclear installations. In addition, further expenses are recovered from the largest licensees in respect of a programme of generic safety research agreed between HSE and the industry. HSE uses a work recording system to identify the effort and expenses of its staff attributable to each licensee.

7.32. Section 41 of EA95 provides EA and SEPA 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 EA and SEPA. EA and SEPA use a work recording system to identify the effort and expenses of its staff attributable to each licensee.

Appeal against regulatory decisions

7.33. Nuclear site licensees, like all duty holders under HSWA74, have the right of appeal to an industrial tribunal in respect of Improvement and Prohibition Notices. However, Section 44 of HSWA74 precludes the right of nuclear licensees to appeal over licensing decisions made under NIA65. This reflects the nature of the hazard being regulated and the particularly complex technical arguments that underpin most key licensing decisions. A licensee who is dissatisfied with a licensing decision may raise concerns with the site inspector and the relevant management in NII. Although HM Chief Inspector of Nuclear Installations is the final arbiter of licensing decisions, a licensee may seek a review by HSE of the process by which a licensing decision had been reached.

7.34. The process of Judicial Review is always open within UK law to challenge regulatory decisions, but this only applies to a review of process.

7.35. 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, or who do not have their applications determined within the appropriate period, may appeal to the Secretary of State. Appeals are sent to the Planning Inspectorate (PINS), which is an executive agency of the Department of Communities and Local Government and the Welsh Assembly Government. In Scotland, appeals can be made to Scottish Ministers and the appeals are handled by the Directorate for Planning and Environmental Appeals of the Scottish Executive.

Continuity of responsibility

7.36. Under NIA65, the nuclear installation licensing system applies throughout the lifetime of a civil nuclear site, including installation, commissioning and operation to eventual decommissioning. The NIA65 and HSWA74 allow the HSE to revoke a licence, or for it to be surrendered by the licensee. However, in either event, the licensee will remain responsible for the safety of activities on the site. This "period of responsibility" can end only when a new licence has been granted for the site or the HSE has given written notice that in its opinion there has ceased to be any danger from ionising radiations from anything on the site. HSE's new criteria for delicensing are described in Section 2.

Independent advisory bodies

7.37. Section 13(1)(d) of HSWA74 allows the HSC to appoint committees to provide the HSC with advice on any of its functions. Hence, the HSC is able to draw on independent expert technical advice on nuclear safety issues from an independent committee: the Nuclear Safety Advisory Committee (NuSAC). NuSAC comprises experts from industry, academia and elsewhere. It provides a technical forum in which nuclear safety issues, and any proposals that might impact on nuclear safety, can be considered in as open and independent a manner as possible. Its terms of reference are:

- *'To advise the HSC on matters which are referred to it or which it considers require attention regarding nuclear safety policy and its implementation at nuclear installations; and*
- *To advise the HSC on the adequacy and balance of HSC's nuclear safety research programme.'*

7.38. The HSC has established the Ionising Radiations Health & Safety Forum (IRHSF) to consider all matters concerning protection against ionising radiations that are relevant to HSC's remit. IRHSF 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.

Research and development

7.39. The UK nuclear safety research and development programme is undertaken to ensure the continued safe operation of facilities and activities on nuclear licenced sites in the UK and operates within the legislative framework of HSWA74. This Act places a duty on HSE to make arrangements for carrying out research to support its statutory role as the health and safety regulator and advisor, and also to encourage research by others. HSWA74, section 13(1)(f), gives HSC the power to carry out, arrange for, or make payments in respect of research into any matter connected with any of HSC's functions, and to disseminate information derived from such research.

7.40. The NIA65 gives the HSE, at the direction of the HSC, the further power to recover from the nuclear licensees any expenses incurred if it should consider it necessary to commission research into nuclear safety in support of its regulatory activities. The Atomic Energy Act 1989 transferred the responsibility to direct the UK's Generic Nuclear Safety Research Programme to the HSC and where necessary to recover the costs of this programme, which is managed by HSE on behalf of the HSC.

7.41. Most of the safety research in this programme is funded and either undertaken or managed by the licensees themselves. Research proposals and the results of any research projects undertaken as part of this generic safety programme

are shared with HSE. Also, HSE uses its powers to commission research of its own and recover its costs where,

- UK participation in international collaborative research is more appropriately carried out through a government agency (such as participation in OECD-NEA projects and the Euratom framework programmes), or
- HSE identifies a need to fund research to maintain its access to independent technical capability to support its regulatory responsibilities, or
- a licensee declines to undertake research that the HSE has judged to be important for nuclear safety.

Financial provision for radioactive waste management and decommissioning

7.42. 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 on 1 April 2005 with the formation of the NDA. These arrangements are financed by the taxpayer and subsume all previous financial provisions for decommissioning made by the publicly owned civil nuclear utilities. Separate arrangements for BEGL's privately owned NPPs are explained under Article 11. The NDA provides the strategic direction for cleaning up Britain's civil public sector nuclear sites including Magnox reactors. It does this both by managing contracts placed with the site operators (the Site Licence Company, which employs the operations staff, is the enduring entity which holds the nuclear site licence and discharge authorisation, and is subject to regulation by both HSE and the relevant environment agency) and by competing the ownership of the SLCs to provide improved strategic approaches and innovation to decommissioning. Full details of the NDA's work, including its strategy which has been agreed by Government following public consultation, can be found on their website[43].

Offences and penalties

7.43. Provisions as to offences are specified in HSWA74 sections 33 to 42. Penalties are defined in section 33 of the Act. The maximum penalty depends on the nature of the offence and whether the case is tried in the Magistrates Court or in the Crown Court. The maximum penalty in the Magistrates Court is a fine of £20,000 and/or a prison sentence of six months. The maximum penalty in the Crown Court is an unlimited fine and/or a prison sentence of two years.

Obligations under international treaties, conventions or agreements

7.44. The IRR99 made under the HSWA74, implemented most of the revised Basic Safety Standards Directive (96/29/Euratom)[29]. IRR99 also implement Council Directive 90/641/Euratom[30] on the operational protection of outside workers exposed to the risk of ionising radiation during their activities in controlled areas.

7.45. REPPIR implements in Great Britain the articles on intervention in cases of radiation emergency in Council Directive 96/29/Euratom. REPPIR also partly implement Council Directive 89/618/Euratom (known as the Public Information Directive on informing the general public about health protection measures to be applied and steps to be taken in the event of an emergency). RSA93 was amended by the EA95 so that the EA is the regulatory body for authorisations in respect of premises in England and Wales and the SEPA is the regulatory body for Scotland. As part of the implementation of the Basic Safety Standards Directive 96/29/Euratom a number of the Agencies' existing administrative practices under RSA93 have been put into legally binding obligations.

7.46. EIADR99 implements the requirement for an environmental impact assessment for decommissioning nuclear power stations and nuclear reactors arising from Council Directive 85/337/EEC (as amended by Council Directive 97/11/EC) on

the assessment of the effects of certain public and private projects on the environment.

Involvement of public and other bodies in the regulatory process

7.47. Planning permission is obtained from the relevant local authority under the Town and Country Planning Act 1990 for England and Wales or the Town and Country Planning (Scotland) Act 1997 for Scotland. In Scotland, in due course, this will be replaced by secondary legislation bringing in to force the provisions of the Planning etc (Scotland) Act 2006. In some instances, an application for planning permission may be "called in" by the relevant Minister for ministerial decision. This usually reflects the fact that the development is seen as having national importance. The planning authority may suggest the "call in". Where an application for planning permission is "called in", a local Public Inquiry is set up. In England and Wales the independent Planning Inspectorate arranges for one of its inspectors to hear and receive evidence for or against the proposal. The inspector then makes a report and a recommendation to the Secretary of State for Communities and Local Government or the Welsh Assembly Government. In Scotland, the Directorate for Planning and Environmental Appeals determines appeals under delegated powers other than in cases where the decision is taken by the Scottish Ministers. This decision is made public by letter issued by the staff of the Planning Decisions Division of the Scottish Executive Planning Directorate.

7.48. The planning application process provides an opportunity to inform and obtain views from the public. For major developments such as a radioactive waste repository, this would be through the public inquiry process. Similarly, the environment agencies will consult on a developer's application for the authorisation of disposal of radioactive waste in a repository. HSE, EA 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 2002[44], the Freedom of Information (Scotland) Act 2002[45], and the Environmental Information Regulations 2004[46].

7.49. One of the statutory objectives of the environment agencies is to develop a close and responsive relationship with the public, local authorities and other representatives of local communities and regulated organisations. In determining applications for radioactive waste disposals on or from sites licensed under NIA65, the agencies consult statutory bodies such as local and health authorities, fisheries and agriculture committees, in addition to the Food Standards Agency and the HSE. They also undertake wide public consultation. After considering all the views expressed, they publish a "decision document" setting out their decision and the reasons behind it, including their response to issues raised during consultation. In Scotland, SEPA also consults with the Scottish Executive for applications made to dispose of radioactive waste from nuclear licensed sites under the terms of a mutual agreement.

Application of new requirements to existing facilities

7.50. Modifications to either the design intent of a new plant or the upgrading of facilities in an old plant represent a change that affects the validity of the existing safety case. Consideration of such changes is an essential element in the justification of the proposed modification, and is controlled under the licence conditions. In such situations, the licensee has to update the safety case to the satisfaction of HSE before any change significant to safety is made. More information on the licence conditions and their coverage is given under other Articles, particularly Articles 6 and 14, and Annex 5.

Article 8 - 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 7, and provided with adequate authority, competence and financial and human resources to fulfil its assigned responsibilities.***
>
> ***2. Each Contracting Party shall take the appropriate steps to ensure an effective separation between the functions of the regulatory body and those of any other body or organization concerned with the promotion or utilization of nuclear energy.***

Under this Article, compliance with the Convention is demonstrated in a way that has not substantially changed since the third UK report (i.e. in a way that has implications for the Convention obligations), except in paragraphs 8.7, 8.8, and 8.26 to 8.29 below.

Organisation of the regulatory body

8.1. The legal framework of the regulatory body was introduced under Article 7. Further details of the regulatory structure and operation are provided below and at Annex 6.

Health and Safety Commission

8.2. The Health and Safety Commission (HSC) was set up by HSWA74 as the overarching body that sets the policy framework for health and safety regulation. The HSC is appointed by, and reports to, the Secretary of State for Work and Pensions, though it may report on specific matters to other Secretaries of State as appropriate. In particular, it advises the Secretary of State for Business, Enterprise and Regulatory Reform on nuclear safety policy matters relating to civil nuclear sites. The HSC's duties include:

(i) assist and encourage people to promote health and safety at work;

(ii) make arrangements to carry out and publish research and provide training and information in connection with health and safety at work;

(iii) ensure that people are kept informed of, and adequately advised on, matters relevant to health and safety at work; and

(iv) submit proposals for the making of regulations.

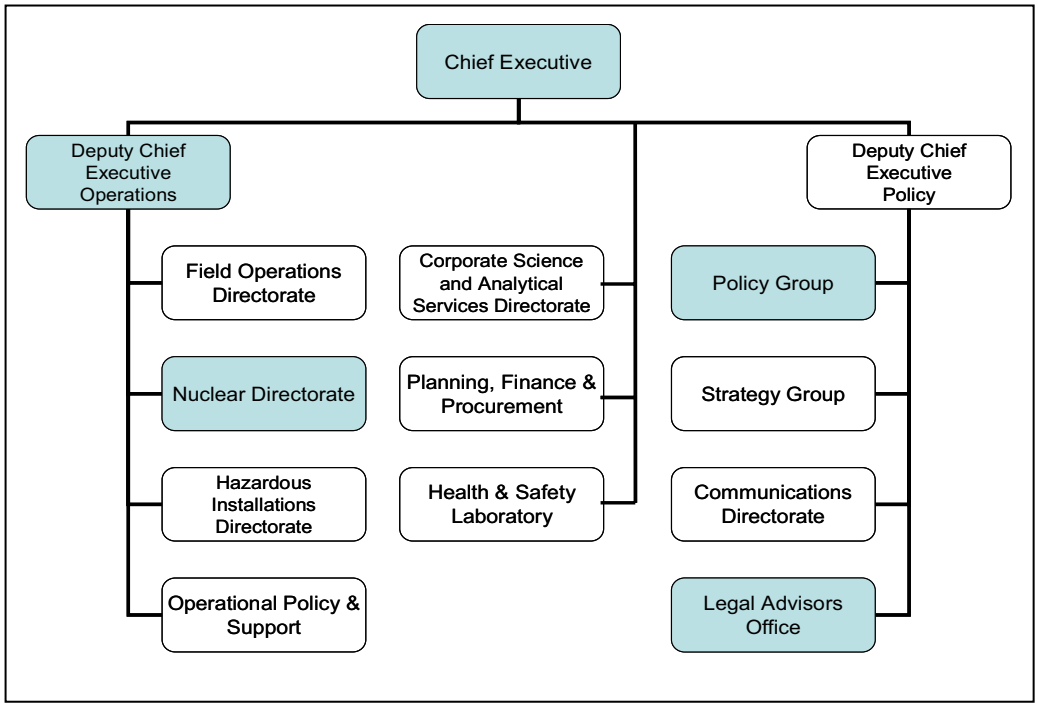
8.3. The HSC has general oversight of the work of HSE, provides general policy direction for HSE's nuclear activities and has power to delegate to HSE any of its functions. However the HSC is precluded from giving directions to HSE about the enforcement of the HSW Act in any particular case. HSE converts HSC's policy into strategic initiatives.

Health and Safety Executive

8.4. The Health and Safety Executive (HSE or the 'Executive') is the second body set up by HSWA74 and comprises three persons appointed by HSC with the approval of the Secretary of State. The Executive's duty is to enforce the relevant statutory provisions where it is the enforcing authority; to exercise on behalf of the HSC such of the HSC's functions as HSC directs; and to give effect to any directions given to it by HSC (except that HSC cannot give the Executive any directions as to enforcement in a particular case). HSWA74 empowers the Executive to employ civil servants to assist it, who are known collectively as the HSE. In particular, the Executive appoints inspectors, to allow it to carry out its duties. Inspectors have a

range of powers including powers of entry, powers to investigate and, in England and Wales, to prosecute. HSE's structure relevant to the Convention is shown in Figure 8.1 below.

Figure 8.1 - HSE structure relevant to the Convention



8.5. HSE is responsible for enforcing legislation on health and safety at work and in particular, in relation to nuclear installations, for the operation of the nuclear site licensing regime. Within HSE, the responsibility for regulating the nuclear industry has been delegated to its Nuclear Directorate (ND). ND includes HM Nuclear Installations Inspectorate (NII) and it is NII that carries out the licensing and day-to-day regulation of the nuclear industry. Licensing powers are delegated to HSE's Director of the Nuclear Directorate, who is also Her Majesty's Chief Inspector of Nuclear Installations. This delegated authority from the Executive gives the Chief Inspector the power to issue, add conditions to, and revoke nuclear site licences.

8.6. Her Majesty's Chief Inspector of Nuclear Installations has direct lines of access, on nuclear safety matters, to Ministers for the Department of Business, Enterprise and Regulatory Reform and the Ministry of Defence, reflecting their respective responsibilities to Parliament on civil and military nuclear safety.

Environment Agency and Scottish Environment Protection Agency

8.7. The EA is the principal environmental regulator in England and Wales. SEPA has the equivalent responsibilities in Scotland. Their regulatory responsibilities include the authorisation of the disposal of radioactive wastes from nuclear licensed sites. There are no nuclear installations in Northern Ireland to which this Convention applies.

Responsibilities of other Agencies and bodies

8.8. The Health Protection Agency (HPA) was established on 1 April 2005 under the Health Protection Agency Act 2004[17] as a non-departmental public body, replacing the HPA Special Health Authority and the National Radiological Protection Board (NRPB), and with radiation protection as part of health protection incorporated in its remit.

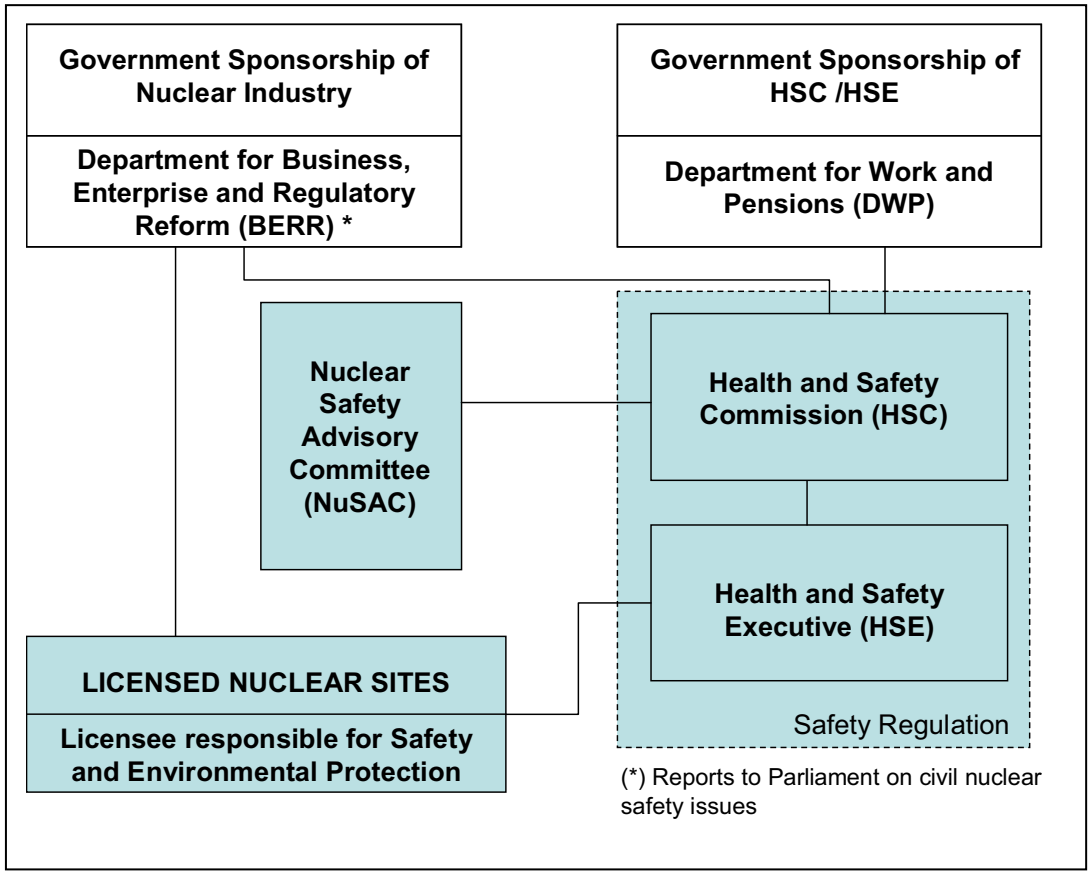
8.9. The NRPB role continues as the Radiation Protection Division (RPD) of HPA. Their statutory functions include:

- the advancement of the acquisition of knowledge about protection from radiation risks; and
- the provision of information and advice in relation to the protection of the community (or any part of the community) from radiation risks.

8.10. RPD also provides technical services to persons concerned with radiation hazards; and makes charges for such services, and for providing information and advice.Further information on the nuclear installations' regulators is at Annex 6, which includes: mandates and duties; structure; and resources.

8.12. Figure 8.2 illustrates the responsibilities of the various bodies relevant to nuclear safety in the UK and how they interact.

Figure 8.2 - Responsibilities for nuclear safety at nuclear installations (licensed sites)



Regulatory Body organisational structure

8.13. HSE's Nuclear Directorate normally reassesses the resources it needs to regulate the nuclear industry about every five years taking account of potential changes in the nuclear industry over the following 20 years. In doing so, it builds on earlier horizon scanning exercises and on strategic reviews of the most probable scenario for the industry using current information. The assessment provides a detailed analysis of nuclear regulation and resource projections, which not only considers the work arising from the changing nature of the nuclear industry, but also considers its own structure including its retirement profile and a practical recruitment rate. Recent analysis showed projected recruitment needs were insensitive to a detailed understanding of the workload scenario beyond five years, as any likely

change in the workload could either be matched by retirements, or there would be time to adjust recruitment requirements.

8.14. HSE's ND prepared a Strategic Plan for 2004 –2010[21], which sets down goals for that period. Additionally, more recent work has looked at the possible impact of potential new reactor build in the UK.

8.15. Resourcing projections are compiled against current predictions of regulatory activities, including statutory responsibilities to administer nuclear licensing, existing government policy, known licensees' requirements (such as the closure plan for reactors), reorganisation of parts of the nuclear industry and nuclear site restoration programmes. HSE currently has 165 nuclear safety inspectors in post, including those in managerial positions and 10 inspectors in training. HSE plans to recruit a further 35 inspectors this year.

Regulatory Body independence

8.16. The governmental infrastructure has been described under Article 7. In particular, under the HSWA74, HSE's independence as regulator of nuclear safety is ensured as HSE is given direct responsibility for the enforcement of the nuclear safety regulatory system. The potential conflict of interest between the roles of the nuclear safety regulator and the financial regulator has been addressed. The Gas and Electricity Markets Authority (GEMA) is the commercial regulatory body for the gas and electricity supply industries in England, Wales and Scotland. Its principal duty is to protect the interests of consumers of gas and electricity wherever appropriate by promoting competition in the shipping, transportation or supply of gas and the generation, transmission, distribution or supply of electricity. GEMA has a duty to consult HSC on '… all electricity safety issues …' and to take account of the advice offered, whether or not in response to such consultation. An 'electricity safety issue' is '..Anything concerning the generation, transmission, distribution or supply of electricity which may affect the health and safety of members of the public, or persons employed in connection with any of those activities'. In addition, a Memorandum of Understanding (MoU) has been drawn up between GEMA and HSE to provide a mechanism for consultation between the two parties where there is, or could be, an overlap of interests, and particularly to ensure nuclear safety.

Regulatory responsibilities

8.17. HSE, the EA and SEPA work closely with one another to ensure the effective co-ordination of their respective regulatory activities at nuclear installations. They have agreed MoUs whose objective is to facilitate the minimisation of the overall detriment due to radioactive waste management on licensed sites, from generation to disposal. Under the NIA65, HSE consults the EA 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.

8.18. Similarly the EA or SEPA consult HSE under the RSA93[32] on proposed (new or varied) authorisations for disposals of radioactive waste including discharges to the environment.

8.19. In addition to their own routine inspection activities on nuclear licensed sites, the EA and SEPA carry out planned joint inspections with HSE and co-operate in investigations of incidents where appropriate.

Regulatory management system

8.20. HSE's ND has developed a Business Management System (BMS) to provide an integrated approach to system management, thereby ensuring that the system adds value to internal processes, and reflects the interests of ND's staff. It has been designed to document appropriate policies, management controls and process

controls in a manner that augments the experience, training and professional judgment of all staff. This is reflected in the systems Key Business Activity areas. The system is a living one, as a result experience of its use is gathered and fed back to improve systems if shortfalls are found.

8.21. Within the BMS, procedures and guides of ND's key processes (Key Business Activities) are documented in a consistent manner. The activity-based approach ensures that the documentation adapts easily to accommodate re-organisations or changes in organisational focus. The system includes a means for continuous improvement. Audit, review and use of specified monitoring tools (e.g. the European Foundation for Quality Management Excellence Model), ensures that the focus on processes maximises the efficiency and effectiveness of efforts towards meeting ND's aspirations.

Principles, regulations and guides

8.22. The regulatory approach to nuclear safety in the UK is based on a nuclear site licensing regime (see Appendix 5). Hence, most of the requirements for nuclear safety are imposed by means of Conditions attached to the nuclear site licence. As a result, the HSE 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 implementing UK regulations (see Article 7).

8.23. Where regulations are appropriate the process of preparing them is as follows:

- A timetable for the preparation of the regulations is agreed with departmental lawyers;
- Instructions are prepared and agreed with the lawyers;
- Draft regulations are prepared and consulted on. The consultation includes a regulatory impact assessment and an equality impact assessment;
- Final draft regulations are developed taking account of consultation results.
- HSC (if they have responsibility for proposing the regulations), after consideration, approves the draft; and
- Draft regulations and an explanatory memorandum are prepared for relevant Minister to approve the Regulations be "made" (i.e. they are signed by the Minister).

8.24. The Regulations come into force at least 21 days after they are laid before Parliament. This is a complex process, but in simple terms, allows for the following:

- Scrutiny by Parliamentary Committees as to the merits and the drafting accuracy of the regulations.
- Most regulations are subject to the 'negative resolution' procedure, i.e. once the Regulations have been laid before Parliament, any member of each House of Parliament has 40 days from the laying date to object to the Regulations. If this results in a Parliamentary resolution to annul them and it is voted for in Parliament, the regulations cease to have effect. Some regulations are subject to the 'positive resolution' procedure, which means that they must be raised first before Parliament.

8.25. HSE has prepared Safety Assessment Principles (SAPs)[14], which form a framework that is used by its Inspectors as a reference for technical judgments on the adequacy of licensees' safety cases. SAPs also assist HSE in applying a consistent and uniform approach to its assessment process. In carrying out an assessment, the HSE nuclear inspectors judge the extent to which the safety submission shows that the design of the plant is in conformity with the relevant SAPs, noting that not all of the principles are applicable to every licensed site. Some of the SAPs embody specific statutory limits. Apart from these, the SAPs should be met, so

far as is reasonably practicable, which is a requirement of the HSWA74. There can, therefore, only be a rigid interpretation of those principles that reflect statutory limits. SAPs were revised in 2006 and are described in more detain in Annex 8.

8.26. HSE has prepared Technical Assessment Guides (TAGs), which are primarily guidance for its inspectors on the interpretation and application of the SAPs. There is also guidance relevant to principles underlining the enforcement of licence condition compliance, which supplements Technical Inspection Guides (TIGs). The TAGs provide guidance in particular technical areas, and they are used at the discretion of inspectors. Copies of TAGs and TIGs are available through the HSE website detailing HSE'S Internal Operational Instructions & Guidance[47].

Technical support organisations

8.27. The nuclear safety regulator in the UK does not use Technical Support Organisations (TSOs). Most of the expertise to regulate nuclear safety is available to the regulator through its own staff. To maintain this situation, the regulator periodically reviews its expertise and its likely needs for the near and intermediate term, and adjusts its recruitment and training activities accordingly. There are occasions, however, when specialist advice and/or additional resource are needed to respond to a high workload. To accommodate this, the regulator has an extramural support budget and framework agreements with some outside bodies known to be independent, to enable contracts to be placed quickly.

8.28. Currently, ND obtains technical support through three main sourcing routes:

- From within HSE; the Health and Safety Laboratory provided approximately 3 staff years in 2005/06 and this has almost doubled in 2006/07 due to initiatives taken by ND to make better use of the Laboratory's capability.
- Purchasing, through normal procurement routes, a range of one-off consultancy contracts from a range of suppliers.
- Purchasing consultancy advice through the HSE Framework agreement with a nominated supplier.

8.29. ND has concluded that this current approach will not supply it with the increase in capacity that we need in the future. ND needs to develop arrangements that better underpin our requirement to access a range of contractors with both capability and capacity to meet our future demands.

8.30. Taking account of a recommendation of the IAEA's IRRS in 2006 (see Annex 10), which stated that ND should have access to scientific and technical support in the same way it is available to many other nuclear regulators in other countries, ND proposes to develop a system for commissioning external support that is sustainable, flexible and adheres to procurement rules.

Advisory bodies to the Regulatory Body

8.31. HSC's Nuclear Safety Advisory Committee (NuSAC) and its terms of reference were introduced under Article 7.

8.32. The Chairman and the 20 members of NuSAC are appointed by the HSC, normally for a period of three years, and are drawn from a wide field of specialisms and expertise. They include four representatives from industry and four representatives from the unions. NuSAC discharges its responsibilities mainly through formal meetings of the whole committee and through sub-committees that report to the main Committee on particular subjects. On certain topics, NuSAC calls upon HSE and the nuclear licensees to give it appropriate information and considered opinions.

8.33. The HSWA74 makes it clear in law that the advisors can only advise, and HSE, as the regulator, is responsible for its regulatory decisions and

recommendations. NuSAC advises the HSC and it is therefore not responsible for commenting upon specific regulatory decisions.

International co-operation

8.34. HSE has a number of bi-lateral arrangements with regulatory bodies in other countries to ensure the smooth flow of information relevant to nuclear safety. In addition, HSE's nuclear installations inspectors attend and contribute to international discussions and initiatives on nuclear safety. This includes working with the International Atomic Energy Agency (IAEA) and the Organisation for Economic Co-operation and Development's Nuclear Energy Agency (OECD's NEA), Western Nuclear Regulators Association (WENRA) and the International Nuclear Regulators Association (INRA).

8.35. Representatives of HSE attend and contribute to international discussions and initiatives on nuclear safety standards and recommendations. This includes working with the IAEA, OECD's NEA, the EU and regulators associations.

8.36. HSE has also undertaken a review of its SAPs, and is currently in the process of reviewing its TAGs, by benchmarking them against IAEA Standards, this is addressed further in Annex 8.

Article 9 - Responsibility of the Licence Holder

Each Contracting Party shall ensure that prime responsibility for the safety of a nuclear installation rests with the holder of the relevant licence and shall take the appropriate steps to ensure that each such licence holder meets its responsibility.

Under this Article, compliance with the Convention is demonstrated in a way that has not substantially changed since the third UK report (i.e. in a way that has implications for the Convention obligations).

Operator's prime responsibility for safety

9.1. HSWA74 requires every employer so far as is reasonably practicable to:

i) ensure the health, safety and welfare at work of all their employees (HSWA74 section 2); and

ii) conduct their undertakings in such a way as to ensure that persons not in their employment who may be affected thereby are not exposed to risks to their health and safety (HSWA74 section 3).

9.2. In addition, NIA65 requires that in the case of nuclear installations, no one can construct or operate such an installation without a nuclear site licence. Section 7 of this Act places duties on the licensee in respect of nuclear occurrences.

9.3. In the UK, therefore, the holder of a nuclear site licence is responsible for the safety of its nuclear installations and also for the health and safety of its employees and members of the public that may be affected by the installations' operations. The non-prescriptive licensing regime in the UK ensures that the licensees recognise and accept their responsibilities, whilst allowing them to determine their own methods for meeting the law. The way in which this responsibility is carried out is monitored and, if necessary, safety improvements are enforced by the HSE as described in Annex 6.

9.4. With regard to the financial responsibilities of the operator for potential damages to the public or the environment, British Energy is insured against its liabilities and the Government has its financial responsibilities as a contracting party to the Paris and Brussels Conventions. HSE seeks assurance from BERR on the issue of liability before issuing a nuclear site licence, but does not have any review responsibilities.

9.5. The UK's legislation for health and safety, HSWA74 does not provide a route whereby the regulatory body can relieve the licensee of its responsibility for safety.

Demonstration of safety

9.6. Once a reactor design has been accepted for licensing, HSE determines after discussion with the licence applicant, those topics required to be dealt with in the applicant's safety submissions. These safety submissions describe the safety case for the nuclear installation. They typically cover the licensee's management and organisation structure, design safety principles and criteria (and a safety report showing how these are met), fault studies and quality management. This safety case is assessed by HSE as described under Article 14. During construction and commissioning, a number of hold points are agreed at which the licensee must receive HSE's Consent in order to proceed (see Annex 2). This would only be granted when HSE is satisfied that the licensee's responsibilities for safety are being met, and that an adequate safety case has been made for the next stage to commence.

9.7. Once a nuclear site licence has been granted, NIA65 enables HSE to attach any conditions to the licence that may have a bearing on safety. Currently, HSE

attaches 36 Conditions to a nuclear site licence that, in effect, envelope all the requirements for the effective management of nuclear safety. These Licence Conditions (LCs, listed in Annex 5) cover matters such as the need to set operating limits, to provide a list of competent persons, to draw up operating, test and maintenance activities, to manage radioactive waste, to report and investigate incidents, and to implement adequate arrangements for dealing with accidents or emergencies. Nuclear installation inspectors carry out a comprehensive programme to check that the licensee is complying with its arrangements made under each of the Licence Conditions.

Operator's responsibility for safe operation

9.8. A particularly important aspect of a licensee's safety case is its management and safety organisation. HSE requires that the licensee's safety policy and organisational structure are documented, as part of the licensing process. This document sets out the senior management structure, the health and safety responsibilities of key staff and, in particular, how health and safety performance is monitored and reviewed. The licensee ensures that its organisation maintains effective control of operations that take place at the licensed sites for which it is responsible. The licensee's organisation also acts as an 'intelligent customer' when contracting out work that could have an impact on safety. An intelligent customer understands the safety case for the plant and can manage the work of contractors ensuring that when goods and services are procured, the safety implications are fully understood.

9.9. All UK nuclear licensed sites have a designated site manager who acts as the Agent of the Licensee. The site manager is responsible for all day-to-day activities and operations. This includes responsibility for compliance with specified aspects of the nuclear site licence. The licensees have centrally based staff that, for example, set safety and operational standards, carry out reviews of safety and provide specialist support for a number of licensed sites. The responsibility for compliance with some site licence conditions for a specific site may be held centrally by the licensee.

Interfaces between the Regulatory Body and the Operator

9.10. The most frequent interfaces between the licensee and HSE arise through the assessment of safety cases and inspections at nuclear licensed sites by HSE to check the operator's compliance with licence conditions and other legal health and safety requirements. HSE nominates an inspector to each site to lead on this regulatory work (Article 14). The processes of assessment and inspection provide HSE with assurance that the licensee meets its responsibilities with respect to the licence conditions and safety case. The HSWA74 gives inspectors the power to enforce relevant legislation at nuclear installations by imposing legal sanctions against the licensee or its employees if appropriate, as described at Annex 3.

9.11. The licensees and HSE also have a formal hierarchy for meetings to address and resolve issues arising from the regulatory processes, see Table 9.1 below.

Table 9.1 - Licensee – HSE meeting interface levels

TYPE	MAIN BUSINESS	AUTHORITY
Level 1	Strategic plans and priorities Safety and regulatory strategy Consider matters raised from Level 2 Monitor overall progress	Establish plans Resolve issues Action plans for lower levels
Level 2	Implement safety and regulatory strategy Plan for key stages in licensing programme Consider major regulatory/safety issues Consider matters raised from Level 3 Identify issues to be raised at Level 1	Agree Strategy Agree major stages Resolve/refer issues Action work at Level 3
Level 3	Discuss and agree programmes of work Progress resolution of regulatory issues Progress resolution of specific issues Consider matters raised from Level 4 Identify issues to be raised at Level 2 Formalise agreements	Agree programmes Resolve/refer issues Action work at Level 4
Level 4	Gather and exchange information Test understanding Identify issues to be raised at Level 3	No authority (but can refer issues to Level 3)

9.12. Representatives at the four levels of meeting from the licensee and regulator are as follows in Table 9.2. For meetings at Levels 1, 2 and 3, it would be usual for the senior representative on each side to be accompanied by support staff.

Table 9.2 - Representation at formal meetings between the regulator and licensee

	HSE	LICENSEE
Level 1	HM Chief Inspector of Nuclear Installations	Relevant Licensee Chief Executive Officer
Level 2	Deputy Chief Inspector of Nuclear Installations	Licensee Executive Team (Managing Director, Directors of operations, engineering, safety and regulations, etc.)
Level 3	Superintending Inspector of Nuclear Installations and other inspector grades as necessary	Licensee's Managers and Group Heads and supporting staff.
Level 4	Nuclear Installations Inspectors	Licensee's supporting staff.

Article 10 - Priority to Safety

Each Contracting Party shall take the appropriate steps to ensure that all organisations engaged in activities directly related to nuclear installations shall establish policies that give due priority to nuclear safety.

Under this Article, compliance with the Convention is demonstrated in a way that has not substantially changed since the third UK report (i.e. in a way that has implications for the Convention obligations) except in paragraphs 10.7, 10.8. and 10.12 to 10.17 below.

The regulator's (HSC's and HSE's) priority to nuclear safety

10.1. HSC's and HSE's business is to ensure that risks to people's health and safety from work activity are properly controlled, in ways that are proportionate to risk, allow for technological progress, and pay due regard to cost as well as benefits. They act in close consultation with those whom they regulate or who are affected by work activities, and promote better management of health and safety through systematic approaches to identifying hazards and assessing and controlling risks.

10.2. It should be noted that the UK's non-prescriptive, goal-setting regulatory system is not 'self-regulation'. Rather, in relation to nuclear licensed sites the Conditions attached to the Nuclear Site Licence are designed to encompass the overall management of nuclear safety at the site. Licensees are required to submit a licence compliance statement to show how they comply with the requirements of the licence. HSE, when satisfied with the compliance statement, requires the licensee to comply with the Licence Condition arrangements.

10.3. The Sizewell B and Hinkley C Public Inquiries[48, 49] were set up on behalf of the relevant Secretary of State under the legislation at the time (Electric Lighting Act 1909 and Electricity Act 1957). The Secretary of State appointed eminent legal Counsel as "Inspectors" to preside over the two inquiries. The Inspectors were assisted in technical matters by a number of eminent experts. Any person or organisation, UK or foreign, could volunteer evidence. The Inspectors were free to choose the methodology and the way of evaluating evidence, within broad terms of reference chosen by the Secretary of State. The findings were made available in published reports.

10.4. The Sizewell Inspector reported on the total safety process, in order that the process need not be subject to a similar degree of public scrutiny in any future Inquiry. The system of nuclear installation regulation in the UK was found to be acceptable by the Inspectors at both public inquiries.

10.5. There are no nuclear power plants currently under construction in the UK. However, the licensee is responsible for safety and is required to be an intelligent customer to ensure that any proposed reactor design meets its safety requirements.

10.6. The UK's nuclear installation licensees are committed to giving due priority to nuclear safety. This commitment is reflected in the companies' annual reports, as indicated below.

The operators' priority to nuclear safety

Magnox Electric Ltd

10.7. Magnox Electric Ltd (MEL) is a BNFL Group Company. At the time of preparation of this report, BNFL had just announced the sale of its Reactor Sites Management Company (including control of Magnox Electric Ltd) to the US company, Energy Solutions. At the same time, Magnox Electric Ltd is in the process of being split into two separate licensee companies (North and South) to reflect the NDA strategy for competition in the award of Management and Operation contracts. This change is being managed through controls in place to satisfy site licence condition LC36.

10.8. As a BNFL Group Company, Magnox Electric is required to work under the BNFL policies and values. These policies and values are given in the BNFL 2006 Corporate Responsibility Report[50], from which the following text has been extracted.

"We recognise that our health and safety performance is essential to the success of our business, and we continually look to drive improvement in this area. Accountability for environmental, health and safety performance rests at the highest levels of the business. The BNFL Board is accountable for EH&S strategy. EH&S is a central feature of each Executive meeting, with additional quarterly Executive meetings dedicated solely to EH&S policy and performance. To reflect progress over recent years, we set increasingly more demanding targets for our safety key performance indicator (KPI)".

"We aim to inspire good EH&S practice from the highest levels and ensure it is shared across the businesses. We do this by maintaining a culture of continuous improvement in the key focus areas of: leadership in EH&S, better communications, promoting learning and involving all employees at every opportunity."

"We stringently control employee exposure to radiation, and our Group policy requires the businesses to seek to minimise radiation doses to all of our employees and contractors."

"We have reviewed our general nuclear safety performance to ensure that it remains a focus for the business. Despite the recent organisational restructuring, nuclear safety and EH&S education remain absolute priorities."

"BNFL believe that 'nothing is more important than the protection of the environment and the health and safety of the workforce, contractors and public. Excellence in environment, health and safety (EH&S) is an integral part of our business and is essential to our commercial success.

BNFL's EH&S policy is by seeking continuous improvement to achieve and maintain excellence in EH&S and operational performance.

Our primary goal is that no harm should result from our activities and that we will be respected and trusted by our workforce, the public and our stakeholders. In pursuing this we will work in partnership with employees and contractors at all levels in BNFL, and will strive to:

- eliminate injuries and ill-health at work and minimise radiation doses;
- prevent incidents, but nevertheless maintain effective emergency arrangements;
- prevent pollution and minimise waste and the use of natural resources as part of our contribution to sustainability and environmental improvement;
- ensure the safe disposal or storage of radioactive and other waste;
- achieve and sustain an excellent safety and environmental culture;
- learn the lessons from events, implement corrective actions and seek out and use good practices wherever we may find them;

- ensure that our activities, products and services are in compliance with applicable legislation and meet the requirements of good practice and applicable standards of EH&S performance.

In doing this we will:

- consult our employees on EH&S matters of mutual interest.
- listen to and respond to our customers, shareholder, suppliers and neighbours.
- openly report our EH&S performance every year.
- work with our regulators, the rest of our industry and our customers and contractors to raise EH&S standards.
- inform, instruct, train and develop the people who work for us and ensure that competent EH&S advice is available.
- audit the management system which flows from this policy, and set and review EH&S objectives and targets, working within a quality framework.
- maintain high standards in the conduct of our operations, in particular by ensuring that they are adequately resourced and carried out by suitably qualified and experienced people and with regard to nuclear safety at all times."

British Energy Group plc

10.9. The British Energy Group plc web site[51] gives details of its Corporate Social Responsibility report for 2006 – 2007.

"British Energy Generation's safety management arrangements are an integrated part of our general management process. All our staff are involved in maintaining and improving safety standards. Formal consultation is through Health and Safety Committees at all locations. These are playing an increasing role in helping to improve safety culture and developing new approaches to health issues."

10.10. British Energy: Health and Safety Policy - the "Board of the Company will:

- Promote Health and Safety actively, giving priority to providing safe and healthy working conditions, safe plant and premises, and safe systems of work, to ensure, so far as is reasonably practicable, the safety and well being of staff, visitors, contractors and the general public;
- Work with staff and their representatives to improve Health and Safety, including consultation through Health and Safety Committees, for the company as a whole and locally at each company site.
- Deploy an effective Health and Safety management system, which ensures compliance with relevant legislation and embodies principles of continuous improvement in occupational Health and Safety awareness and performance
- Promote a culture of co-operation and open communication in which every opportunity is taken to learn from actual and potential failures of the Health and Safety arrangements and no unfair blame is placed on individuals.
- Monitor regularly the effectiveness of these provisions and arrangements. This will include benchmarking against external standards using the International Safety Rating System (ISRS) and independent Peer Review against the World Association of Nuclear Operators (WANO) Performance Objectives and Criteria.
- Ensure that the policy and the implementation arrangements are reviewed regularly and revised as required."

10.11. A UK nuclear installation licensee takes measures that seek to ensure that it has an understanding of the safety significance of any expertise bought in from outside the organisation and the licensee is in a position to take responsibility for the resultant effects on the site's safety. In addition, the licensee oversees and takes responsibility for its contractors' or consultants' activities to ensure that the use of

such resources does not compromise either the licensee's chain of command or the licensee's ability to control activities on the nuclear licensed site. As stated previously, this knowledge base within the licensee's organisation is known in the UK as being an 'intelligent customer'.

Management function's priority to nuclear safety issues

Magnox Electric Ltd

Organisation

10.12. Magnox Electric Ltd is the licensee organisation responsible for the management and operation of a number of nuclear installations owned by the Nuclear Decommissioning Authority. Under the Nuclear Installations Act 1965, the responsibility for Health, Safety and Environmental performance lies with the licensee and therefore with the Board of Magnox Electric Ltd. The Managing Director discharges the accountabilities through two regional organisations, which are being prepared for division into two separate licensee companies. Each region has its own Executive Committee and the Site Directors (who sit on the regional Executives) report to a Chief Nuclear Operations Officer (CNOO), who has responsibility for maintaining high standards of nuclear safety across all the sites.

Nuclear Safety Committees

10.13. On all matters related to nuclear safety, MEL takes advice from its Nuclear Safety Committees. These committees include independent members with extensive experience and knowledge in the field of nuclear safety.

Assurance

10.14. Within each region, the EHS&Q Director has the responsibility to provide assurance to the Executive that the licensee is meeting its obligations under various EHS&Q standards, including those relating to nuclear safety. In common with other plants across the world, operational power stations are subject to regular peer evaluations against the WANO Performance Objectives and Criteria. Staff from throughout the licensee's organisation also participate as members of peer evaluations of other plants. By these means, performance is measured against international standards and good practices are brought into the organisation from elsewhere. Programmed and reactive audits are carried out at all sites, with the outputs from these and other assurance activities being considered by a central scrutiny process on a regular basis to identify and act on generic issues.

Allocation of responsibilities

10.15. In common with other licensee organisations, responsibilities for nuclear safety are vested in a number of positions, both on individual sites and within the central support organisation. The CNOO is responsible for ensuring that nuclear safety requirements are implemented on the sites and taking an overview of nuclear safety performance. Standards for nuclear safety performance, including safety case production and operational standards are set by the Engineering, Strategy and Technical function, whose staff are also responsible for carrying out independent assessment of nuclear safety cases. The Environment, Health, Safety and Quality function are responsible for assurance of nuclear safety standards, via monitoring of indicators, assessment of audit results and on-site inspection activities.

British Energy Group plc

Organisation

10.16. British Energy Group Ltd has one nuclear operating company, British Energy Generation Ltd. (BEGL). The nuclear operating company is the nuclear licensee. Responsibility for Health, Safety & Environmental performance within the licensee

lies with the Board of that company. The Chief Executive Officer (CEO) of British Energy plc is the Chairman of the licensee company and has executive responsibility for ensuring that the company operates safely and complies with legislative and regulatory requirements. The CEO is also responsible for ensuring that those appointed to the Board of the licensee company, or who influence strategic direction in areas which impact on nuclear safety, are suitably knowledgeable on nuclear industry requirements and standards.

10.17. BEGL has divided its nuclear power stations into three operating regions, each lead by a Chief Nuclear Officer. The central support organisation to the stations is grouped under the Chief Technical Officer.

Nuclear Safety Committee

10.18. On all matters related to nuclear safety, BEGL takes advice from its Nuclear Safety Committees. This committee includes independent members with extensive experience and knowledge in the field of nuclear safety.

Safety and technical division

10.19. BEGL has a Safety and Technical Division charged with independently scrutinising the licensee's arrangements and performance.

British Energy: review and audit

Peer evaluation

10.20. Peer Reviews against the Performance Objectives and Criteria set by the World Association of Nuclear Operators (WANO) take place at all UK nuclear power stations, as at the majority of nuclear power stations around the world. The Performance Objectives and Criteria provide a detailed description of the characteristics of a safe and reliable nuclear power plant under 10 general headings:

- Organisation and Administration
- Operations
- Maintenance
- Engineering support
- Training and qualification
- Radiological protection
- Chemistry
- Operating experience
- Fire protection
- Emergency preparedness.

10.21. The peer review programme identifies strengths and good practices, which are shared between the UK nuclear operators and internationally with other WANO members. It also identifies improvement areas. In recognition of the benefits of performing these reviews, BEGL has increased their frequency, and there is now a programme to undertake a review at each station every 3 years.

Allocation of responsibilities

10.22. The licensees' arrangements provide an effective allocation of responsibility between corporate functions and the local managers. Reporting to the Board of Directors, there are a number of Heads of Functions or senior managers who run divisions responsible for certain aspects of the company's activities. Divisional Directors also report to a Chief Executive with the responsibility for the day-to-day running of the company. The Safety and Technical Division has a special status as it

reports directly to the Chairman of the British Energy Group. In this way, it has authority and independence from the company's commercial activities.

10.23. The three Chief Nuclear Officers (CNOs) provide a co-ordinated management system for the operation of the nuclear installations. For example, the Station Director can be responsible for: a nuclear installation or group of nuclear installations situated at one site; implementing the company's safety policy; and ensuring that safety responsibilities are effectively discharged. The CNOs ensure consistency across the plants.

10.24. The central functions that provide services to all sites are grouped within the central technical organisation responsible for providing technical support to Station Directors for the preparation, development and assessment of the nuclear installation safety cases. These functions include specialist areas covering such aspects as fuel performance, fault studies, structural integrity, human factors, operational experience feedback, quality assurance and support for technical training standards.

10.25. The Safety and Technical Division seeks to ensure that appropriate health and safety policies and standards are formulated and promulgated throughout the company. It provides advice and monitors independently the effectiveness of and compliance with the company's health and safety policy. The monitoring programme includes independent on-site inspections and reviews of the various health and safety performance indicators. The Division has responsibilities for all health and safety issues, including: safety standards and independent assessment of nuclear installation safety cases; radiation protection; independent audit, surveillance and review. It also forms a view on the adequacy of quality assurance arrangements.

10.26. The Safety and Technical Division also includes the function called the Design Authority, that ensures the overall Station Safety Case is maintained, and coordinates Periodic Safety Reviews.

Operating rules

10.27. Key to the safe operation of our power stations is the quality of the procedures and guidance available to operational staff. Following successful experience at Sizewell B, BEGL has recast the Operating Rules and Instructions at the AGR stations into a similar format. This structure, known as "Technical Specifications", is the approach in use at most high performing nuclear plants around the world. Two key benefits have flowed from this:

- The AGR Technical Specifications identify more clearly the limits and conditions within which the Station must be operated, and relate these to the requirements of the safety case.
- They identify the actions to be taken if these limits and conditions cannot be met, and the time limits within which those actions must be carried out.

10.28. An infrastructure was developed for the AGR Technical Specifications, governing such things as the authoring rules, the generic framework and the additional arrangements required when modifying Technical Specifications. The infrastructure encapsulates Company and international best practice, and ensures consistency across stations. Training modules have been produced for authors and verifiers involved in Technical Specification modification. The format of these Technical Specifications is identical to that in use at Sizewell B Power Station. Their content is based on the limits and conditions specified in the existing Operating Rules and Identified Operating Instructions in use at these stations.

10.29. Technical Specifications have been implemented at all Stations. On completion of the implementation programme, a generic review was carried out.

10.30. All AGR stations with experience of operating under Technical Specifications report an overall improvement in nuclear safety culture and an increase in the availability of nuclear safety related plant.

Activities outside normal procedures

10.31. Operating Rules define the envelope within which the plant normally operates. Occasionally, the plant condition may move outside this envelope and corrective action is promptly taken that returns the plant conditions back within the Operating Rule boundary. It is very improbable that an event would occur that would result in the plant condition moving significantly outside the Operating Rule boundary. Should this occur, symptom-based emergency guidelines are provided that advise the operator on appropriate action to ensure plant safety. If the event led to core damage, further guidelines are available to advise the operator on the safest action to take.

Proposed changes to licensees management structure

10.32. This is achieved through the arrangements made to meet the requirements of LC36, the wording of which can be found at Annex 5.

Article 11 - Financial and Human Resources

> 1. ***Each Contracting Party shall take the appropriate steps to ensure that adequate financial resources are available to support the safety of each nuclear installation throughout its life.***
> 2. ***Each Contracting Party shall take the appropriate steps to ensure that sufficient numbers of qualified staff with appropriate education, training and retraining are available for all safety-related activities in or for each nuclear installation, throughout its life.***

Under this Article, compliance with the Convention is demonstrated in a way that has not substantially changed since the third UK report (i.e. in a way that has implications for the Convention obligations) except in paragraphs 11.8 – 11.19 below.

Financial resources

11.1. Under UK law, a registered company must have sufficient assets to meet all of its liabilities to continue in business. A balance sheet of assets and liabilities is a required element of the annual accounts, which under UK law must also be audited and made available to the public. The published accounts for the UK's nuclear installation operators are on their web sites[50, 51].

11.2. The cost of operating a nuclear installation is determined by taking into account: the repayment of the capital costs; the operating costs; and liabilities, particularly from fuel reprocessing and decommissioning. To determine the capital cost, each nuclear installation was assigned at the start of its life an assumed operating life for accounting purposes. The nuclear power plant and facilities originally operated by BNFL are beyond their initially assumed operating lives but the assets and liabilities have now been transferred (with effect from 1 April 2005) to the NDA which has strategic oversight of its operations. For British Energy Generation Ltd, the AGR stations have assumed operating lives of 30-35 years and for the Sizewell B PWR, a life of 40 years was initially assumed. Achievement of each nuclear installation's initially assumed operating life is subject to ongoing satisfactory periodic safety assessments. The charge for depreciation of these assets is based on the 'straight line' method to write off the initial cost over their initially assumed useful lives.

11.3. However, the lifetimes of the plants may be different from their assumed accounting lifetime depending upon such things as economic, technical and safety factors. Special financial provision is made for the particular liabilities relating to the reprocessing and storage of spent fuel, the storage and disposal of nuclear waste and the nuclear installation's decommissioning costs. In particular, BEGL's decommissioning costs are to be met from the Nuclear Liabilities Fund established for this purpose when the company was restructured in 2005.

Financing safety improvements during operational life

11.4. The costs of making any necessary safety improvements during the operating life of a nuclear installation are treated as part of the installation's normal operating costs identified above. The principal elements of operating costs comprise:

- fuel (including the cost of new fuel and treatment of irradiated fuel);
- materials and services (the cost of engineering, including contractors, and consumable spares for maintaining the nuclear installations, 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 the accounting life).

11.5. As with any other expenditure, the operators' internal financial control processes determine the necessary authority required before commitments are made to make safety or any other improvements. These processes examine the impact on the operators' financial accounts of any proposal for improvement work, using discounted cash flow and cost-benefit analyses. Such analyses take into account both the immediate costs of carrying out the improvements and future income through continued electricity generation.

Financing radioactive waste management at nuclear installations

11.6. The published audited accounts of UK nuclear installation operators include details of waste management costs and of the provisions made in order to meet them. However, there is currently no disposal route for intermediate and high level radioactive waste (ILW and HLW) in the UK. The costs of storing these wastes comprise:

- costs actually incurred during the operational phase; and
- liabilities associated with the management of ILW and HLW before ultimate disposal during the decommissioning phase.

11.7. The cost of managing radioactive waste during the operational phase is an operational cost spread across the materials, services and staff costs in the reported accounts. The materials and services costs in the accounts include costs associated with disposals of low level radioactive waste (LLW) where the operator of the LLW facility sets a price that reflects all operational and liability cost considerations. (All disposals of radioactive waste, including those to the environment, are undertaken in accordance with regulatory authorisations. The regulator (either the EA or SEPA) recovers its costs in granting, monitoring and enforcing the authorisations from the operator).

Financing decommissioning programmes

11.8. NDA was set up under the Energy Act 2004 and is responsible for 19 sites previously owned by BNFL (i.e. the Magnox nuclear power stations, the Springfields nuclear fuel production facility; and the Sellafield site) and the UKAEA (notably Dounreay). It currently manages these through management and operation contracts with the site licensee companies, Magnox Electric Ltd for Magnox nuclear power stations and UKAEA (known as the “incumbents”), but will progressively offer all the management contracts to full competition from 2007 onwards.

11.9. The NDA’s Strategy (approved end March 2006) is the first ever UK wide plan for dealing with the historic civil legacy. The Strategy confirmed the NDA mission as delivering a world class programme of safe, cost-effective and environmentally responsible decommissioning and clean up of the nuclear legacy. It also confirmed its commitment to openness and transparency. The NDA does this both by managing contracts placed with the site operators (the Site Licence Company (SLC), which employs the operations staff, is the enduring entity which hold the nuclear site licence and discharge authorisation, and which is subject to regulation by both HSE and the relevant environment agency (EA or SEPA)), and by implementing competitions (as mentioned above) for the ownership of the SLCs, to reduce decommissioning costs through innovative and competitive practices.

11.10. The NDA has responsibility for expenditure of about £2.2 billion per annum. Half of this is from UK Government funding and half from commercial income receipts from the continued operation of nuclear power plant and facilities. However, this funding relates only to public sector nuclear sites and their associated plant and facilities. British Energy Generation Ltd is a private sector company with its own

duties and responsibilities. Full details of the NDA's work can be found at www.nda.gov.uk.

11.11. Under the Energy Act 2004, ownership of the Magnox nuclear installations' assets and liabilities passed to the NDA on 1 April 2005.

11.12. British Energy plc was formally restructured in to British Energy Group plc on 14 January 2005. Under the restructuring arrangements agreed between DTI and British Energy Group plc and its subsidiaries, British Energy Generation Limited and British Energy Holdings plc, which were cleared by the European Union, the Nuclear Liabilities Fund Ltd (NLF) was established to take over the assets of the previous Nuclear Generation Decommissioning Fund Ltd and to provide for a larger scope of funding compared with the previous arrangements (it covers for example the defuelling of British Energy Generation Ltd's (BEGL's) nuclear stations which was previously excluded). The UK Government will underwrite the costs of decommissioning BEGL's nuclear power stations and the discharge of certain nuclear liabilities not covered under contract with third parties, to the extent that there might be any shortfall in the NLF.

11.13. The NLF is to be used solely to fund BEGL's liabilities and, as such, is ring-fenced from the funds required to clean up the NDA's sites. It is managed by a board of Trustees appointed by DTI and British Energy Group plc.

11.14. Upon restructuring, the NLF was given the assets of the previous Nuclear Generation Decommissioning Fund and £250 million of bonds in British Energy Holding plc. In addition, BEGL is committed to provide additional funds to the NLF as follows:

- an annual lump sum based on the number of remaining operating facilities, plus a fixed amount for each tonne of uranium in fuel loaded into the Sizewell B nuclear power station (these sums are subject to indexation).
- BEGL is also required to pay 65% of its free cash flow (termed 'the cash sweep') into the NLF annually.

Both of these are paid by British Energy Group plc on behalf of BEGL. The NLF's right to the cash sweep is convertible, in whole or part, into British Energy Group plc shares that can be held by the Fund or sold to third parties. On 1 June 2007, the NLF sold 450 million shares, raising approximately £2.3 billion for the NLF, reducing its interest in the cash sweep to approximately 36%, and thereby achieving the Government's objective of diversifying the NLF's assets. The Secretary of State for Business, Enterprise and Regulatory Reform has indicated that he does not intend to direct the NLF to reduce its economic interest in British Energy Group plc by way of the cash sweep to below a strategic interest of 29.9%.

11.15. The arrangements for decommissioning BEGL's nuclear power stations and discharging its uncontracted liabilities are contained within the Nuclear Liabilities Funding Agreement (NLFA). Under this Agreement, BEGL is required to produce plans on a three year ahead and lifetime basis for the decommissioning of its stations, including the necessary pre-closure planning work. These are subject to review and approval by the Nuclear Decommissioning Authority (NDA). In addition, BEGL produces an annual report describing changes in the estimated costs of decommissioning and uncontracted liabilities over the previous financial year. This is also subject to review and approval by the NDA.

11.16. The NLFA also describes the process whereby BEGL can claim its costs from the NLF. This requires BEGL to make a formal application for funding qualifying clean-up work on a post-hoc basis. The NDA then reviews this and if approved, notifies the NLF, which then makes the approved payment to BEGL.

11.17. The NLFA specifies certain conditions under which any increases in liabilities are either allowed or disallowed. An example of the former would be costs arising

from changes to the regulatory regime, and of the latter, costs arising from BEGL's failure to meet the requirements of its site licence or discharge authorisations. These are subject to oversight by the NDA.

11.18. Although British Energy Group plc, as a private company and site licensee, is solely responsible for decommissioning its plants, the restructuring agreements provide for the Secretary of State to acquire BEGL's nuclear power stations for a nominal sum after they are closed, either to continue to operate them if this is safe and feasible, or to decommission them, e.g. by adding them to the NDA's portfolio of sites.

11.19. Financial details of British Energy Group plc's liabilities and the NLF are set out in the respective Companies' annual accounts.

Management of human resources for safety related activities

Regulatory background

11.20. HSW74[26] places responsibility for safety on the plant operator. This responsibility includes the competence and training of staff with safety related roles. Specific requirements are included in the Management of Health and Safety at Work Regulations 1999[40], in particular Regulation 13 on Capabilities and Training.

11.21. In addition, several licence conditions (LC) set goals on training and the management of human resources (see Annex 5). LC10 requires the licensee to make and implement adequate arrangements for suitable training of all those on site who have responsibility for any operations which may affect safety. LC12 requires the licensee 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 operation.

11.22. The licensees' arrangements made under other licence conditions such as plant modification procedures (LC22), emergency arrangements (LC11) and the control of corporate structure (LC36) also require that the licensee should address human resource and training issues.

11.23. HSE's role is to monitor the adequacy of, and compliance with, the arrangements made under the licence conditions. Under normal circumstances, HSE does not have any specific role in the selection, training and authorisation of staff to perform safety related duties. It does, however, have powers to intervene if, in its opinion, any person is unfit to perform the duties of a duly authorized person.

11.24. Training and human resource issues are addressed by nuclear inspectors when they are reviewing safety documentation requirements against HSE's SAPs[14]. The requirement is that provisions are made for training staff who will have responsibility for the safety of the plant. These include a management system for training on the site, analysis of jobs and tasks, development of training methods, assessment of trainees, revision training as required, and regular evaluation of training. Thus, licensees have in place a systematic approach to training and assessment of personnel with safety roles. Analysis of tasks provides an input to the specification of personnel training. Emphasis is placed on training that enables staff to implement accident management strategies, utilising appropriate instrumentation and items of plant that are qualified for operation in severe accident environments.

11.25. In order to comply with regulatory requirements, a licensee must demonstrate to HSE's satisfaction that it has:

- lines of authority leading to adequate control of the activities, whether these are carried out by the licensee's own staff or by contractors;
- adequate staff resources;
- precise definition and documentation of duties;

- integration of health and safety responsibilities into job functions;
- appropriately trained 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 peer review of the safety case, audit and review.

This demonstration is achieved by the preparation of adequate arrangement to satisfy the requirements of the relevant licence conditions.

Licensees' training programmes

Qualification, experience and training

11.26. For all tasks undertaken on site, licensees' and contractors' staff receive training: to make them aware of the safety hazards on the site, and in the use of preventive and protective measures established to reduce risks to health and safety. For each post or role with a responsibility for safety, licensees ensure that the duties, responsibilities and competencies are identified and that the training needs of an individual are met.

11.27. The assessed competence of an individual to undertake a specific task is achieved by a combination of:

- knowledge, academic and practical qualifications, assessed training and experience of the person;
- the instructions and information provided to the person; and
- the degree of control and supervision exercised in carrying out the task.

Training requirements are then identified, depending on the needs of the job and the assessed competence of the individual. Procedures for assessing competence prior to undertaking a safety related job are part of the arrangements made under LC10. Although the responsibility for evaluating an individual's suitability for a specific job rests with the licensee, NII will, as part of its inspection programme, inspect the adequacy and implementation of the licensees' training programmes.

11.28. LC12 requires that any posts on site that may affect operational safety, or that implement any actions connected with the site licence conditions, must be performed only 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. NII inspectors will again inspect adequacy and implementation of this process, and HSE has powers under the Site Licence to require that the licensee ensures that no person continues to act as a duly authorised person if, in the opinion of the Executive, he is unfit to do so.

Training of external personnel

11.29. When licensees use contractors for safety related work, they must satisfy themselves that the contractors' staff have the appropriate qualifications and training to undertake the tasks safely. The training of contractors' staff so that they comply with Site Safety Rules is part of the contractual agreements for such work.

11.30. When safety analysis work and/or inspection work (e.g. NDT examination) is contracted to organisations external to the licensee, HSE advocates the 'intelligent customer' approach. This means that the licensee should have sufficient in-house expertise to manage (and if necessary, challenge) the work of contractors.

11.31. In the UK, licensees are responsible for ensuring the safety on the licensed site and are required under LC17 to have quality assurance arrangements for all matters that might affect safety. Licensees are therefore responsible for ensuring, amongst other things, that its contractors are suitable for the work that they do. HSE has guidance for its inspectors on judging whether licensees and contractors meet

their safety responsibilities, and this guidance is available to licensees. It does not specifically prescribe the qualification, quality systems or performance of contractors but it does carry out inspections of the licensees' quality assurance arrangements. For critical components, such inspections may also involve examination of the quality assurance arrangements of suppliers or contractors. However it is always the licensees' responsibility to ensure that these arrangements are adequate.

Periodic reviews

11.32. The performance of employees is assessed continually by their line management. In addition, periodic formal appraisals are undertaken and recorded. In the course of these appraisals, corrective and development actions are identified and taken as necessary. This process is part of the arrangements made under LC10 for training.

Responsibility for training

11.33. The licensee is responsible for all safety matters. Therefore it is the licensee's responsibility to provide the necessary resources and facilities for training. Failure to do this would breach the requirements of LC10.

11.34. The need for training, in terms of the job requirements and the needs of the individual, are determined by the licensee's organisation.

Training programme development

11.35. The training programmes take into account changes to plant configuration, plant modifications and the corrective action needed to respond to incidents on site and on other sites. Plant modification proposals, made under the arrangements under LC22, identify where instructions and procedures need to be changed and the associated training needs. For large modifications that need stage Consents to be granted by HSE, evidence of satisfactory retraining may be a requirement prior to a Consent being granted to bring the modified plant into routine service.

Operational experience feedback in to training

11.36. LC7 requires the licensee to develop adequate arrangements for the notification, investigation and reporting of incidents on site. The outcomes of these investigations are reported to HSE. These reports ensure that any training deficiencies are identified and that the licensee takes the necessary corrective action.

11.37. The adequacy of all training courses is kept under review and takes account of feedback from trainees and their line managers. The training arrangements are the subject of internal audits by the licensee's staff and also routine and team inspections by HSE inspectors.

Priority for training

11.38. The conduct of training is an integral part of the arrangements made under LC10. This includes the provision of staff to cover for the work normally done by the trainees.

Competence of instructors

11.39. Training instructors comprise staff of proven competence and experience who are employed in the work area in which they provide training, as well as full time instructors normally based at a training centre. Instructors are given training in teaching and instruction methods. Arrangements are in place for line managers to assess the performance of instructors, and feedback is also provided by the staff receiving instruction.

Simulators

11.40. Computer based simulators are available for all reactor types and form part of the training of plant operators. The simulators are capable of simulating a range of accident conditions.

Beyond design basis

11.41. This is covered under the response to Article 16 (Emergency Preparedness) and Article 19 (Operations).

Technical support resources

11.42. The prime engineering and technical capability of the licensees comprises staff at operating and central locations. These staff provide the in-house resource available to respond to requirements for technical analysis and informed action which are immediate, and in those situations where plant-specific or specialist knowledge is not readily available elsewhere. Where it is economic and practicable, technical services may be procured from suitably qualified and experienced specialists in other utilities or organisations under appropriate contractual arrangements. These arrangements follow the 'intelligent customer' approach. Similarly, the technical services of the licensee may be contracted to external organisations where this does not compromise the support needs of the licensee's operating locations. In these areas, there may be technical support from, and collaboration with, other licensees.

11.43. Each licensed nuclear site has engineering and technical support staff who know and understand the nuclear safety case, its relationship to the plant, and the plant's operational characteristics. These staff are responsible, on behalf of the Station manager, for ensuring that nuclear safety cases are prepared at the location, in the central organisation, or externally. These staff are also responsible for the preparation, review and development of the written instructions that implement the limits and conditions of the nuclear safety case and the assessment of work for radiological significance.

11.44. The central engineering and technical organisation provides technical support to all locations. This includes a broadly based capability and specialists in key technical and safety areas which are recognised as specific to the licensee's reactors and are not readily and securely available in the external market. These staff understand the design of the stations and the nuclear safety cases that underpin their operation, and they prepare and modify the nuclear safety cases. The central engineering and technical organisation also has access to specialist facilities and support staff to enable it to maintain and develop the necessary knowledge base.

11.45. The licensee's health and safety function has its own technical capability and access to other technical capability. It is therefore able to carry out independent nuclear safety assessments and peer reviews of new safety cases, and proposals for modifications, experiments and decommissioning.

Plant operation resources

11.46. During the initial licensing process, the licensee makes a safety case that identifies the need and demonstrates the availability of sufficient numbers of suitably qualified staff. This case is reviewed as part of the Periodic Safety Review Process and at other appropriate times (such as relicensing). The licensee's case is reviewed by HSE, whose inspectors regularly inspect and assess the adequacy of the licensee's resources. This is also carried out during targeted inspections by human factors specialist inspectors.

11.47. Each nuclear licensed site has engineering and technical staff who are suitably qualified, experienced and, where appropriate, authorised to operate, maintain, improve and modify the plant in accordance with its nuclear safety case, and after getting the agreement of the regulator (see Article 14). These staff assess

the operational safety significance of any proposed work to check that suitable and sufficient preventive and protective measures have been provided and that there is sufficient first-line control and supervision of activities that may affect safety.

11.48. Plant improvements and modifications requiring more extensive project management or technical capabilities are carried out by the central organisation on behalf of the station manager. Where it is economic and practicable, maintenance services are procured from suitably qualified and experienced specialists in other utilities or organisations under appropriate contractual arrangements.

11.49. Project management capabilities are available to support new plants and major modifications on existing plants. These capabilities include the specification of items and services, supervision of contractors and the management of construction, installation and commissioning of plant.

Article 12 - Human Factors

Each Contracting Party shall take the appropriate steps to ensure that the capabilities and limitations of human performance are taken into account throughout the life of a nuclear installation.

Under this Article, compliance with the Convention is demonstrated in a way that has not substantially changed since the third UK report (i.e. in a way that has implications for the Convention obligations), but which has been updated to reflect the issues raised at the third Review Meeting.

Human factors in the design and assessment process

12.1. The UK's nuclear installation operators and regulators recognise that human performance plays an important role in ensuring the safety of a nuclear installation throughout every stage of its life cycle - from design, construction, commissioning and operation, through to decommissioning. Human factors are concerned with all aspects of human performance, and the factors affecting this performance, which can impact on the safe operation of a nuclear installation. Therefore human factors analyses are applied, as appropriate, to all activities and functions related to nuclear safety. The licensees, as well as the regulator, employ human factors specialists who carry out human factors assessments themselves, or who oversee work carried out by external consultancies on their behalf.

12.2. Where new nuclear installations are proposed, human factors assessments are carried out to inform the design process, and to confirm that the designs take due account of the needs of the User. It is usual to engage human factors specialists at an early stage of the design process in order that they can influence the design so that it reflects human capabilities and limitations and supports correct human action. All nuclear installations are also re-assessed as part of the periodic safety review (PSR) process (see Articles 6 and 14), and human factors analyses form an integral part of these reviews.

12.3. As part of the safety case supporting the operation of the nuclear facility, the licensees carry out fault analysis to identify initiating events that may occur due to human error and identify operator safety actions. In general, where a plant failure or incorrect operation leads to a need for safety system operation, the plant is designed so that it is rendered safe by the action of passive or engineered features. These, in general, offer greater reliability than the human operator, especially where rapid safety system operation is needed. Where operator safety actions are identified, and it is not reasonably practicable to provide an engineered safety system, analysis of the operator actions demonstrates that tasks required are feasible, and that they can be performed safely and reliably in the time available. Where the analysis indicates that improvements can improve human, and hence plant, reliability, these are considered as part of the 'as low as reasonably practicable' (ALARP) review process.

Application of ergonomic principles

12.4. Task analysis is carried out to identify the operator actions required to monitor the plant, diagnose plant state, make decisions and implement necessary actions. The analysis takes account of the physical, physiological and cognitive demands that may be placed on the operator and on teams of operators. It addresses the potential consequences of failure to perform the safety actions successfully, and the potential for recovery from error. The analysis forms a primary input to inform decisions on plant staffing, and on the equipment and other facilities which are provided to support the operator. In particular, it is important to the design of the User Interface, and also provides a basis for developing procedures and the content of personnel training. It

influences the way in which the job is organised, as well as being used to determine and demonstrate the feasibility of individual tasks. Ergonomics principles are applied to support reliable human performance and inform the design of the working environment, including factors such as access, noise, thermal and lighting conditions and communications facilities. Issues related to fitness for duty, such as shift working patterns and working hours (overtime) are also taken into consideration.

User Interface

12.5. The design of the 'User Interface' follows good human factors practice, to ensure that it is compatible with human psychological and physical characteristics, and to enable the required tasks to be performed reliably and efficiently. For new designs, a structured User Interface design process is adopted and relevant standards applied. In particular, the User Interface for the reactor main control room is based on a comprehensive and systematic task analysis, which identifies the operational requirements during normal, transient and fault conditions. The User Interfaces of existing nuclear installations have been subject to scrutiny during the PSR processes in order to ensure that they remain fit for purpose, and that operator actions are properly supported.

12.6. The design of the reactor control room enables the operator to carry out safety functions and tasks during normal operations, postulated fault conditions and, where practicable, severe accidents. Adequate provisions are available in the control room and at emergency locations to enable the monitoring of plant state in relation to safety, and to take any necessary safety actions. Due attention is given to the specification and design of local control stations, and to the design of all equipment having the potential to impact upon plant safety (for example, maintenance and testing equipment and computer-based systems used to present operating instructions).

12.7. The probabilistic safety assessments (PSA) undertaken on the nuclear installations provide quantitative assessments of the risk to safety arising from plant designs and operations. The PSAs highlight significant contributors to risk, and take into account the impact of human actions on safety. The licensees ensure that relevant operator actions are identified and modelled in the PSAs, and suitable methods are used to assess the potential errors associated with these actions and to determine the consequent human error probabilities.

12.8. The initial stage of the human reliability analysis identifies potential human errors which can impact on safety. The error identification process is rigorous and thorough. Quantitative estimates of human error probability are then produced for the significant human errors defined during the error identification process. The probabilities reflect influences on performance arising from psychological factors (e.g. stress, personal experience and knowledge) and with other task-specific factors (e.g., the physical environment, training, working practices, time constraints, adequacy of procedures and User Interface etc). Dependencies between actions are identified. The potential for impact of dependencies between separate operator actions activities (either by the same or by different operators) is assessed and the results are factored into the PSA. The potential for recovery from previous errors is also examined - this is especially pertinent where long timescales are available to take corrective action.

12.9. The licensees identify potential improvements as part of this analysis and use this information to ensure that risk is reduced so that it is ALARP.

Managerial and organisational human factors issues

Nuclear Directorate activities

Safety Assessment Principles - leadership and management for safety

12.10. HSE's Nuclear Directorate's recently (2006) revised Safety Assessment Principles (SAPs)[14], now have much greater focus on leadership and management for safety. The principles provide guidance to inspectors on ND's expectations of licensees regarding the foundation for the effective delivery of nuclear safety, including the development and maintenance of a positive safety culture.

12.11. The SAPs on Leadership and Management for Safety comprise four high-level interrelated principles: Leadership, Capable Organisation, Decision Making and Learning. More detailed attributes are set out for each principle. The attributes are expressed as outcomes to be achieved for effective leadership and management for safety rather than prescribing specific systems, processes and procedures required to achieve safety. Because of the interrelated nature of the principles, there is some overlap between them. They should be considered as a whole and an integrated approach will be necessary by licensees to deliver the expected attributes.

12.12. The Leadership and Management for Safety principles reflect:

a) the emphasis HSE's strategy gives to leadership and management for safety, the role of directors and worker involvement;

b) the necessary emphasis on leadership and managing people and processes as well as on engineering; and

c) the need to consider the management of safety throughout the whole organisation in building and sustaining a positive safety culture.

Safety culture

12.13. ND has developed a tool for examining a licensee's safety culture, which is based largely on IAEA work in this area. A successful pilot use of the tool took place in 2006, although it highlighted the need for a significant commitment of resources to undertake the assessment. ND intends to use the tool selectively to complement continual monitoring of safety culture – for example, where events indicate a weakening in safety culture or where a need to send a clear regulatory signal is identified. ND will be developing the mechanism for continuous monitoring of cultural indicators using the leadership and management for safety SAPs.

Safety performance indicators

12.14. ND has developed a generic framework of safety performance indicators (SPIs) based on IAEA TECDOC 1141, with additional factors to cover leadership and management. It is more difficult to define meaningful indicators for these factors, but world-wide experience (such as the Davis Besse vessel head corrosion event and the Texas City oil refinery explosion) reinforces the potential consequences of inadequate or insufficient indicators. All nuclear licensees are involved in identifying and agreeing with ND suitable metrics commensurate with the SPI framework. ND will be developing the use of these SPIs, including trending and analysis.

Corporate integrated intervention strategy

12.15. ND's principles on Leadership and Management for Safety are being used to develop the regulatory intervention strategy. The corporate element of ND's Integrated Intervention Strategy (IIS) recognises the need to address the licensee's organisation as a whole including directors, senior management and central/corporate functions, in addition to the plant and sites. The Corporate IIS embodies the concept of regulatory leverage; applying regulatory effort and attention in those areas most likely to be effective.

Licensees' activities

12.16. The licensees in the UK that operate nuclear reactors are making a number of improvements to processes which impact on organisational factors, human performance and safety culture.

12.17. In one licensee, these improvements include:

- A core organisational function has been established to drive continuous improvements through benchmarking and self-assessment. Many of the elements of the continuous improvement programme have been drawn from best practice in the USA.
- Development of its capability to learn from external events in both nuclear (e.g. Davis-Besse) and non-nuclear (e.g. Texas City) contexts. Specifically workshops have been used to promote safety culture based on the study of events at Chernobyl and Davis-Besse as well as events internal to the licensee. The workshops have encompassed managers and staff at all levels in the organisation, at all sites and in the corporate centre.
- Increased focus on human performance through the use of error reduction tools, enhancement of leadership skills, task observation and coaching to reinforce desired behaviours. An externally benchmarked and formally accredited systematic approach to training has been adopted.

12.18. Another licensee has also introduced measures that include:

- Development of its own practical, behavioural approach to assessing safety culture, known as SCART (Safety Culture Assessment and Rating Tool). The approach is based on observable behaviours and gives strong emphasis to 'leadership' as a key influencer of culture. It produces quantitative ratings to help monitor progress towards the desired standards and a qualitative analysis which reviews the underlying issues.
- To support human error reduction initiatives, significant numbers of staff have received bespoke training in the use of common human error avoidance tools. In addition, interventions as part of behavioural safety observations are encouraged through challenging targets monitored at Executive level.
- Increased focus on benchmarking including feedback from WANO/INPO visits and comparisons with high performing nuclear sites and other types of organisation.
- Setting Key Performance Indicators for completion of actions to time for each site. These rates are monitored at Executive level.
- A significant increase in the number of focused benchmarking visits its staff have made to other high performing organisations. These have included other nuclear sites both in Europe and elsewhere, and also to other organisations with a strong focus on human performance, such as air traffic control services. More emphasis has also been placed on the sharing of good practices between sites.

Further points

12.19. The UK licensees have a system for reporting receipt and assessment of reports of nuclear plant events and are members of World Association of Nuclear Organisations (WANO), and as such, share operating experience internationally. In addition, the HSE operates the IAEA's Incident Reporting System (IRS) on behalf of the UK. Nuclear utilities co-operate in programmes of Peer Evaluation and Operational Experience Feedback. Also, they participate in the programmes of WANO, the IAEA and the Institute of Nuclear Power Operations (INPO), which give an international perspective on performance levels. As well as the professional, focused critique which a station gains from an Evaluation or an IAEA Operational Safety Review Team (OSART) mission, the many staff who help conduct such

reviews bring home valuable insights and ideas, which can be applied at their own stations.

Regulator's assessment of human factors

12.20. The HSE's SAPs form the basis against which the regulatory assessment of human factors is carried out. They identify explicitly the need for a nuclear licensee to consider a comprehensive set of influences on human performance.

12.21. Regulatory assessment of the licensee's treatment of human factors is made throughout the life cycle of a nuclear installation. When a safety case is submitted to HSE, nuclear site inspectors, project managers and human factors specialists agree on the scope of any human factors assessment work that is appropriate to the case in question. HSE ensures that licensees place considerable emphasis on the inclusion of human factors analysis in the early stages of plant design in order to ensure that the design properly reflects the capabilities and limitations of human performance, and that reliable operator performance is adequately supported. A set of Technical Assessment Guides is being developed to support the consistent assessment of licensees' treatment of human factors issues.

12.22. Some aspects of human factors are specifically addressed by the nuclear site LCs (e.g. LC10 - Training, LC12 - Suitably Qualified and Experienced Persons), and compliance with these LCs is monitored as part of each nuclear site inspector's normal duties. To ensure this is done effectively, HSE's nuclear installation inspectors have access to training to help them to identify human factors concerns and they are then able to discuss these with the licensee or raise them with HSE's specialist human factors inspectors. A Technical Assessment Guide is provided to support HSE's review of licensee's arrangements for training and competence assurance. This is consistent with the expectations of IAEA as described in IAEA GS-R-3 and IAEA NS-G-2.8.

12.23. The HSE's human factors inspectors proactively identify areas of the licensees' operations for examination based on their awareness of issues which have been raised from a variety of sources, including national and international operating experience, developments in human factors techniques and research, and discussions with HSE and the licensee's personnel. HSE also maintains exchange arrangements on human factors, and other technical areas, with regulatory bodies and research establishments in other countries.

12.24. The HSE carries out targeted inspections of human factors-related issues. Such inspections provide confidence that the licensee's human factors analyses are implemented in practice. All areas of human factors can be examined in this way, but particular emphasis is given to targeted inspection of the licensee's management of safety and training arrangements. This reflects not only the significance of these areas, but also the fact that they can be subject to more regular change than other factors such as the User Interface.

12.25. With regard to assessment of safety culture, HSE considers it important that the licensees 'own' their safety culture. It is considered neither practicable nor desirable to compel a licensee to adopt a culture advocated by the regulator. The regulatory approach to this issue, therefore, is to seek information that allows HSE to make judgements about the licensee's safety culture, by reviewing indicators of plant and personnel performance, and to use these observations to encourage and support licensee initiatives to promote improvements. As described earlier, HSE has developed a tool for assessing licensee safety culture which draws upon IAEA work. HSE is also working proactively with licensees to understand and influence senior managers' awareness of safety culture and the steps that they take to promote a positive safety culture.

Article 13 - Quality Assurance

Each Contracting Party shall take the appropriate steps to ensure that quality assurance programmes are established and implemented with a view to providing confidence that specified requirements for all activities important to nuclear safety are satisfied throughout the life of a nuclear installation.

Under this Article, compliance with the Convention is demonstrated in a way that has not substantially changed since the third UK report (i.e. in a way that has implications for the Convention obligations), but has been updated to reflect the IAEA Requirements document GS-R-3.

13.1. This article has been addressed by considering the quality assurance issues arising from the IAEA's Requirements document GS-R-3 on "The Management System for Facilities and Activities." GS-R-3 has replaced IAEA 50-C/SG-Q in part. A further IAEA document (currently draft DS 349) "Application of the Management System for Nuclear Facilities" will supplement GS-R-3 to ensure that all elements of IAEA 50-C/SG-Q are addressed. This suite of documents, including a guide document for GS-R-3, includes quality assurance as part of an overall Management System which is described primarily in GS-R-3 under six basic headings, which have been used to structure the following text. The introduction heading of GS-R-3 is not included. The following paragraphs identify where UK organisations are meeting the new IAEA Requirements documents and also where there is still work to be done.

13.2. The HSE SAPs (see Annex 8) broadly reflect the new IAEA requirements. 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

Establish management system

13.3. Licensees' management systems (including QA programmes) are developed as part of their arrangements to meet LC17, 'Quality Assurance' (see Annex 5). They meet the requirements of national and international quality management Codes and Standards. In addition to including all the relevant elements of those documents, the management system is also the vehicle by which all other arrangements required to be made under the nuclear site licence are identified, referenced and controlled. Furthermore, any significant changes to the licensees' organisational structures or resources are controlled by arrangements made to meet the requirements of LC36, 'Control of Organisational Change'. Licensees are currently considering the implications of any requirements identified in GS-R-3 and the related documents that are not currently covered by IAEA 50-C/SG-Q.

13.4. Collectively, these arrangements provide a description of organisational structures and detail the arrangements for such things as the control of documentation, the provision of control and supervision, the establishment and maintenance of competency, the management, control and verification of work and the audit and review of performance. The development of integrated management systems by licensees supports the requirement to collectively consider safety requirements as part of a total business perspective.

Graded application

13.5. Graded application of QA is used by the licensees so that there is a hierarchy of controls applied to activities depending on the safety significance and the related hazards of the plant on which the activity is to be carried out. This approach ensures that appropriate levels of supervision, inspection, monitoring, documentation, training

and audit and surveillance are applied according to the safety significance of the plant, and the potential for error leading to the possibility of severe consequences associated with ill conceived or executed activities or equipment failures. Licensees use a well established process that allocates a QA grade to an activity. This grade relates to the control measures to be applied to the activity to ensure that it is carried out in accordance with the specification requirements, and that proper records are maintained. The process is also applied to contractors carrying out work on licensed sites where an element of control will be by the licensee and which may, for the highest QA grades, also require the involvement of an independent third-party inspection body.

Management responsibility

Commitment and resources

13.6. Licensees use a number of processes to support continual improvement of the management system. In addition to established arrangements for self and independent audit and operational experience feedback, licensees periodically review their management systems to ensure that these are providing and delivering business objectives which include the achievement of nuclear safety. These reviews use a wide range of information including that from the audits and reviews referred to above, and also from the analysis of incident and event data, industry feedback and interactions with the regulators. The output from such reviews are used to improve future arrangements, plans and objectives and may also lead to organisational restructuring. This approach is compatible with HSE Safety Assessment Principle MS 1 on leadership, in showing commitment to safety and system improvement.

13.7. Audit and review (assessment) is a fundamental element in 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 layers of audit and review in self-audit, task independent audit and review, and independent audit and review, some of the latter being carried out by third party organisations. In addition to the audits and reviews carried out by, or on behalf of, the licensees, HSE, as part of its regulatory activities, also audits and inspections of the licensees' arrangements.

Goals, strategies, plans and objectives

13.8. LC17 requires the licensee to make and implement adequate quality assurance arrangements in respect of all matters that may affect safety. Licensees develop business plans for the various stages in the plant life cycle e.g. design, construction and operation. Quality Assurance arrangements are part of these business plans and are one of the mechanisms used to ensure the implementation of the plans. The licensee identifies where the achievement of business plans requires the input of other organisations. The licensee retains responsibility for the achievement and effectiveness of the plans. Licensees develop policy statements and implement strategies to achieve these policies. There is an increasing use of an integrated approach to business management and licensees are conscious of the interactions between environmental, safety, security and quality issues. There are frequent and structured reviews of safety performance against specified performance indicators. Implicit in this process is the monitoring and correction process employed by licensees where performance indicators identify such action to be required.

Management responsibility

13.9. Licensees' management systems are authorised for use by senior management and are mandatory on all employees. Processes are implemented to inform senior management of the suitability, adequacy of and 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. Responsibilities

and processes are identified for monitoring, audit and review to ensure that management processes and work performance are effective. These activities are integrated such that the specification, execution, supervision and monitoring of the work are properly resourced and carried out.

13.10. All licensees have established procurement arrangements. An integral part of these arrangements is the evaluation and selection of suppliers and contractors, including the suitability of contractors to comply with the requirements of the licensees' management systems, or to provide adequate arrangements themselves that provide equivalent levels of control.

Resource management

13.11. The allocation of resources is not a requirement specifically placed on the licensee through LC17, except to the extent that licensees' arrangements for safety related activities cannot be considered to be adequate if the resources needed to undertake those activities are clearly inadequate. LC36 was introduced some ten years ago specifically to guard against any downward drift in the licensees' 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 the 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.

Process implementation

13.12. Licensees' Management Systems are developed as part of their arrangements to meet licence conditions. In addition, they are designed to meet the requirements of national and international quality management Codes and Standards. On this basis, licensees have to implement suitable and adequate processes to meet all these requirements and to instigate assessment and review arrangements to ensure these processes remain fit for purpose and are subject to continual improvement. The management system is also the vehicle by which all other arrangements required to be made under the nuclear site licence are identified, referenced and controlled. Licensees are currently considering the application of any elements identified in GS-R-3 and the related documents that are currently not covered by IAEA 50-C/SG-Q. Fundamental aspects of the licensees' arrangements (e.g. modifications, design control and safety case development) are unlikely to change as a result of this process.

Generic processes

13.13. GS-R-3: 5.11-5.28 identifies a number of generic processes to be developed in the management system. These are control of documents; control of products; control of records; purchasing; communications; and Management of Organisational Change.

13.14. Licensees' arrangements, as a matter of course, cover these processes which are basic elements of any management system. In addition, because of the nuclear licensing arrangements within the UK, these are supplemented by the processes required under the licence conditions, including LC17 and LC36.

Measurement, assessment and improvement

Independent assessment

13.15. The term 'independent' in 'independent assessment' distinguishes between the audit and review carried out by those involved in the work being assessed, and that which is carried out by personnel that have no involvement in the work under review. This is achieved in a number of ways, including the use of audit and review

personnel from a different part of a licensee's organisation, a different site, from corporate resources, or from another organisation under contract to the licensee.

Management system review

13.16. Licensees carry out management system reviews to ensure the continuing effectiveness of their arrangements and to provide a basis for continued improvement. There are a number of processes that contribute to these reviews including auditing, which is a fundamental element in licensees' management systems, incident and accident analyses, operational failures, deficiencies and non-conformances and procedural non compliance. With respect to auditing, there is a strong element of defence-in-depth in the audit and review process. Licensees employ layers of audit and review in self-audit, task independent audit and review and independent audit and review, some of the latter being carried out by third party organisations. In addition to these levels of audit and review, HSE carries out, as part of its regulatory activities, audits and inspections of the licensees' arrangements.

13.17. When licensees carry out periodic (usually annually) reviews of the effectiveness of the quality management system, information from a number of sources is taken into consideration. This includes the results of all assessments, including independent assessments. On a more frequent basis, management is made aware of the output of all audits and assessments. This information is used as the basis for corrective action and/or as an initiator for process improvement.

Non-conformances

13.18. Items, services and processes that do not meet requirements are identified by the licensees through a number of processes including, receipt and in-process inspections, contract reviews, supervision, monitoring and audit activities, all of which are required to be carried out as part of the management system. The level of reporting of a non-conformance depends on its nature, its potential effect on nuclear safety, its cost and its affect on the licensee's programme. Defective items and services can result in the supplier being barred from supplying in the future by being removed from the approved suppliers list. Close-out of non-conformances identified through audit and review processes are reported to management, and if no corrective action is taken within a prescribed time-scale, the report is escalated to senior management for appropriate action. The details of non-conformances are entered, with other data such as incidents and accidents, onto databases where the data is analysed and developing trends identified.

13.19. One of the main reasons the analysis described above is carried out by the licensees is in order to identify any underlying causes. Licensees do this as part of the process of ensuring that the non-conformance will not recur. Underlying causes (such as inadequate supervision, lack of training or incorrect documentation) have been identified and corrective action taken. Learning from errors and mistakes, as part of an operational experience programme, is an essential part of a well developed management system and is a requirement of the nuclear site licence.

Opportunities for improvement

13.20. Licensees consider the identification of opportunities for improvement as an ongoing responsibility and activity. External influences such as changes to standards or legislation, as well as social and business pressures, all provide the motivation to update business plans and therefore management systems.

Article 14 - Assessment and Verification of Safety

Each Contracting Party shall take the appropriate steps to ensure that:

(i) comprehensive and systematic safety assessments are carried out before the construction and commissioning of a nuclear installation and throughout its life. Such assessments shall be well documented, subsequently updated in the light of operating experience and significant new safety information, and reviewed under the authority of the regulatory body;

(ii) verification by analysis, surveillance, testing and inspection is carried out to ensure that the physical state and the operation of a nuclear installation continue to be in accordance with its design, applicable national safety requirements, and operational limits and conditions.

Under this Article, compliance with the Convention is demonstrated in a way that has not substantially changed since the third UK report (i.e. in a way that has implications for the Convention obligations), but has been updated to reflect current procedures.

Safety assessment

14.1. The following pages provide an overview of the phases in the lifetime of a nuclear installation that require safety justifications. The key landmarks are:

- Pre-construction safety report.
- Pre-operation safety report.
- Station safety report (operational).
- Pre-decommissioning safety report.

14.2. During the operational and decommissioning phases, the Station safety report is updated frequently to reflect changes to plant or procedures, new safety analysis techniques, research findings and the outcome of Periodic Safety Reviews.

14.3. Tables 14.1 to 14.5 below show more detail on the purpose of each of the reports and indicate how they are used by the licensee and the regulator.

14.4. In the UK there has been no new reactors constructed since Sizewell B in early 1990s so the process for developing pre-construction and pre-operation safety reports is largely historical. However these early reports provide an invaluable source of data and reference levels that justify current operation and inform the periodic safety review process. Most of the UK's nuclear reactors are in the late stages of operation, or undergoing defuelling and decommissioning. The emphasis now is on the periodic safety reviews and on pre-decommissioning work such as environmental impact studies.

14.5. This report under Article 18 reflects current thinking should the UK opt for a new build programme. The broad principle of pre-construction and pre-operation reports will still be valid but the process will need to recognise the international nature of possible vendors and potential licensees.

Safety cases

14.6. There are common features for all the safety documentation required during the lifetime of an installation. The initial assessment and verification of the safety of a nuclear installation starts before construction commences, with the production and development of safety analysis reports by the licensee. The safety case consists of a tiered set of these safety analysis reports covering a range of topics, from general safety principles through to detailed aspects of design and operation. The licensee "owns", understands, endorses and makes use of the safety case at all stages of the

installation's life. Licensees' Quality Assurance arrangements that are required under LC17 ensure that external suppliers of safety related plant meet appropriate standards. The licensee has systems in place to ensure that the plant is operated and maintained in accordance with the requirements and assumptions of the safety case. Comprehensive safety assessments were carried out at the time of construction of the UK's nuclear installations. Under the terms of the licence conditions, these safety assessments are updated, as necessary, during the station's lifetime.

14.7. The safety case of an installation is, therefore, the totality of the documented information and arguments that substantiates the safety of the plant, activities, operations and modifications. It demonstrates in writing that the plant, its processes, activities, modifications, etc.:

- meet the design safety requirements and criteria;
- conform to good nuclear engineering practice and to appropriate, standards and codes of practice or as appropriate supporting research;
- are adequately safe during both normal operation and fault conditions;
- are, and will remain, fit for purpose;
- give rise to a level of nuclear risk to both public and workers which is ALARP; and
- have a defined and acceptable operating envelope, with defined limits and conditions, and the means to keep within the envelope.(safety management).

Legal requirements for safety documentation

14.8. Some Licence Conditions (see Annex 5 for the full text) require the licensee to put in place arrangements to ensure that adequate safety documentation is produced. In particular, the intent of these LCs is as follows:

- LC14, 'Safety Documentation', requires the licensee to make arrangements for the production and assessment of safety cases consisting of documentation to justify safety during the life of the nuclear installation.
- LC15, 'Periodic Review', gives HSE the power to require reviews of safety documentation.
- LC16, 'Site Plans, Designs and Specifications', requires that the licensee provides HSE with a site plan, a schedule of buildings on the site and the description of the function of plant contained therein.
- LC19, 'Construction or Installation of New Plant', requires the provision of adequate documentation to control safety during the construction and installation of new plant.
- LC20, 'Modification to Design of Plant under Construction', requires the provision of adequate documentation to control safety related modifications that are found necessary or desirable during construction.
- LC21, 'Commissioning', requires the provision of adequate documentation to control all commissioning activities that confirm the design intent of the plant, that activities are carried out by suitably qualified people, that records are kept and that modifications are implemented according to a change procedure.
- LC22, 'Modification or Experiment on Existing Plant', requires the provision of adequate documentation to justify the safety of a modification or experiment on the plant and that this justification is subject to appropriate review.
- LC23, 'Operating Rules', requires the licensee to produce an adequate safety case for any operation that may affect safety and that this safety case identified safe limits and conditions for operation known as operating rules.

- LC28, ‘Examination, inspection, maintenance and testing’, requires the licensee to verify that the limits and conditions identified in the safety case continue to be valid by instigating a regime for the maintenance, inspection and testing of safety related plant.

14.9. The safety case also needs to demonstrate compliance with other appropriate legislation, for example, IRR99.

Safety analysis methodology

14.10. The totality of the documentation that makes up the plant safety case provides a demonstration that the nuclear installation conforms to good nuclear engineering practices and sound safety principles. A nuclear installation is designed against a set of deterministic engineering rules, such as design codes and standards. It uses the concepts of "defence in depth" and "adequate safety margins". To this end, the licensees have developed their Nuclear Safety Principles that set down the deterministic and probabilistic acceptance criteria against which they judge each safety case.

14.11. The safety case provides sufficient information to demonstrate that the engineering rules have been applied in an appropriate manner. In particular, there is a clear demonstration that all equipment important to safety has been designed, constructed, operated, and maintained in such a way as to enable it to fulfil its safety function for its projected life.

14.12. The licensees’ analyses of normal operating conditions show that resultant doses of ionising radiation, to both members of the work force and the public, are, and will continue to be, below regulatory limits and, furthermore, are ALARP (see under Article 15).

14.13. The licensees prepare an analysis of faults that could initiate accident sequences (initiating faults) and the defences available at the plant to mitigate the predicted consequences. The analysis includes the two complementary approaches of deterministic and probabilistic assessment and severe accident analysis (see paragraphs 496-493 of the SAPs and SAP FA1). A comprehensive fault schedule that includes both internal initiating events as well as internal and external hazards is the starting point of both deterministic and probabilistic safety analyses (see SAP FA2). The deterministic approach is used in the analysis of design basis accidents (DBAs) to demonstrate the capability of the safety systems. Analyses are also undertaken of more severe faults outside the design basis, which could lead to large releases of radioactivity. This includes analysis of the potential failures of the physical barriers to the release of radioactivity, analysis of the magnitude and characteristics of the releases, identification of the accident management strategies to reduce the risk, together with the necessary equipment, instrumentation and accident management procedures.

14.14. Probabilistic Safety Assessment (PSA) provides a comprehensive, systematic and numerical analysis of the risk from the plant to demonstrate its acceptability. PSAs for most of the gas-cooled reactors (Magnox and the earlier AGRs) were carried out as part of the Periodic Safety Reviews. For the later AGRs at Heysham 2 and Torness and the PWR at Sizewell B, PSA was used from the design stage. Currently, Sizewell B and the AGRs have established “Living PSA programmes”. UK regulation is not prescriptive, however, there is an expectation that licensees will follow good international practices when developing their safety documentation and their processes. In this regard, it should be indicated that the living PSA programmes established by BEGL generally follow the practices proposed in IAEA-TECDOC-1106.

14.15. Safety documentation also provides the basis for the management of safety by addressing: management and staffing levels; training requirements; maintenance

requirements; operating and maintenance instructions; operating rules; and contingency and emergency instructions. The operating rules and instructions are identified from the assumptions made in the safety analysis of the safety case.

14.16. The safety case includes a summary document called a safety report. This report and the safety documentation make reference to supporting arguments and evidence, as well as to existing or proposed instructions, procedures, arrangements and standards. The references may range from national or international codes to corporate standards, criteria and procedures that provide requirements for safety and the means to ensure that the process of producing the safety case is properly controlled.

14.17. All the UK's nuclear power reactor installations are either in their operating, defuelling or decommissioning phase. The magnitude, complexity, and development of the safety case through the life of each plant has required the implementation of adequate systems to manage its safety case, use the safety case effectively, and correctly update the safety case. In this regard, some UK reactors have recently undertaken major projects to significantly enhance the visibility, traceability, user friendliness and manageability of their safety cases.

14.18. The licensees put systems in place to properly manage the changes to the safety cases to ensure that these accurately reflect the as-built and as- operated plant. Thus the documentation that forms the safety case is subject to appropriate quality assurance procedures discussed under Article 13, and any changes to the safety case are regulated as modifications under LC22.

14.19. Changes in the purpose and use of a safety case at each stage can involve changes in the organisations responsible for preparing it. At the design stage, the safety case was developed mainly by a design team who eventually handed over responsibility to the operator. QA documentation was prepared to address these issues. This documentation defines how information will be transferred, demonstrates that there are mechanisms in place to ensure that responsibilities are clear, and ensures that the case is fully adopted and implemented.

14.20. In order to meet the licence conditions, supplementary documents are sometimes added to the safety case to justify the safety of activities carried out at particular points in time. For example, a method statement may be prepared to demonstrate that the integrity of plant will be maintained and quality ensured during installation work. Similar types of safety case documentation are produced to demonstrate the safety of temporary plant modifications. These documents define and justify, for limited periods of time, operations that are necessary, but which may be outside the normal operating envelope described by existing rules and instructions. If there is a need to conduct a non-routine operation, test or experiment, the licensee will prepare a safety case as required by LC22.

14.21. All licensees categorise the safety significance of safety cases and proposals to modify the safety cases, to ensure that the degree of assessment and verification and the choice of clearance route (through independent peer review and a nuclear safety committee) is commensurate with the assessed safety significance. Proposals to change the safety case for a plant are managed by the same process as proposals to modify the plant physically. Typically these require (at the highest level of safety significance) a proposal to be:

- verified in depth by suitably qualified and experienced persons who have not been involved in preparing the proposal (but may be from the same organisation or working group);
- assessed as satisfactory as to category and content through an independent nuclear safety assessment by, or to the standards established by, the licensee's health and safety function;

- considered by the Nuclear Safety Committee (required by LC13) which includes suitably qualified and experienced persons from outside the licensee's organisation, with the licensee taking due notice of the advice given by the committee; and
- formally agreed by HSE.

14.22. At the lowest level of safety significance, the Station Manager may authorise and implements the proposal, but must prepare sufficient documentary evidence to justify the category allocated, and this evidence is available for auditing if needed.

14.23. Finally, licensees in the UK also make extensive use of external international peer reviews.

Reviews of the safety case

14.24. Periodic Safety Reviews (PSRs) were addressed under Article 6. As well as the PSRs, outage reviews are undertaken every 2 or 3 years. These coincide with the reactor Statutory Outages that are carried out in accordance with LC 30 for the purpose of enabling examination, inspection maintenance and testing.

14.25. Outage reviews demonstrate that adequate safety margins, within current safety standards, exist for the next period of operation (to the next outage). During these reviews, the focus is on plant inspection results and modifications that were completed during the outage, and confirmation is given to HSE by the licensees that the nuclear installation and procedures are still in accordance with the safety case and that future operations are therefore justified by the current safety case. HSE's Consent to restart the reactor takes account of the findings of the outage review.

14.26. In years in which there is no requirement for an outage, a meeting is held by HSE at the nuclear licensed site to review the plant and safety case status to maintain a regular overview of the position.

Verification by analysis, surveillance, testing and inspection

Maintenance, testing and inspection

14.27. All UK nuclear installation licensees are required to make and implement adequate arrangements for maintenance, testing, surveillance and inspection of those structures, systems and components that are important to safety. LC28 requires licensees to verify the physical state of all plant that may affect safety by regular and systematic examination, inspection, maintenance and testing. Safety related plant systems and components are listed in a Maintenance Schedule. This defines the periodicity of maintenance inspection and testing, and details the scope of work to be carried out. The results are reviewed to confirm that plant still meets the original design assumptions.

14.28. Whilst some maintenance inspection and testing can be carried out while a reactor is in operation, some work will inevitably necessitate a reactor shutdown. With the exception of Sizewell B, UK’s reactors can refuel on load, and there is not a refuelling outage during which essential maintenance can be carried out. Therefore, LC30 requires licensees to periodically shutdown nuclear installations (referred to as a statutory outage). Statutory outages are for the purpose of examination, inspection, maintenance and testing of plant that may affect safety. Before the re-start of operation after a statutory outage, the safety case is reviewed in the light of any findings arising during the previous operational period and during the statutory outage. The plant must be shown to be safe to operate until the next statutory outage. Periods between statutory outages on nuclear power plants vary from 2 to 3 years, and must be explicitly defined in the Plant Maintenance Schedule.

14.29. LC29 requires licensees, after consultation with HSE, to carry out and report the results of tests, inspections and examinations specified by HSE. This LC may therefore be regarded as a verification activity by the nuclear regulator.

14.30. In order to justify operation until the next statutory outage, the licensee may carry out analysis to predict that failures due to ageing processes, such as creep or fatigue, are unlikely in a defined future period of operation. Non-destructive testing and sample monitoring are used widely to support these analyses.

14.31. The licensees' overall analyses, surveillance, testing and inspection strategies are to ensure that their nuclear installations are kept in accordance with overall requirements for their designs. Safety objectives of these overall strategies include:

- The integrity of all safety-related plant to meet plant operating conditions;
- That the reliability of plant remains within safety case assumptions;
- That plant operation within safety case assumptions can be demonstrated; and
- That sufficient safety-related plant is always available to comply with the safety case.

14.32. In the design phase, diverse and redundant systems and plant are provided to ensure that safety-related systems meet the safety performance criteria, making due allowance for active and passive failures and realistic maintenance requirements. These include issues such as the time taken to perform preventive maintenance and the time taken to correct defects. A key operational issue is that additional plant surveillance and operational constraints are imposed when an 'urgent maintenance state' arises due to limited plant availability (for testing, preventive maintenance, or as the result of plant defects).

14.33. Licence conditions require the licensees to maintain records of maintenance, inspection, surveillance and testing. HSE's nuclear site inspectors review the availability of this information routinely. The results of testing and maintenance of safety-related items and components are also reviewed by the licensees' staff, who are aware of the safety case assumptions and preserved in a plant history. This data enables reviews of the appropriateness of the intervals and activities to be undertaken to optimise maintenance work so as to minimise plant interference, operator radiation dose, and cost.

Surveillance of compliance with operational limits and conditions

14.34. LC23 requires the licensee to produce a safety case and to identify conditions and limits necessary for safe operation. These are referred to as operating rules. The licensees have systems for implementing and complying with these operating rules. This is achieved by defining a set of safety requirements that are presented to HSE for agreement, and which cannot be altered without HSE's further agreement. They are supported by a hierarchy of operating instructions that define the normal operating limits and conditions, required plant availabilities and plant operating procedures. These are referred to as Technical Specifications and/or Identified Operating Instructions, and compliance with them will ensure that the fundamental plant limits and conditions are complied with.

14.35. The licensees have systems for routine compliance monitoring to self-check that they are complying with their Technical Specifications and Identified Operating Instructions. This includes plant surveillance, maintenance checks and administrative checks. The licensees also have an internal safety department which will undertake inspections to verify that the limits and conditions are being complied with, and that routine surveillances are conducted. Where events of non-compliance occur, the licensees investigate them and report them to HSE in accordance with the arrangements under LC7.

14.36. The licensees have programmes to ensure that deviations from operational limits and conditions are documented and reported. Some nuclear installations use tools to assist operators in addressing compliance with the some of the station's Operating Rules. These assist the operators by indicating whether or not the current plant configurations are compliant with the predetermined permissible plant configurations and, in parallel, carry out a risk evaluation. They have user-friendly interfaces and present risks in a way that can be appreciated by the operators. Logs of all changes in plant configuration and the results of operating rule compliance are retained, and these are periodically reviewed to confirm satisfactory operations.

Assessment and verification by the nuclear regulator

14.37. HSE's nuclear installations inspectors check that appropriate standards are developed, achieved and maintained by the licensees. HSE also takes the following actions:

- It confirms that licensees establish, manage and maintain safety requirements for the protection of employees and members of the public;
- It assesses the safety of proposed and existing sites and nuclear installation designs; and
- It inspects nuclear installations for compliance with these requirements at all stages from construction to operation and eventual decommissioning.

14.38. In the course of its nuclear regulatory work, HSE scrutinises the activities of licensees both at their licensed nuclear sites and through assessment of the licensees' written safety submissions. This section describes the assessment and verification activities carried out by HSE. Special emphasis is put on describing how the Safety Assessment Principles (SAPs) are used during the assessment to judge the adequacy of safety case submissions.

Regulatory assessment

14.39. HSE sets safety standards in broad terms for the reviews and assessments using licence conditions, and the TOR principle and SAPs (Annexes 7 and 8). In June 2002, HSE published guidance to its inspectors on purpose, scope and contents of the safety cases "HSE Technical Assessment Guide T/AST/051"[47].

14.40. HSE's SAPs (see Annex 8) form a framework that is used as a reference for technical judgements on the adequacy of licensees' safety cases. They also assist HSE in applying a consistent and uniform approach to its assessment process. In carrying out an assessment, the HSE assessors judge the extent to which the safety submission shows conformity with the relevant SAPs, noting that not all of the principles are applicable to every licensed site or to every assessed safety case submission. The SAPs contain numerical targets and limits, some of which embody specific statutory limits. In addition to the duty of licensees to meet all statutory limits, the SAPs should also be met, so far as is reasonably practicable (SFAIRP). This latter phrase is a fundamental principle of UK health and safety law embodied in HSWA74, which conveys many of the same ideas as the ALARP and as low as reasonably achievable (ALARA) concepts, more familiar to international safety experts. See Annex 8 for a further discussion of these concepts.

14.41. The SAPs are aimed at the safety assessment of proposed (new) nuclear facilities, as well as existing facilities. The SAPs supplement the LCs, which require arrangements to be made, procedures written, etc. that, in many cases, expand the requirements of the SAPs into instructions that are more appropriate for a licensee to use on an existing plant.

14.42. For the assessment of existing plants, there is a further point to be considered: the safety standards used in their design and construction may differ from those used in plants designed and built more recently. The existence of such

differences is recognised by HSE's nuclear installations inspectors when applying the SAPs in the assessment of modifications to old plants. The ALARP principle is of particular importance to such assessments, and the age of the nuclear installation and its projected life are important factors taken into account when making regulatory judgements on the reasonable practicability of making improvements.

14.43. The majority of the SAPs are engineering (or deterministic) principles. In creating a design, there are many choices to be made. Each choice involves, to a greater or lesser extent, the use of judgement in technical, scientific or commercial issues. Not all of these judgements are concerned directly with safety, but most will influence its achievement. The deterministic SAPs provide inspectors with guidance on what to look for when judging the ALARP arguments in a safety case. They represent HSE's view of good nuclear engineering practice. They point to the design features that in HSE's view would lead to a safe plant.

14.44. To judge the adequacy of the safety case, HSE also uses quantitative comparisons of the safety case numerical elements against the licensee's criteria and against the relevant (probabilistic) SAPs. Probabilistic Safety Assessment (PSA) is used to produce numerical estimates of the risk from the plant and thus provides a very important input to the plant safety case. PSA acts as a crosscheck on the level of safety provision, so that the PSA and deterministic SAPs are complementary.

14.45. Assessment is undertaken by first understanding and then sampling the key aspects of a safety case using HSE's SAPs[14], and other national and international standards when appropriate. The technical expertise of the staff is used to select the issues to be pursued in depth. HSE's nuclear project or site inspectors bring together and integrate the findings from assessment of the different technical areas and provide an overall conclusion regarding the adequacy and acceptability of the assessed safety case. This is formally documented in Assessment Reports.

14.46. Extensive discussion between the different technical assessors and the project and site inspectors, together with face-to-face discussions and written exchanges with the technical experts of the licensee, is used to clarify and test the information used, background analyses performed and assumptions made in the safety case. The overall judgement of acceptability is based on the full range of assessment advice. The assessors make recommendations, if appropriate, on where safety can be improved. These recommendations are discussed with the licensee and a programme to implement improvements is usually agreed. If agreement cannot be reached with the licensee, and the issue is considered to be of sufficient importance by HSE, enforcement action to achieve compliance can be undertaken, using the powers discussed in Annex 2.

14.47. The contents of safety cases may vary due to differences in design between different nuclear installations, but HSE's appraisal of the case always addresses three questions:

- Are the objectives of the safety case right?
- Are the details of the safety case right? and
- Has enough been done?

14.48. In answering the above questions, HSE nuclear inspectors seek certain attributes in the licensees' safety case submissions. These are:

- Completeness: All reasonably foreseeable threats to safety must be identified, and it should be shown that the plant incorporates adequate protection against these threats, or that their contribution to the risk is negligible.
- Clarity: There must be a logical presentation of the plant, system and processes and the safety justification that applies, with clear referencing of supporting information and clear identification of conclusions and recommendations.

- Rationality: The safety case should provide cohesive and logical arguments to support the conclusions.
- Accuracy: The safety case should reflect the 'as is' state of the plant, including processes and procedures.
- Objectivity: The claims in the safety case must be properly tested and checked. As far as is reasonably practicable, claims must be supported with factual evidence. The necessary understanding of the behaviour of novel systems or processes should be established from appropriate research and development. The sensitivity of the conclusions to assumptions should be visible.
- Appropriateness: Methods and codes used to demonstrate safety must be fit for purpose with adequate verification and validation.

14.49. If a safety issue is judged to be of sufficient importance, HSE may commission parallel analyses and research to allow additional input into the regulatory judgement process. In addition, if insufficient in-house expertise is available to validate a key safety case claim or if additional views are required, HSE may use external recognised independent experts in the appropriate technical field to help to inform its judgement.

14.50. Not all modifications are reviewed by the regulatory body. However, as described above, the licensee prepares sufficient information on the modifications to allow the regulator to decide whether the decision was justified, should HSE decide to undertake a check. Some modifications will be examined as part of the HSE's inspection routine.

14.51. The points in the lives of the UK's nuclear installations when a regulatory decision to allow the licensees to proceed have been indicated in the previous text. HSE uses procedures defined in its Business Management Systems to prepare project reports, and records its regulatory decisions and the basis for the conclusions reached in writing.

Regulatory inspection

14.52. HSE carries out planned inspections of nuclear licensed sites to monitor licensees' compliance with the LCs and the general requirements of the HSWA74. An inspector is allocated to the nuclear installation site from the start of construction. This means that frequent inspections and discussions take place, key tests can be witnessed and the test reports checked. In addition, the specialist nuclear installation inspectors who assess the safety case often visit the site and key manufacturers' works. They use their expertise to monitor the construction of components important to safety and they can witness quality assurance procedures. Once the reactor is operational, the nuclear site inspectors spend about 30% of their time on their site. In particular, they check that the licensee is complying with the licence conditions and the arrangements made under the licence conditions.

14.53. Safety audits or team inspections that address specific or more generic aspects of the safety of the nuclear installations are also carried out at the plants and at the Utility corporate centres. For such actions, a multi-disciplinary group of inspectors will visit the site. They make their findings known to the operator, so that improvements are made, where appropriate.

14.54. Individual Site Inspection Plans are produced according to generic templates based on a matrix that includes both the LCs and relevant legislation, and the important critical systems (derived from the safety case). They are based on a three-year cycle to ensure that all relevant regulatory requirements and important systems are periodically checked. Before the start of each year, the plan is modified, as necessary, to take into account experience, regulatory issues and developments affecting the plant. Unplanned and reactive inspection work is also integrated, as necessary, into the site inspection activities throughout the year. Site inspectors are

supported by other nuclear installation inspectors who carry out specialist assessments or inspections as necessary. The Integrated Intervention Strategy (IIS) developed by HSE embraces the site and corporate inspection processes, together with the assessment processes, (both discussed above) to help provide a consistent and integrated framework for all regulatory activities.

14.55. Following inspections by the nuclear installations inspector, the findings of the inspection are discussed with the licensee and, where appropriate, the corrective actions required from the licensee agreed. Subsequently, an inspection report is prepared by the inspector to record appropriate details of the objectives of the visit, matters considered, conclusions drawn and follow-up actions identified.

14.56. Historically, the process for the development of site inspection plans within HSE (as described above) has been evolutionary, with the result that there has not been either consistency or transparency, although the requirement for plans to exist has always been there. Since 1 April 2006, site or plant intervention plans have been produced, monitored and reviewed within the IIS. The purpose of this is to ensure both that HSE focuses its resource where they are most needed and that this planning process is transparent to stakeholders.

14.57. The aim of this focused approach is to ensure that HSE intervention activities are planned, implemented, monitored and reviewed in a way that resources can be efficiently allocated and data can be generated to enable management to be able to form a view on both the efficiency of intervention activities and the effectiveness of those activities.

14.58. To this end, HSE now develops targeted intervention strategies for every nuclear licenced site taking into account issues of local environment, priorities and changes in the industry. Within the intervention strategies for each site it is expected that a significant proportion of the planned inspection interventions will be focused on the ‘cornerstone’ factors of compliance, which contribute most to the licensee's safety management performance, and the prevention of significant nuclear events. For high hazard operational plants these will include licence conditions concerning: reporting of incidents, emergency arrangements, qualification and experience of staff, managing change to plant and procedures, operations and maintenance (LCs 7, 11, 12, 19-22, 23, 24, 26, 28 and 36). These ‘cornerstone’ licence conditions are inspected at least twice per year, working to a common inspection template and protocol. In any year a number of these ‘cornerstone’ licence conditions will be the subject of team inspections to improve consistency and reproducibility of compliance scores/ratings for performance trending. The planned inspection activities also ensure that key components of the safety case are sampled proportionately and scored against these ‘cornerstones’. In addition, inspection visits to site by the 'nominated site inspector' regularly updates awareness of current site performance and operational issues, which is obtained through activities such as examination of event and operational records.

Table 14.1 - Principal nuclear installation life phases requiring safety reports

PHASE	LICENSEE'S SAFETY REPORT	PURPOSE
DESIGN	Design Safety Criteria Pre-Construction Safety Report (PCSR)	Design and safety principles Justify start of nuclear safety related work on site (including licensing). Identify data from commissioning and parallel research and development work to support safety case.
CONSTRUCTION AND COMMISSIONING (including modifications)	Pre-Operation Safety Report (POSR) Station Safety Report (SSR) is the safety case for nuclear fuel to be loaded into the reactor.	Development of the PCSR during construction and commissioning up to fuel load. SSR is consolidated with further commissioning data until routine operation safety case is established.
OPERATION	Station Safety Report Periodic Safety Reviews (PSR) - every 10 years	Justifies safety of continued operation and takes strategic look forward to consider the next 10 years.
END OF LIFE SHUTDOWN	Pre-Decommissioning Safety Report Care and Maintenance Safety Report Periodic Safety Reviews Dismantling Safety Report	Unloading of Fuel. Justify resources and scope of operations, maintenance, contingency and emergency arrangements.

Table 14.2 - Pre-construction Safety Report (PCSR)

PURPOSE	USE MADE BY:	
	LICENSEE	**HSE**
To demonstrate to the licensee and the regulator the safety of: - detailed design proposals for new plant or major modifications prior to commencement of construction or installation; - the construction and installation activities.	1. To identify design standards and safety criteria. 2. To define the arrangements for management of safety. 3. To demonstrate how the design will meet the licensee's safety criteria. 4. Define the status of safety issues and confirm that any which are unresolved will not prejudice the design. 5. To confirm a Safety Category for the project. 6. To refine the safety specification for detailed design. 7. To allow independent assessors to make a judgement on the adequacy of proposals.	1. To understand the basis of the design and confirm that safety principles and criteria are appropriate. 2. To assess the adequacy of proposals. 3. To determine the extent of Regulatory involvement.

Table 14.3 - Pre-operation Safety Report (POSR)

PURPOSE	USE MADE BY:	
	LICENSEE	**HSE**
To justify to the licensee and the regulator the safety of: - the design of the facility following construction and installation prior to the start of commissioning; - the commissioning of the facility and any remaining installation activities. The safety case identifies those commissioning tests and inspections required to: - confirm the plant's design safety assumptions and predicted performance, in particular that of the safety provisions; - characterise the plant as a basis for evaluating its behaviour during its operating life. The safety analysis is reviewed in the light of the results of the commissioning programme and any modifications made to the design of intended operating procedures since the commencement of construction.	To describe 'as built' facility and justify any deviation from the proposed design. To identify commissioning arrangements for demonstrating that the design intent and performance have been met or exceeded. To identify schedule of tests necessary or desirable in the interest of safety. To identify contingency plans should the design intent or performance not be met. To confirm design standards and criteria and justify any variation from those previously declared. To define arrangements for management of safety. To identify the plant specific arrangements for complying with the licence conditions and other relevant statutory provisions. To demonstrate how the facility design will meet the licensee's safety criteria. To confirm that any outstanding safety issues have been resolved. To identify any further safety issues which are required to be resolved or the need to invoke the special case procedure. To confirm that any unresolved issues are unlikely to prejudice the commissioning and operation of the facility. To facilitate independent assessment. To refine the safety analysis for all fault conditions. To confirm how the radioactive waste and decommissioning strategies will be implemented.	To identify the plant specific arrangements for complying with the site licence conditions and other regulatory provisions. To identify regulatory issues to be addressed during the commissioning of the plant.

Table 14.4 - Station Safety Report (SSR)

PURPOSE	USE MADE BY:	
	LICENSEE	**HSE**
Confirm prior to fuel load that the as-built plant meets safety standards and criteria and adequate management arrangements are in place. Consolidate the result of development and commissioning to support safety of routine operations. Consolidate results of subsequent modifications and justifications for continued operation.	Identify the safe operating envelope, including the safety limits and conditions in operating rules. Confirm that operational experience does not affect the safe condition or safe operation of the plant. Identify operational implications for chosen decommissioning strategy. Implementation of the radioactive waste management strategy.	Assess the adequacy of safety of the facility and the basis for consent for routine operation and start-up after statutory shut down. Confirm the extent of further regulatory involvement. Form the basis of regulatory inspection and the examination of arrangements.

Table 14.5 - Periodic Safety Review (PSR)

PURPOSE	USE MADE BY:	
	LICENSEE	**HSE**
Demonstrate that the plant is adequately safe for continued operation for a period of at least 10 years.	Define the current safety standards and criteria to be applied. Demonstrate how the plant meets the safety standards and criteria. Identify programmes of work including analysis and modifications where reasonably practicable in response to safety issues. Define the arrangements for the management of safety.	Regulatory reassessment of the adequacy of the safety of the plant. Provide input for regulatory inspection of the plant.

Article 15 - Radiation Protection

Each Contracting Party shall take the appropriate steps to ensure that in all operational states the radiation exposure to the workers and the public caused by a nuclear installation shall be kept as low as reasonably achievable and that no individual shall be exposed to radiation doses which exceed prescribed national dose limits.

Under this Article, compliance with the Convention is demonstrated in a way that has not substantially changed since the third UK report (i.e. in a way that has implications for the Convention obligations), but has been updated to reflect current procedures. Paragraphs 15.33 – 15.40 reflect the latest information on radiation doses.

15.1. A summary of the laws and regulations relevant to nuclear safety, environmental and radiation protection can be found under Article 7.

Protection and safety optimisation

15.2. 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. However, in the UK "as low as reasonably practicable", 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. 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. 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 spending more to reduce them. In general, risk-reducing measures are weighed against the associated costs (in time, trouble and money). The licensee takes the measures, unless the costs of taking particular actions are clearly excessive (in gross disproportion) compared with the benefit of the risk reduction. The widely used International Commission on Radiological Protection (ICRP) concept, ALARA (economic and social factors being taken into consideration), is equivalent to ALARP, but unlike ALARP, does not have the legal precedent in the UK (see Annex 8 for a more detailed discussion of these concepts). Financial equivalent values are used in the ALARP analyses, noting that 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 (HPA). 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.

15.3. 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 aspects of the Fundamental Principles of the SAPs:

- the duty holder must demonstrate effective understanding of the hazards and their control for a nuclear site or facility through a comprehensive and systemic process of safety assessment;
- protection must be optimized to provide the highest level of safety that is reasonably practicable;
- 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;
- arrangements must be made for emergency preparedness and response in the case of nuclear or radiation incidents.

15.4. The licensees are obliged in UK law 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.

15.5. 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 so far as is reasonably practicable. In general the licensees have considerable experience in developing dose databases which represent good practice.

Control of occupational exposure

15.6. IRR99 Regulation 11 specifies dose limits for persons engaged in work with ionising radiation essentially in line with the above limits, but specifically to comply with the limits in the Euratom Basic Safety Standard[29]. For example, for adult employees the normal dose limit for whole body exposure is 20 milliSieverts (mSv) per year. In practice, all doses recorded for employees at nuclear installations are well below dose limits for normal operations. IRR99 also allow the dose limitation for an individual worker in specified circumstances to be based on a dose of 100 mSv averaged over a period of five consecutive calendar years, with a maximum of 50 mSv in any one year, but only if the licensee can demonstrate to HSE's satisfaction that an annual limit of 20 mSv is impracticable for that person.

15.7. Where classified individuals receive exposure from a number of sites operated by different employers, the "outside worker" provisions of the IRR99 may apply. In such cases, individuals are required to carry radiation passbooks, which contain personal identification details together with their cumulative dose. Information in the radiation passbook enables the licensee to properly control combinations of exposures. The Approved Code of Practice (ACoP) and guidance[52] supporting IRR99 gives practical advice on the most appropriate methods of complying with the regulatory requirements and how to ensure that exposures do not exceed any dose limit and are also ALARP. This guidance covers matters such as: restriction of exposure; information instruction and training; co-operation between employers; designation of controlled and supervised areas; personal protective equipment and its maintenance; and monitoring of designated areas.

Licensee responsibility

15.8. For the assessment of compliance with dose limits relating to members of the public (IRR99 Regulation 11, ACoP and guidance[52] refer), the licensee is expected to derive realistic estimates of the average effective dose (and where relevant, equivalent dose) to representative members of the appropriate reference group for the expected pathways of exposure. Through IRR99 Regulation 8 covering ALARP, licensees are also required to keep their activities under review to establish whether doses from direct radiation could be reduced.

15.9. Nuclear installations require authorisations to dispose of radioactive waste, whether by discharge directly to the environment, or by burial, incineration or transfer of waste off-site. Authorisations:

- specify the disposal routes to be used and place limits and conditions on disposal;
- place a requirement to use “best practicable means” (BPM) to minimise waste generated and the 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, non-compliance with limits; and
- may specify improvements in waste management arrangements.

The requirement that operators use BPM, to minimise discharges and radiological effects, helps ensure that doses to members of the public are as low as reasonably achievable (ALARA), as required by the Basic Safety Standards Directive[29].

The limits on radioactive discharges are set on the basis of the 'justified needs' of the licensees, i.e. licensees must make a case that the proposed limits are necessary to allow safe and continued operation of the plant. Licensees are required to take all reasonably practicable measures to minimise the production and disposal of radioactive waste so as to achieve a high standard of protection for the public and the environment taken as a whole. This includes the application of the concept of Best Practicable Environmental Option (BPEO), which is the outcome of a systematic and consultative decision making process that emphasises the protection and conservation of the environment across land, air and water. The BPEO process establishes, for a given set of objectives, the option that provides the most benefit (or least damage) to the environment as a whole, at acceptable cost in both the long and short term. The environment agencies have recently published guidance for their assessment of BPEO studies at nuclear sites[53]. In setting limits, the environment agencies use monitoring, discharge and plant performance data with suitable modelling to ensure that the radiation exposure of the public as a consequence of the discharges would be less than the dose constraints and limits set in the Basic Safety Standard Directive and implemented by the UK Government. Currently these are:

- a source constraint of 0.3 mSv per annum for an individual nuclear installation which can be optimised as an integral whole in terms of radioactive waste disposals;
- a site constraint of 0.5 mSv per annum for a site comprising more than one source, e.g. where 2 or more nuclear installations are located together; and
- a dose limit of 1.0 mSv per annum from all sources of man-made radioactivity including the effects of past discharges, but excluding medical exposure.

15.10. In addition to the requirements placed on operators to monitor environmental radioactivity around their sites, the environment agencies undertake their own 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. is monitored. The results of the monitoring are published annually. The Food Standards Agency is responsible for the safety of radiation levels in foods. The environment agencies and the Food Standards Agency annually publish a joint report[54] on radioactivity in food and the environment in the UK, which also includes estimated doses to the public. Monitoring 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. Exposure of consumers to artificially produced radioactivity via the food chain remains well below the UK public dose limit of 1mSv for all artificial sources of

radiation. In addition, the exposures of members of the public from all pathways resulting from aerial and liquid discharges, and exposure to direct radiation from nuclear licensed sites remains below the dose limit of 1 mSv.

Qualified experts

15.11. In the UK, the qualified expert in relation to occupational radiation protection is the Radiation Protection Adviser (RPA). At nuclear installations, the licensee is required to consult and appoint an RPA, under IRR99, to provide expert advice on compliance with those Regulations. In particular, the employer must consult the RPA on those matters set out in Schedule 5 of IRR99. The HSE has published a statement[55] on RPAs, setting out criteria for core competences of individuals and bodies intending to give advice as RPAs. The licensee then has to select suitable RPAs whose experience is appropriate to the advice required. The licensee will usually operate with an independent Health, Safety and Environment department. This will be separate from the main production departments and will be available to them to give advice on health and safety issues. The RPA will usually be a member of this department, but may, alternatively, be employed as a consultant to the operating organisation, thus giving the necessary independence from the production departments.

Local rules and procedures

15.12. IRR99 Regulation 17 requires licensees to provide written local rules to identify key working instructions intended to restrict any exposure in a controlled or supervised area. The local rules for a controlled area usually should include: arrangements for restricting access into that area; dose levels; contingency arrangements; identification and description of the areas covered; and confirmation of the appointed radiation protection supervisor (RPS). The guidance to IRR99[28], (paragraphs 278. 279 280 and 281) contains advice on the essential and optional contents for local rules. To meet the requirements of IRR99 Regulation 17 covering local rules licensees have put in place arrangements to ensure compliance. The RPS has a major role in helping ensure that the work carried out is done in compliance with the arrangements licensees have put in place for complying with the IRR99, in particular, in supervising the arrangements set out in the local rules. The RPS does not need to have the same depth of knowledge of the IRR99 as an RPA, but will be suitably trained and appointed in writing.

15.13. Under IRR99 Regulation 8, if an employee has a recorded whole-body dose greater than 15 mSv (or a lower dose established by the employer) for the year, the employer must carry out an investigation, usually in conjunction with the RPA. The purpose of this investigation is to establish whether or not sufficient is being done to restrict, so far as is reasonably practicable exposure to ionising radiation.

15.14. IRR99 Regulation 25 requires that where a licensee suspects or has been informed of an exposure in excess of a dose limit, HSE is notified, whether this arises from a single incident or through an accumulated dose. The employer undertaking work with ionising radiation must carry out a thorough investigation. To meet the requirements of Regulation 25 covering investigation and notification of overexposure, licensees have put in place arrangements to ensure compliance.

15.15. Similarly, Regulation 30 requires incidents, like the release (unless in accordance with a discharge authorisation) or spillage of radioactive substances above certain quantities, to be investigated. LC34 requires that radioactive material or radioactive waste on a nuclear licensed site is adequately controlled or contained, and that any leak or escape of such material to be notified, recorded, investigated and reported in accordance with LC7 arrangements.

Individual monitoring

15.16. If an employee is likely to receive a radiation dose greater than three-tenths of a relevant dose limit in a year (6 mSv in the case of whole-body exposure), IRR99 Regulation 20 requires the employer to designate that employee as a classified person. For non-classified employees, the ACoP and guidance to IRR99[52] provides guidance on the arrangements that licensees should be put in place to restrict exposure. Guidance[52] for licensees is also provided on the arrangements for entry into controlled areas by members of the public or employees who do not normally work with ionising radiation.

15.17. For classified employees, the employer has to arrange for any significant doses (internal or external) received by that person to be assessed by a dosimetry service approved by HSE for the assessment of doses for the relevant type of radiation. Such services are referred to as Approved Dosimetry Services (ADS) (assessment). HSE also approves dosimetry services to co-ordinate individual doses received from different ADS (assessment) and to produce and maintain dose records for classified persons. These services are referred to as ADS (records).

Exposure records

15.18. To help the employer assess the effectiveness of the dose control measures, the ADS (records) provides a written summary of the doses recorded for each classified employee at least once every three months. Many ADS (records) provide monthly dose summaries. By the end of March each year, the ADS must also provide HSE with summaries of all recorded doses relating to classified persons for the previous calendar year.

15.19. Reflecting concern expressed at the Public Inquiry[48] into the construction of Sizewell B, an additional licence condition (LC18) was attached to all nuclear site licences requiring licensees to make and implement adequate arrangements for the assessment of the average effective dose equivalent of a class or classes of persons as specified in the arrangements and to notify the HSE if this figure exceeds the level specified by the 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.

Control of exposure

15.20. HSE has a computerised Central Index of Dose Information (CIDI) that receives and processes the annual dose summaries for classified persons. All dose summaries and individual personal data provided to HSE by ADS (records) under IRR99 (or previously under IRR85) are treated as confidential. Various safeguards protect the computer files and the information presented in published reports maintains that confidentiality. The data in CIDI are periodically analysed to identify any trends in dose uptake.

15.21. Designation of *Controlled* or *Supervised* Areas is required by IRR99 Regulation 16. The main purpose of designating controlled areas is to help ensure that routine and potential exposures are effectively prevented or restricted. This is achieved by controlling who can enter or work in such areas, and under what conditions. Normally, controlled areas will be designated because the employer has recognised the need for people entering the area to follow special procedures to restrict exposure to ionising radiation. Regulations 18 and 19 specify requirements for designated areas to ensure that, inter alia, there are appropriate arrangements for control and monitoring of radioactive contamination, including contamination of workers. Such arrangements typically include monitoring of contamination where work is being carried out, and of workers at the points of egress from the local work area, and at the exits from the designated areas.

15.22. Assessment of intakes of radioactive material by workers and the resultant doses is carried out by means of air sampling (personal and area), excreta sampling and analysis, and in-vivo monitoring. IRR99 includes a number of regulations to ensure that appropriate steps are taken for the assessment of internal exposure. Regulations 20 and 21 require that relevant workers are classified, and that for these workers all significant doses are assessed and recorded. A comprehensive system exists to ensure that the assessment and recording of doses for classified workers is done accurately and reliably.

15.23. IRR99 Regulation 23 states that where any accident or other occurrence takes place which is likely to result in a person receiving an effective dose exceeding 6mSv, or equivalent dose greater than three tenths of any dose limit, the employer shall, for a classified person who is an employee who has been issued with a dosemeter or other device in accordance with contingency plan requirements (IRR99 Regulation 12 refers), and any other case having regard to the advice of the radiation protection advisor, arrange for a dose assessment by an approved dosimetry service. This should include in-vivo and biological monitoring as necessary to determine the extent of any exposure to internal contamination. The employer is expected to inform those affected as soon as possible, and to keep records for the durations required in IRR99 Regulation 23.

Employer co-operation

15.24. IRR99 Regulation 15 requires employers to co-operate with each other. The aim of the co-operation should be to co-ordinate the measures they take to comply with legal requirements and inform each other of the risks to employees arising from their work. The information shared would include matters such as relating to controlled areas, contingency arrangements, and sharing information on the doses incurred whilst working under each employer's control.

Controlled areas

15.25. In the UK, a *Controlled* area is an area in which specific protection measures and safety provisions are, or could be, required for controlling normal exposures or preventing the spread of contamination during normal working conditions, and preventing or limiting the extent of potential exposures. A *Supervised* area is an area, other than a controlled area, in which occupational exposure conditions are kept under review, even though specific protection measures and safety provisions are not normally needed.

15.26. Under IRR99 Regulation 16, the responsibility for designating a controlled or supervised area rests with the employer in control of that area. In the case of a nuclear licensed site, this duty is also on the licensee. An assessment undertaken by the licensee will establish whether special procedures are necessary to restrict exposure. The designation of a supervised area by the licensee will depend on the assessment of doses, and whether conditions may change. The licensee is required under IRR99 Regulation 13(1) to consult an RPA on the implementation of the requirements as to controlled and supervised areas. IRR99 Regulation 19 also requires licensees who designate controlled or supervised areas to ensure that levels of ionising radiation are adequately monitored, and that those areas are kept under review. Advice is provided in the ACoP and guidance to IRR99[52] on issues for consideration and dose levels appropriate to designate a controlled or supervised area. Licensees have therefore developed arrangements to ensure the appropriate legal requirements are met and relevant good practice adopted for controlled and supervised areas on nuclear licensed sites.

15.27. Evidence from UK installations suggests that the spread of contamination beyond the boundaries of controlled areas is uncommon. This is generally achieved by applying strict controls to such activities as changing of clothing and personal

monitoring at various stages within the controlled area, rather than at the boundary between controlled and other areas.

Protective equipment

15.28. IRR99 Regulations 9 and 10 require licensees to ensure that any personal protective equipment provided pursuant to Regulation 8 is appropriate and that it is subject to routine examination and maintenance. Licensees are also required, under Regulation 14, to ensure appropriate information, instruction and training is provided to workers using personal protective equipment. To meet the personal protective equipment requirements in IRR99, licensees have developed their own arrangements to ensure compliance. The HSE checks that the requirements are met as part of its inspection programme. The HSE has published guidance on the use and maintenance of respiratory equipment.

Licensing requirements

15.29. In addition to the application of IRR99, the regulation of radiological hazards is also achieved through the licensing regime. Under LC14 on safety documentation, the licensee is required to submit to HSE written safety cases demonstrating that safety will be maintained during design through to the decommissioning of the installation.

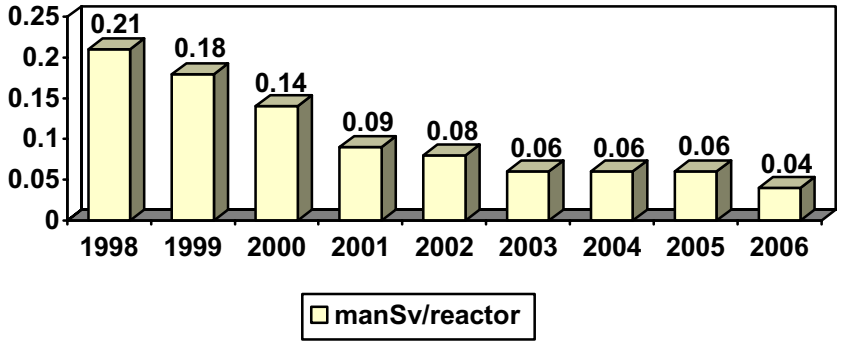
15.30. The adequacy of the licensee's safety submissions is assessed by HSE against its SAPs (see Annex 8). The principles relating to radiation protection are consistent with the latest recommendations in ICRP60[56] and ensure that the licensee makes a strenuous pursuit of the objective to keep exposures ALARP. The HSE considers that the principles in the SAPs relating to radiation protection will be consistent with the new recommendations of the ICRP due to be published in 2007.

15.31. Owing to the nature of the radiological hazard presented by large nuclear installations, there is, in addition to the provisions of IRR99, the requirement for licensees to make and implement adequate arrangements for the assessment of the average effective dose equivalent (including any committed effective dose equivalent) to specified classes of person (LC18 on radiological protection). Again, enforcement of this requirement is carried out by the HSE.

Radiation doses at nuclear installations

15.32. The radiation doses to personnel working at the nuclear installations licensed to Magnox Electric Ltd are given in the following chart. This data excludes Calder Hall and includes Chapelcross from 2003.

Figure 15.1 - Radiation dose to staff at Magnox reactors



15.33. The total collective dose to all persons working at the nuclear installations licensed to MEL during the calendar year 2006 was 0.52 manSv with 0.32 manSv to

employees and 0.20 manSv to contractors. No individual received a dose in excess of 5 mSv whilst working at these sites during 2006.

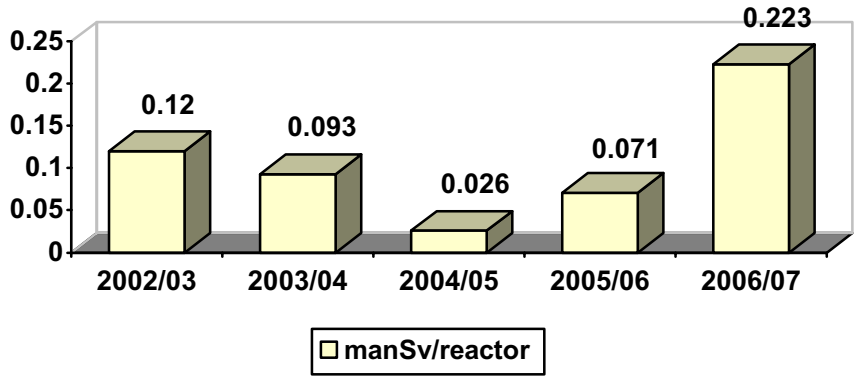
15.34. Doses due to maintenance outages at operating power stations are significantly higher than those for routine operation, but for gas-cooled reactors are substantially lower than those for other reactor types. For maintenance outages on MEL licensed plants during 2006, the total collective dose was 0.17 manSv, accounting for almost 70% of the total dose received on those sites for the year.

15.35. Following approval from HSE, all installations licensed to MEL (with the exception of Chapelcross) have moved to the use of Electronic Personal Dosemeters (EPDs) as the legal dosemeter. These have been used at all sites as control dosemeters for some time. Subject to approval, Chapelcross will also be moving to the use of EPDs as legal dosemeters in due course.

15.36. The total collective dose to all persons working on BEGL during calendar year 2006 was 2.47 manSv with 0.56 manSv to employees and 1.91 manSv to contractors. Doses were higher in the 2005/2006 year because a greater number of higher dose statutory activities were necessary.

15.37. Whilst no person exceeded the statutory annual dose limit of 20 mSv specified in IRR99, approval was granted for 73 people to exceed the BEGL company dose restriction level of 10 mSv (62 at Hinkley Point B and 11 at Hunterston B) to undertake necessary work. The maximum individual dose received by a BEGL employee was 9.58 mSv and the maximum individual dose received by a BEGL contractor was 11.67 mSv. Record information has determined that the average dose received by BEGL employees was 0.117 mSv and by BEGL contractors was 0.245 mSv.

Figure 15.2 - Radiation dose to staff at BEGL reactors



15.38. Figure 15.2 shows the cumulative dose received by all employees and contractors, divided by the number of reactors worked on, and represents a 'snapshot' in time at the March/ April of each year. Full details can be obtained from the British Energy Group plc Corporate Social Responsibility Report 2006/07[51].

15.39. EPDs are now being used at all BEGL sites as the legal dosemeter (following approval from the HSE), in place of passive dosemeters, to make assessments of individual radiation exposure. These have been progressively introduced since 2001 as aids to the management and control of dose.

UK safety performance overview

15.40. An annual update paper to NuSAC in January 2007[57], covering the preceding year but including data for the previous ten years, reviewed the safety performance of the major UK nuclear licensees.

15.41. In this report, tables (reproduced below for the licensees relevant to the Convention) display trends in worker dose for employees and contractors. All licensees show a substantial reduction in cumulative, average and maximum doses since 1990, reflecting improvements in working practices and the introduction of more modern plant and equipment. The report shows that the majority of worker dose in the UK is accrued at the Sellafield site, which is reported under the Joint Convention.

TABLE 15.1 - Civil nuclear licensees - Collective dose (Sv) – Trends

	BNFL UK[1]		BNG SL		MEL		BEGL	
	E	C	E	C	E	C	E	C
05/06			6.7	3.7	0.6	0.7	0.3	0.8
04/05			6.0	3.2	0.6	0.5	0.3	0.1
03/04	9.4	3.5					0.4	1.0
02/03	10.7	3.4					0.5	1.2
01/02	11.9	4.6					0.6	1.2
00/01	10.4	4.1					0.8	1.8
99/00	11.9	5.0					1.1	1.8
98/99	11.9	3.7			1.6	1.5	0.9	0.6
97/98	13.5	3.9			1.9	1.4	1.0	1.4
1990	33.8	6.8			8.7	2.5	Inc in Magnox	

(1) BNFL includes BNGSL and Springfield Fuels up to 2003/04 and MEL from 2000 to 2003/04

TABLE 15.2 - Civil nuclear licensees- Average dose (mSv) – Trends

	BNFL UK[1]		BNG SL		MEL		BEGL	
	E	C	E	C	E	C	E	C
05/06			0.8	1.1	0.1	0.1	0.1	0.1
04/05			0.7	0.8	0.2	0.1	0.1	<0.1
03/04	0.7	0.5					0.1	0.1
02/03	0.8	0.5					0.1	0.2
01/02	0.9	0.5					0.2	0.2
00/01	0.8	0.4					0.2	0.2
99/00	1.0	0.5					0.4	0.3
98/99	1.3	1.0			0.5	0.2	0.2	0.1
97/98	1.4	1.0			0.6	0.2	0.2	0.2
1990	3.1	1.1			0.6	0.2	Inc in Magnox	

(1) BNFL includes BNGSL and Springfield Fuels up to 2003/04 and MEL from 2000 to 2003/04

TABLE 15.3 - Civil nuclear licensees- Maximum dose (numbers in excess of 5 mSv) - Trends(2)

	BNFL UK[1]		BNG SL		MEL		BEGL	
	E	C	E	C	E	C	E	C
05/06			97	171	0	0	4	45
04/05			75	106	0	3	0	0
03/04	134	87					3	29
02/03	218	74					4	58
01/02	326	163					3	110
00/01	336	113					7	85
99/00	547	230					22	41
98/99	634	222			19	9	0	1
97/98	654	124			27	36	8	48
1990	2436	175			162	51	Inc in Magnox	

(1) BNFL includes BNGSL and Springfield Fuels up to 2003/04 and MEL from 2000 to 2003/04

(2) No person exceeded the legal maximum (now 20mSv pa.). The majority of doses recorded above 5mSv were in the range 5mSv-10mSv.

Article 16 - Emergency Preparedness

1. ***Each Contracting Party shall take the appropriate steps to ensure that there are on-site and off-site emergency plans that are routinely tested for nuclear installations and cover the activities to be carried out in the event of an emergency. For any new nuclear installation, such plans shall be prepared and tested before it commences operation above a low power level agreed by the regulatory body.***
2. ***Each Contracting Party shall take the appropriate steps to ensure that, insofar as they are likely to be affected by a radiological emergency, its own population and the competent authorities of the States in the vicinity of the nuclear installation are provided with appropriate information for emergency planning and response.***
3. ***Contracting Parties which do not have a nuclear installation on their territory, insofar as they are likely to be affected in the event of a radiological emergency at a nuclear installation in the vicinity, shall take the appropriate steps for the preparation and testing of emergency plans for their territory that cover the activities to be carried out in the event of such an emergency.***

Under this Article, compliance with the Convention is demonstrated in a way that has not substantially changed since the third UK report.

Emergency preparedness for a radiological emergency at a UK nuclear installation

16.1. The precautions taken in the design and construction of nuclear installations in the UK, and the high safety standards in their operation and maintenance, reduce to an extremely low level the risk of accidents that might affect the public. However, all nuclear installation operators prepare, in consultation with local authorities, the police and other bodies, emergency plans for the protection of the public and their workforce, including those for dealing with an accidental release of radioactivity. These are regularly tested in exercises under the supervision of HSE.

16.2. The Department for Business, Enterprise and Regulatory Reform (BERR) co-ordinates emergency preparedness policy at national level, as the lead government department on the UK's arrangements for response to any emergency with off-site effects from a licensed civil nuclear site in England and Wales. Consequently, it chairs the Nuclear Emergency Planning Liaison Group (NEPLG), which brings together organisations with interests in off-site civil nuclear emergency planning. NEPLG is a forum for discussing common problems, exchanging information and experience and agreeing improvements in planning, procedures and organisation. It has issued Consolidated Guidance[58] to all those involved in the development of site-specific emergency plans at local level and reviews the results of off-site exercises to ensure lessons are learned and the process of incremental improvement continues. A summary of the scope and content of the NEPLG consolidated guidance can be seen at Annex 9.

16.3. In the event of an emergency at a civil nuclear site in Scotland, the lead Government department responsibility and the main national coordinating role would fall to the Scottish Executive. BERR would still be responsible for briefing the Westminster Parliament and the UK's international partners.

16.4. The UK aims to ensure it is equipped and prepared to respond to the most unlikely event of an emergency at a civil nuclear site. So, in practical terms, individuals with a role if there is an emergency at a nuclear installation receive

briefing and training, mostly through participation in exercises, to ensure they can cope effectively in the event of any nuclear emergency. The police, working in conjunction with other emergency services, expert bodies, and local and national agencies, would coordinate any response effort locally. BERR would co-ordinate the response at national level; it would brief Ministers and the UK's international partners, and be the main source of information at national level to the public and the media. These arrangements are exercised at regular intervals by all the organisations concerned.

16.5. In the event of a nuclear accident overseas, which may have implications for the UK, Defra would be the lead Government department and would receive initial notification through arrangements established by a series of multi-lateral or bilateral Conventions, or agreements. In addition, Defra operates the UK's Radioactive Incident Monitoring Network (RIMNET) of continuous radiation monitoring stations, which would automatically raise an alarm if abnormal increases in the levels of radiation were detected at any of the RIMNET monitoring sites. Defra's Technical Coordination Centre and Information Centre in London would be used to collect, collate and disseminate radiation monitoring data from a wide number of sources and would be used as a basis for any necessary public protection measures.

Governmental emergency preparedness

16.6. REPPIR implement in Great Britain the Articles on intervention in cases of radiation (radiological) emergency in Council Directive 96/29/Euratom. REPPIR also partly implement Council Directive 89/618/Euratom (known as the Public Information Directive) on informing the general public about health protection measures to be applied and steps to be taken in the event of an emergency. REPPIR place 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. Licensees also have to comply with additional requirements on the public availability of certain information (IRR99 also require the preparation of contingency plans under Regulation 12).

16.7. A condition attached to nuclear site licences, LC11 (see Annex 5), on emergency arrangements, ensures that all licensees have adequate arrangements in place to respond effectively to any incident ranging from a minor on-site event to a significant release of radioactive material. The Condition requires employees to be properly trained and that the emergency arrangements are 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 HSE for approval such parts of the arrangements as HSE may specify. Once approved by HSE no alteration or amendment can be made to the approved arrangements unless HSE has approved the alteration or amendment. LC11 requires the arrangements to be regularly rehearsed to ensure their effectiveness.

16.8. The BERR also has an ongoing lead department role in bringing together organisations involved in off-site nuclear emergency planning through the Nuclear Emergency Planning Liaison Group (NEPLG). Members include representatives of the nuclear operators, the police, fire service, local authority emergency planning officers and government departments and agencies that would be involved in the response to an emergency. The NEPLG has issued a number of guidance documents aimed at all those involved in the development of site-specific emergency plans at local level[58].

Arrangements for preparedness and response

16.9. LC11 requires rehearsal of the arrangements to ensure their effectiveness. This is achieved by the licensee holding training exercises and HSE agreeing to a programme of demonstration emergency exercises that HSE nuclear installations inspectors formally observe. HSE can specify that exercises cover all or part of the

arrangements. This power would be used if HSE is not satisfied with an aspect of the licensee's performance and the licensee did not agree or volunteer to repeat the exercise.

16.10. HSE consent is required to bring nuclear fuel onto a site for the first time. As part of the assurances that HSE requires prior to granting this Consent, the establishment of appropriate emergency and evacuation arrangements have to be demonstrated, including the approval of an Emergency Plan that is in the public domain and cannot be changed without the approval of HSE. The relevant considerations are that there are sufficient trained personnel and suitable available equipment to deal with the risks from hazards on the site. Similarly, the consent of HSE is required at stages specified by HSE relating to key increases in hazard on the site during the active commissioning process in which the plant is brought from initial criticality up to its full reactor power rating. At any of these stages, HSE may require a demonstration of enhanced emergency arrangements prior to the granting of Consent to proceed to the next stage. This demonstration may be through an examination of the training records for all staff affected, or by means of a demonstration exercise against a testing scenario. Throughout the life of the nuclear installation, the emergency arrangements are subject to review and, with HSE's approval as described above, revision as appropriate. As part of the licensees 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.

Preparation and testing of emergency plans

16.11. The requirements for the preparation and testing of off-site emergency plans are covered by REPPIR[38] and are regulated by HSE. REPPIR requires off-site plans to be produced by the local authority in consultation with emergency responders, for those sites where a radiation emergency is considered to be reasonably foreseeable. The responsibilities for reviewing and testing off-site emergency plans are also covered in REPPIR. Where there is the potential for an offsite release of radioactivity, that would require implementation of countermeasures, detailed emergency planning zones are provided around nuclear installations. These zones are defined, based on the most significant release of radiation from an accident which can be reasonably foreseen. In the event of an accident being larger than the reasonably foreseeable event, there are arrangements for extending the response.

16.12. The prime function of the off-site facility (Strategic Coordination Centre or SCC) is to: decide on the actions to be taken off-site to protect the public, to ensure that those actions are implemented effectively and to ensure that authoritative information and advice on these issues is passed to the public (the facility includes media briefing centres). Decisions would generally be made through regular coordinating group meetings. These are usually chaired by the Police, who are responsible for taking decisions to protect the public, and would involve all the principal organisations represented at the facility.

16.13. The declaration of a nuclear emergency at a Site would be followed immediately by the notification of the emergency services and local and national authorities. 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, Local Water Company and the Fire and Ambulance services. In addition Government Departments and Agencies would also be represented. These would include Defra, (or Scottish or Welsh equivalents), the BERR, HPA-RPD and the HSE. As the regulators for disposal of radioactive waste, and because of their other environment protection roles, SEPA in Scotland, and EA in England and Wales, would also be represented, as would the Food

Standards Agency to issue advice and restrictions (if it feels it necessary) on fresh food in the area affected by the emergency. These representatives would be in communication with their organisations and be responsible for ensuring that adequate information and advice was available, both at the SCC and at the emergency control centres of their respective organisations. The representatives would liaise closely to ensure that a proper assessment was being made of the situation, that appropriate actions were being taken and that the public was being kept informed. The following Figures 16.1 to 16.3 show the arrangements diagrammatically.

16.14. The technical information regarding plant prognosis and radiological assessments by the Operator is an important aspect in the response to an emergency. The SCC will receive this information from the Operator's organisation. The Operator's representatives at the SCC will have a prime function in ensuring that adequate information is available to those at the facility and to ensure that their own organisations are aware of what assistance the facility requires.

16.15. Emergency arrangements are tested regularly under three categories known as levels 1, 2 and 3. Level 1 exercises are held at each nuclear installation site once a year and concentrate primarily on the operator's actions on and off the site. Level 2 exercises are aimed primarily at demonstrating the adequacy of the arrangements that have been made by the local authority to deal with the off-site aspects of the emergency, particularly the functioning of the SCC where organisations with responsibilities or duties during a nuclear emergency also exercise their functions.

16.16. From the annual programme of level 2 exercises one is chosen as a level 3 exercise to rehearse not only the functioning of the SCC but also the wider involvement of central government, including the exercising of the various government departments and agencies attending the Nuclear Emergency Briefing Room (NEBR) (for England and Wales) in London, or the Scottish Executive Emergency Room (SEER) in Edinburgh. The decision on which exercise should be selected as the level 3 is made jointly between the licensees, the lead government departments (BERR or the Scottish Executive) and NEPLG, in consultation with HSE.

Public information

16.17. REPPIR provide 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 various information services of the local agencies involved and of central government, together with the news media, are available to help inform the public of the facts and of the assessments being made of the course of the accident, should one occur.

16.18. REPPIR requires that members of the public within a detailed emergency planning zone, 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.

Figure 16.1 – Emergency arrangements structure

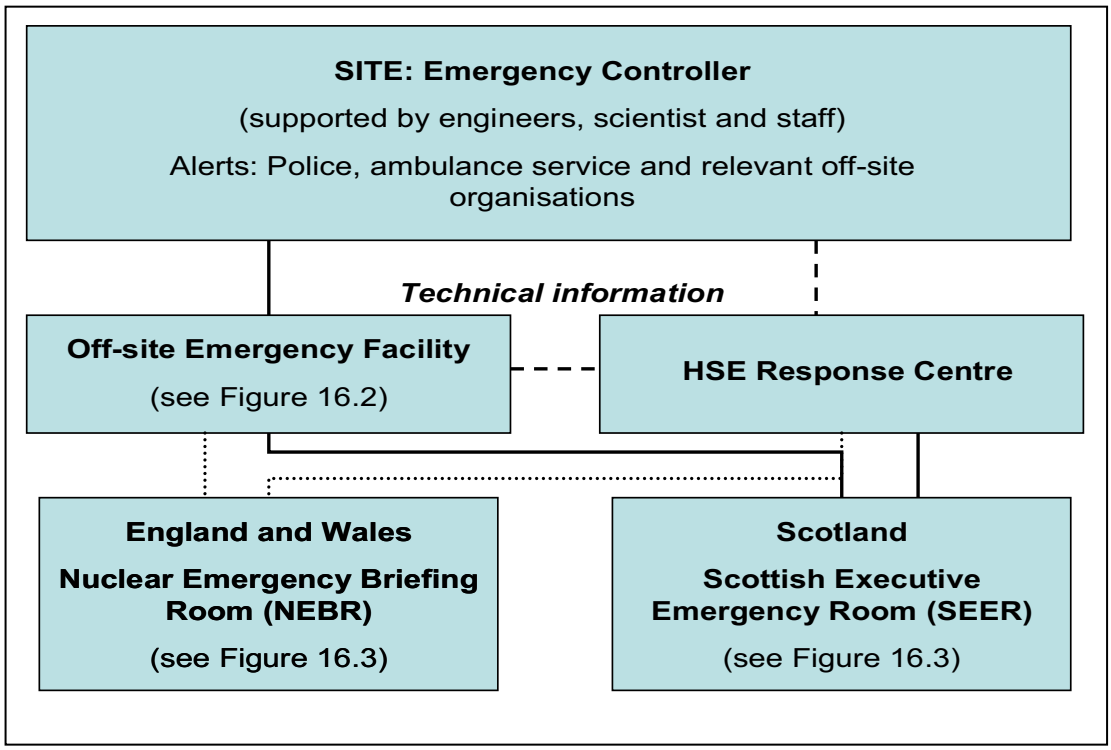


Figure 16.2 – Off-site facility representatives

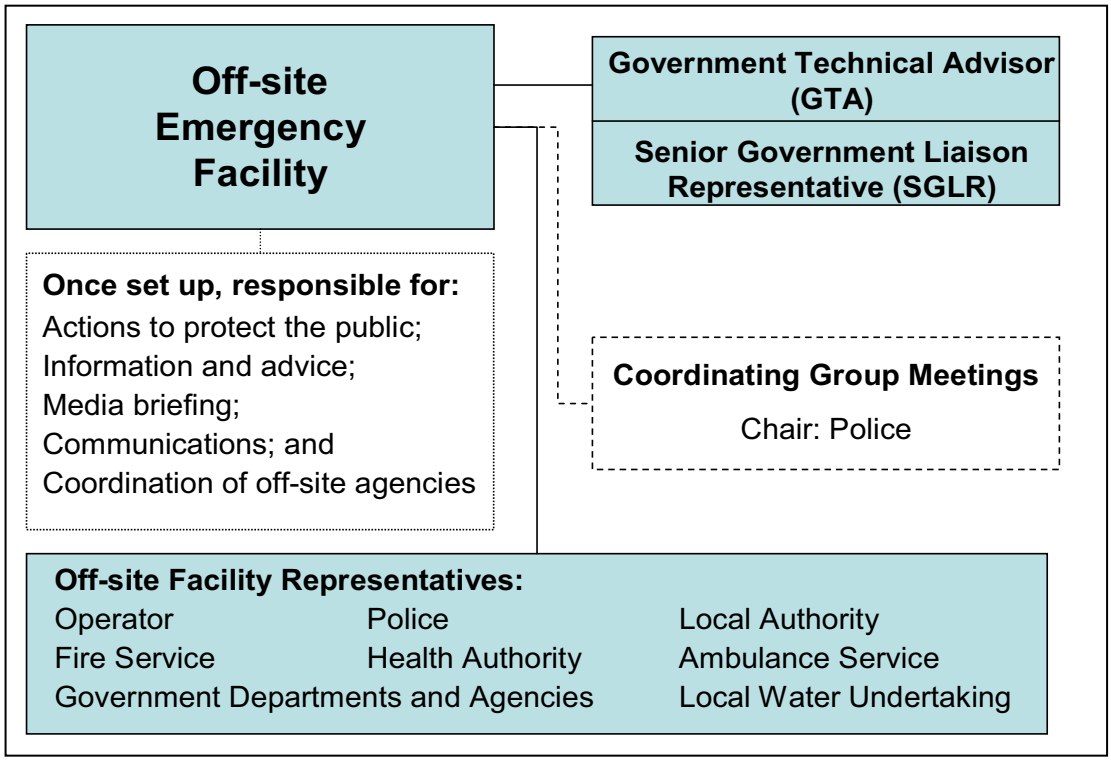
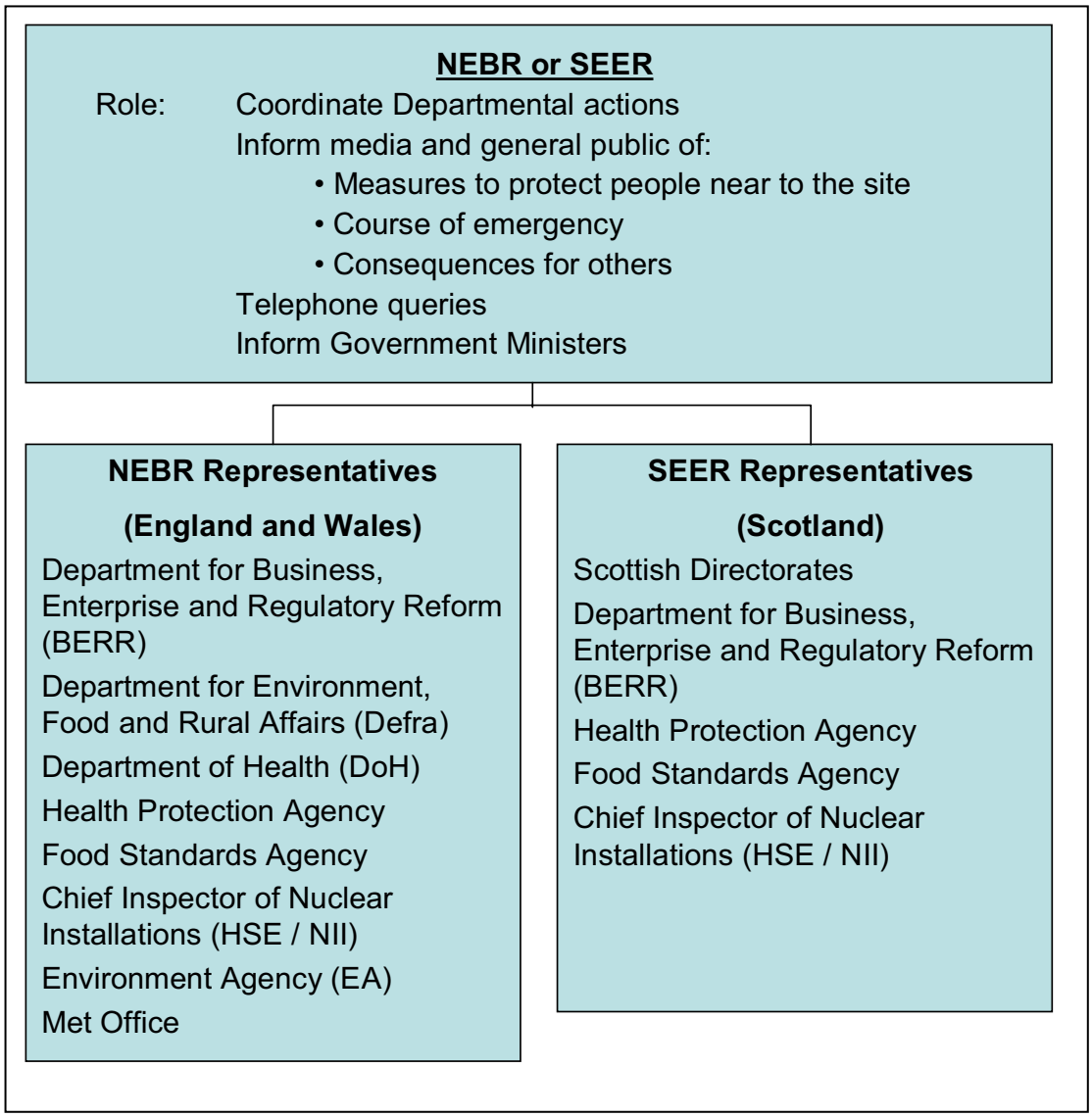


Figure 16.3 – Nuclear Emergency Briefing Room (NEBR) and Scottish Executive Emergency Room (SEER) representation



Information in the event of an emergency

16.19. REPPIR require 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 would also be expected to make a formal announcement as soon as possible after the emergency had been declared. While the agencies involved in responding to the emergency would seek to deal with any queries they received, the main channel of communication with the public outside the immediate vicinity of the affected site would be the media.

16.20. 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.

16.21. For an emergency at a nuclear installation in the UK, BERR would take the responsibility for notifying other countries and initiate requests for international assistance. Under existing early notification conventions, BERR 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.

16.22. The UK regularly takes part in emergency exercises with other countries to test emergency arrangements, should there be a nuclear emergency in another country that has the potential to affect the UK.

Measures to enhance emergency preparedness programmes

16.23. The UK has a well developed programme of site, regional and national exercises of emergency plans. Lessons learned from this programme are reviewed and any actions requiring improvement to emergency facilities, equipment, procedures, training, etc are identified and completed. NEPLG together with NEAF review the UK Emergency Exercise Programme to ensure that a balanced programme of exercises take place covering all types of nuclear facilities. Since some nuclear sites have significant chemical hazards, the implications for this on the nuclear emergency response have been put into the exercise programme.

Response to emergencies outside of UK

16.24. Defra is the lead Government department for coordinating 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. Defra is the contact point for inward notifications under these arrangements. The National Response Plan, implemented by Defra with support from EA provides arrangements for dealing with an emergency. This includes Defra maintaining contact arrangements and duty officers that ensure the UK can be notified of an emergency at any time. The RIMNET network operated by Defra, comprising 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. Defra has established procedures including the notification and alert of organisations within the UK with responsibilities for dealing with an overseas nuclear accident. It maintains the Technical Co-ordination Centre and Information Centre within the Defra headquarters building in London, containing the equipment required for management of the response.

Article 17 - Siting

Each Contracting Party shall take the appropriate steps to ensure that appropriate procedures are established and implemented:

(i) for evaluating all relevant site-related factors likely to affect the safety of a nuclear installation for its projected lifetime;

(ii) for evaluating the likely safety impact of a proposed nuclear installation on individuals, society and the environment;

(iii) for re-evaluating as necessary all relevant factors referred to in sub-paragraphs (i) and (ii) so as to ensure the continued safety acceptability of the nuclear installation;

(iv) for consulting Contracting Parties in the vicinity of a proposed nuclear installation, insofar as they are likely to be affected by that installation and, upon request providing the necessary information to such Contracting Parties, in order to enable them to evaluate and make their own assessment of the likely safety impact on their own territory of the nuclear installation.

Under this Article, compliance with the Convention is demonstrated in a way that has not substantially changed since the third UK report (i.e. in a way that has implications for the Convention obligations), except in paragraphs 17.2, 17.16, 17.19 to 17.22, and 17.24 to 17.26 below.

General

17.1. In the UK, no new nuclear installation sites have been formally considered since the Sizewell B and Hinkley Point C Public Inquiries[48, 49] in the 1980s. Therefore the UK has no recent experience of site evaluation and selection. However, the UK recognises that processes and procedures will need to be in place, should there be a future decision to build new nuclear power stations. Such processes and procedures would be based on the prevailing current national planning and licensing requirements, together with international requirements and obligations. The UK response to Article 17 is therefore largely historic, but it also recognises that the framework exists for the continuing re-evaluation to ensure the acceptability of the existing nuclear installations.

17.2. The factors that should be considered in assessing sites cover three main aspects:

- the location and characteristics of the population around the site, and the physical factors affecting the dispersion of released radioactivity that might have implications for the radiological risk to people;
- external hazards that might preclude the use of the site for its intended purpose;
- the suitability of the site for the engineering and infrastructure requirements of the facility.

National laws, regulations for planning and licensing process

17.3. An organisation wishing to construct, extend or operate any type of power generating station in the UK must first obtain planning permission from the relevant local authority under the Town and Country Planning Act (1990) (TCP Act)[59] for England and Wales, and the Town and Country Planning (Scotland) Act 1997 for Scotland[60]. This includes the site-related factors relevant to the safety of the proposed nuclear installation.

17.4. For proposals for stations exceeding 50 megawatts, organisations must also obtain a consent under Section 36 of the Electricity Act 1989 (see under Article 7) from the Secretary of State for Business, Enterprise and Regulatory Reform for stations in England and Wales, the Secretary of State for Scotland for stations in Scotland or, in the case of stations in Northern Ireland, the Secretary of State for Northern Ireland. Before granting a 'Section 36' consent, the relevant Secretary of State must consult the relevant planning authority. If that authority objects to the proposed development and those objections are not subsequently addressed and the proposal modified accordingly, a public inquiry must be held. Public Inquiries may consider all factors relating to the proposal. Where the relevant planning authority does not object to the proposal, the relevant Secretary of State may, in any case, choose to hold a public inquiry if he or she considers this to be appropriate in the light of other objections and considerations.

17.5. Under the Electricity Act, the relevant Secretary of State has the power, having consulted the relevant local authority and following any public inquiry which might have been required, to direct that the granting of a Section 36 consent also means that planning permission under the TCP Act has also been granted.

17.6. Proposals for nuclear power stations, and also for non-nuclear stations with a heat output of over 300 megawatts must be accompanied by an assessment of the environmental impact of the proposed development for consideration by the relevant Secretary of State.

17.7. For Scotland, the Town and Country Planning (Scotland) Act 1997 provides a comparable planning framework for the consideration of the siting of a nuclear installation to that for England and Wales in the TCP Act, and the Scottish Minister have similar powers to direct that a public inquiry be held.

17.8. In addition to the above, under the NIA65 section 1(1) (see Annex 4), no corporate body can use any site for a nuclear installation unless a nuclear site licence has been granted in respect of that site by the HSE and is for the time being in force. The licensing process includes a safety evaluation of the proposed reactor design. Also, under Section 4(1) of the NIA65, on granting any nuclear site licence, HSE can attach such conditions as may appear to HSE necessary or desirable in the interests of safety. The Licence Conditions (see Annex 5) include provisions with respect to siting. In particular, LC2 requires the licensee to mark the boundaries of the nuclear licensed site. Section 6(1) of the NIA65 requires the Minister 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.

Government siting policy

17.9. Government policy on siting nuclear installations reactors has developed over time. The White Paper 'A programme of nuclear power' (1955) Section 37 stated that '... the first stations, even though they will be of an inherently safe design, will not be built in heavily built-up areas.' A definition of a remote site, based on characteristics of the early sites, was used for all subsequent steel vessel Magnox reactors.

17.10. The Government's siting criteria, developed in 1955, included the following:

- Only a few people should be subject to extreme risk: plans should be prepared for effecting the urgent evacuation of persons close to the site in the downwind direction;
- Protracted evacuation or severe restriction on normal living should not be imposed on any but small population centres; and
- Temporary evacuation or restrictions should not be necessary for more than 10,000 people in any but exceptional weather conditions. If an accident were to coincide with exceptional weather conditions, not more than 100,000 persons should ultimately be affected.

17.11. On 6 February 1968 the Minister of Power stated that, as a result of advances in technology, the safety of a gas-cooled reactor in a concrete pressure vessel was such that it may be constructed and operated much nearer built-up areas than had so far been permitted. The Minister commented that there were advantages in having these stations near centres of population in terms of amenity and of transmission costs.

17.12. The Minister of Technology on 23 March 1970 stated that before a site is accepted for a nuclear power station, account is taken of all known development plans. This ensures that projected developments in the vicinity of the station are not hampered.

17.13. On 5 December 1973 the Secretary of State for Trade and Industry stated that first of a kind reactors, if licensable, would be built on sites similar to those used for early Magnox reactors, i.e. remote sites, and relaxation to sites nearer centres of population would depend on relevant experience.

17.14. The Secretary of State for Energy on 11 March 1988 tabled the demographic criteria for assessing potential sites, both for Magnox reactors and AGRs. Magnox reactors in concrete pressure vessels would be allowed some relaxation of the general Magnox criteria if necessary.

17.15. Work is currently in progress to review the technical basis for the government siting policy.

Evaluation of site-related factors likely to effect the safety of a nuclear installation during its lifetime

17.16. HSE's Safety Assessment Principles (SAPs) for Nuclear Facilities[14] are not mandatory design or operational standards, but they do provide HSE inspectors with a framework for making regulatory judgements. SAP ST.1 expects that account should be taken of factors that might affect the protection of individuals and populations from radiological risk when assessing the siting of a new facility. SAPs ST.2 – ST.7 place further specific expectations on licensees (or prospective licensees) to consider population characteristics, local physical data, external hazards, other installations in the vicinity, and potential changes during the life of a plant.

17.17. When siting the UK's existing nuclear installations, account was taken of natural and man-made hazards in the area. This was an essential part of the design safety report on which initial licensing was based, and will continue to be so in the evaluation of any new sites.

17.18. HSE's SAPs set out expectations on what should be addressed during the design of a new nuclear installation, this including the need for site-specific data. SAPs EHA.1 - EHA.7 address the general principles of hazard analysis including identification, data sources, and input to fault analysis. SAPs EH.8 – 17 address individual site-specific hazards. Earthquakes, flooding, drought, high winds and extremes of ambient temperature are examples of natural hazards that need to be considered. Man-made hazards include the possibility of an aircraft crash on the site and the storage, processing or transport of hazardous materials in the vicinity. The hazard analysis should be used in the plant design and where appropriate, in the operation of the plant.

17.19. The Control of Major Accident Hazard (COMAH) Regulations[61] aims to prevent and mitigate the effects of those major accidents involving dangerous substances, such as chlorine, liquefied petroleum gas, explosives etc which can cause serious damage/harm to people and/or the environment. Industries that have quantities of such substances above a prescribed threshold level must notify HSE. Under REPPIR (see under Article 7) and COMAH, the relevant local authority is required to prepare a written off-site emergency plan that brings together the

emergency arrangements of all hazardous installations in the area. These emergency plans are publicly available and so the existence of hazardous materials which could affect a nuclear site can be used by the licensees in their hazard analyses.

17.20. In addition to the analysis of external hazards as initiating events that could lead to accidents, the site selection process has to consider other external factors that relate to geological suitability, the availability of external services and susceptibility to extreme weather.

17.21. HSE SAPs ECE.4 and ECE.5 expect that investigations should be carried out to determine the suitability of the natural site materials to support the foundation loadings specified for normal operation and fault conditions. The design of foundations should utilise information derived from geotechnical site investigation. The information should include ground-water conditions, contamination conditions, soil dynamic properties and any potential for liquefaction or cyclic mobility.

17.22. Essential services are those resources necessary to maintain the safety systems in an operational state at all times, and they may also provide supplies to safety-related systems. The services may include electricity, gas, water, compressed air, fuel and lubricants, and need to satisfy two requirements. The first requirement is to provide a guaranteed, or non-interruptible short-term supply to ensure continuity until the long-term essential supply is established, and the second is to ensure that there is adequate capacity to supply the service until normal supplies can be restored. SAPs EES.1 – EES.9 address essential services with respect to availability, reliability, back-up systems and the consequences of loss of a service.

Criteria for determining the potential effects of the nuclear facility on individuals, society and environment

17.23. The initial design of a nuclear power plant will optimise the radiation exposure to the workers and general public. This will be addressed in the pre-construction safety report. HSE SAPs NT.1 and Targets 1-3 set out guidelines for radiation exposure during normal operation. The safety case prepared by the licensee has to convince HSE that these guidelines will be met. As the nuclear installation design develops, so too the safety case must become more developed and provide the necessary verification of the initial calculations. The pre-operational safety report will take into account all the commissioning tests and the validation of any initial assumptions. This will be reviewed during the course of the plant's life in the Periodic Safety Reviews (PSRs).

17.24. SAP ST.2 expects that both plant design data and the site location are used to evaluate the radiological risk to the general public. However, in accident conditions, mitigation of radiological consequences will depend on effective emergency arrangements (see under Article 16). This is dependant upon how many people might be involved and how the appropriate counter measures, in particular the distribution of stable iodine and evacuation, might be implemented. Key factors are the population distribution and access facilities in the area. For proposed new nuclear installation sites, the licensee submits to HSE details of present and predicted population around the site out to 30 km. Information on nearby schools, industry, hospitals, institutions and other places where people may congregate is included. On multi-facility sites, the safety case should consider the site as a whole to establish that hazards from interactions between facilities have been taken into account. (SAP ST.6)

17.25. SAPs Targets 4. 6 and 8 set out targets for radiation exposure in design base fault sequences for people on and off the site.

17.26. SAPs paragraphs 622 – 628 and Target 9 address societal risk. As a measure of the societal concerns that would result from a major accident, a target

based on a representative accident leading to 100 or more fatalities is defined. The target does not in itself cover all the factors related to societal concerns. In making an ALARP demonstration, the consequences in terms of other societal effects must also be considered. The safety case should identify accidents that result in source terms that could cause 100 or more deaths. The total risk should be calculated taking account of the frequency distribution of the source terms together with probabilistic weather conditions. In estimating the risks, fatalities both on-site and off-site should be included.

17.27. SAP ST.3 expects the licensee to consider the topography and geology for the area that might effect the dispersion of the authorised 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 examined. This examination determines whether the topography and road and rail systems are such as to create difficulties if it became necessary to evacuate people from the area around the plant. SAP ST.3 also expects the dispersion of radioactive releases via the atmosphere, surface water and ground water and the potential exposure pathways to be considered.

17.28. On 11 March 1988, the Secretary of State for Energy stated that once a site has been accepted for a nuclear station, arrangements are to be made to ensure that residential and industrial developments are so controlled that the general characteristics of the site are preserved.

17.29. The planning and public enquiry processes (see above) require that the all relevant issues are addressed and discussed. The process also facilitates inputs from the public and interested groups. HSE must be satisfied that the size, nature and distribution of the population around the site are properly taken into consideration. If planning permission is granted for the site, there will be planning controls to ensure that significant and unacceptable population growth does not occur. In the UK, the area requiring these restrictive controls is out to 8 km from the nuclear site.

Re-evaluation of relevant safety factors to ensure continued safety acceptability.

17.30. Continued re-evaluation of external hazards and of the emergency plans is required under LCs 15 and 11 respectively. Guidance on re-evaluation of the specific demographic requirements on siting is given in SAPs ST.1 - 7. LC15 also requires periodic safety review of all safety documentation to ensure that the plant design still meets its original intent and that all reasonably practicable safety improvements are implemented (see Article 6). This includes the re-evaluation of external hazards.

17.31. Local authorities consult the HSE with regard to any proposed development that might lead to an increase in population close to the site and on large developments further from the site. Limiting criteria based upon population distribution are used only for guidance, and the HSE cannot necessarily insist on rigid adherence to demographic constraint limits.

17.32. Circular 04/00: 'Planning controls for hazardous substances'[62] issued by the Department for Communities and Local Government, and a similar circular from the Scottish Development Department (5/1993)[63] give advice on the exercise of planning control over hazardous development and over development in the vicinity of hazardous installations.

17.33. These circulars give 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 Installations)[64]. HSE 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 nuclear installations. HSE's nuclear installation inspectors assess such planning applications to determine:

- whether a proposed development would raise the population to near the constraint limits set out in the Government's siting policy for nuclear installations;
- whether the external hazards in the nuclear safety case envelope the hazard from a proposed hazardous installation to ensure that the existing safety case is not compromised, or alternatively whether the nuclear safety case can be modified and justification provided to incorporate the new hazard;
- 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 the nuclear licensed site; and
- for a proposed development within the detailed emergency planning zone (where applicable), HSE refers the application to the licensee, who must in turn liaise with those bodies having responsibilities under the off-site emergency plan, to find:
    a) whether the development can be incorporated into the emergency plan; or failing that,
    b) whether the emergency plan could be modified such that the development could be incorporated into the emergency plan.

HSE requires assurances that the developments in the immediate vicinity of a nuclear installation can be accommodated by the existing emergency preparedness arrangements to satisfy REPPIR requirements.

17.34. Local authorities normally follow HSE's advice as a statutory consultee. In England and Wales, HSE will be informed if the local authority proposes not to follow HSE's advice. HSE can then, if it considers it appropriate, request the Secretary of State for Environment, Food and Rural Affairs to call in the application. In Scotland, any development that has been the subject of consultation with HSE, and where HSE has advised against the granting of planning permission or has recommended conditions which the planning authority does not proposes to attach to the planning permission, must be notified to Scottish Ministers.

17.35. Both the licensee and HSE 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 Periodic Safety Reviews. In addition, HSE maintains a database of the estimated population around nuclear installations, based upon the most recent ten-yearly population census, updated to take account of subsequent planning applications for residential developments[65]. This database is used to compare the projected population, following a proposed residential development, with government demographic guidelines, before HSE advises a local authority on the acceptability of such a planning application.

17.36. Discharge Authorisations are reviewed regularly, including consideration of the level of actual discharges, the margin between discharges and limits and the application of Best Practicable Means (BPM) to minimise waste generation and discharges to the environment. Against a background of Government policy of progressive reduction in discharges overall, the environment agencies may decide to vary authorisations, following a review, for example, to set revised limits or conditions or to require improvement programmes to be implemented.

17.37. The periodic safety reviews described under Article 6 include requirements that the radiological risk from the nuclear installation under review will remain acceptable during the period covered by the reviews.

Consulting Contracting Parties in the vicinity of a proposed nuclear installation

17.38. In the case of an application to the Secretary of State for Trade and Industry for a Section 36 consent for a new nuclear power station, the UK Government will send a copy of the application to the Directorate General for Energy of the European Commission. The Commission will make the application known to other Member States through the Official Journal of the European Communities. Once a public inquiry is called, evidence may be submitted to the inquiry by anyone from any country.

Article 18 - Design and Construction

Each Contracting Party shall take the appropriate steps to ensure that:

(i) the design and construction of a nuclear installation provides for several reliable levels and methods of protection (defence in depth) against the release of radioactive materials, with a view to preventing the occurrence of accidents and to mitigating their radiological consequences should they occur;

(ii) the technologies incorporated in the design and construction of a nuclear installation are proven by experience or qualified by testing or analysis;

(iii) the design of a nuclear installation allows for reliable, stable and easily manageable operation, with specific consideration of human factors and the man-machine interface.

Under this Article, compliance with the Convention is demonstrated in a way that has substantially changed since the third UK report (i.e. in a way that has implications for the Convention obligations). It has been updated to reflect current procedures.

General

18.1. In the UK, no new nuclear power plants have been designed or constructed since Sizewell B in the 1980s. However, the UK licensing system has ensured that all existing nuclear installations were properly designed and constructed to take account of best practices and extant safety standards. This same licensing system will continue to underpin nuclear safety, should the UK embark on a new nuclear power plant programme.

18.2. The response to this Article will look back briefly at the design and construction of UK's existing nuclear installations and describe the essential features of the licensing process that was used to ensure safe design and operation. It will then look forward to see how this process will be applied and developed to accommodate the changes that will inevitably accompany any future new build programme in the UK.

Design and construction of existing nuclear installations

18.3. The granting of a nuclear site licence depends on the submission of an acceptable safety case for the plant. LC14 (see Annex 5) requires a licensee to make arrangements for the production of documentation to justify safety during all phases of a plant's lifecycle, including design and construction. Subsequent design and construction changes are controlled by LCs 19 and 20. LC19 requires the licensee to make and implement adequate arrangements to control the construction or installation of a new plant. If safety-related modifications to the design become necessary during the construction phase, their implementation is controlled by arrangements made under LC20.

18.4. In carrying out its control and regulatory function for the UK's existing nuclear power plants, HSE satisfied itself that the licensee had applied the highest reasonably practicable standards in the design, fabrication and construction of new nuclear plant available at the time. The licensees developed their Design Safety Guidelines, which later became known as the licensees' Nuclear Safety Principles. The licensees' principles were generally consistent with the HSE SAPs, but were more detailed and focussed on the preparation, rather than the review, of safety documentation.

18.5. As described under Article 9, the responsibility for safety rests with the licensee, and it is the licensee who HSE holds responsible for design safety and the

management of the design and construction process. For existing installations, each licensee recognised that the design safety criteria in place at the time of the original design and construction of its current plant did not necessarily fully meet modern standards and expectations. Licensees used their Guidelines to review existing designs of nuclear installations and to prepare proposals to modify them. These reviews addressed the reasonable practicability of achieving improvements in existing plant safety performance. This is one objective of Periodic Safety Reviews and is addressed under Article 6. The outcomes of the licensees' reviews were assessed by HSE against the version of the SAPs that were current at the time. This review process will continue on existing plants and, from 2007, HSE will assess against SAPs 2006.

18.6. At the time the UK's existing commercial nuclear power plants were designed and built, there were only two licensees that were operating such plants. These were the two major electricity utilities, the Central Electricity Generating Board in England and Wales, and Southern Scottish Electricity Board in Scotland. Both were UK based and state owned. The technical knowledge base of the UK's reactors (mainly UK designed gas-cooled reactors) was vested in the licensees. Design and construction companies were also of UK origin, and these worked very closely with the licensees' organisations at that time. From the regulatory perspective, the licensees were the single point of contact who accepted their responsibility for safety. The construction of Sizewell B with its international design input, together with the partial privatisation of the utilities, heralded major changes in the industry. It is anticipated that there will be further changes, should UK embark on a new build programme.

Design and construction of new plant

18.7. The basic licensing system as described above will continue to apply to new plant. However, for any new build programme, it is probable that plant designers and potential licensees will be multi-national companies or consortia. This represents a major change in the UK and inevitably the licensing and regulatory processes will need to adapt to this change.

18.8. Annex 11 describes the HSE strategy regarding the regulation of potential new-build projects. One of the key changes to the licensing process is the concept of generic design assessments. During these assessments, HSE will deal directly with plant vendors and designers rather than a prospective licensee. Site specific design issues, and those issues pertinent to the competence of a licensee, will be addressed at a later date when a potential site and licensee have been identified.

18.9. In the past, the UK licensees had their own design guidelines which they used to negotiate with potential vendors to develop reactor designs. This may not necessarily be the case in the future. The design standards used by multinational vendors may not be in the direct control of a UK organisation particularly if potential licensees are not UK based. However, during the generic design assessment process, it will still be incumbent on HSE to ensure that the safety aspects of designs are acceptable in the UK. This process should be facilitated by the recent review of HSE's SAPs; one objective of which was to move towards international harmonisation.

18.10. The safety features of future designs will be assessed by HSE against the SAPS 2006. The SAPs provide HSE inspectors with a framework for making consistent regulatory judgements on nuclear safety cases. The SAPs also provide potential vendors and nuclear site licensees with information on the regulatory principles against which their safety provisions will be judged. However, they are not intended or sufficient to be used as design or operational standards, reflecting, as they do, the non-prescriptive nature of the UK's nuclear regulatory system and the fact that they have been produced for assessment purposes only. This is also

reflected in the following paragraphs under Article 18, where the term "the SAPs expect …." is widely used to emphasise the non-prescriptive nature of the SAPs. In most cases the SAPs are guidance to inspectors, but where guidance refers to legal requirements they can be mandatory, depending on the circumstances.

18.11. The Principles of "so far as is reasonably practicable" (SFAIRP), and "as low as reasonably practicable" (ALARP), are key elements of UK Health and Safety Law. They are, for the purposes of HSE assessment, interchangeable. The SAPs will assist HSE inspectors in the judgement of whether, in their opinion, the licensee's safety case has demonstrated that the requirements of the law have been met.

Defence in depth

18.12. In the UK, defence in depth is seen as a fundamental element of reactor safety, and has been a requirement for all nuclear installations since the beginning of the reactor programme. The HSE SAPs (paragraphs 140 – 144) expect that:

- deviations from normal operation and failures of structures, systems and components important to safety are prevented;
- any deviations from normal operation are allowed for by safety margins that enable detection, and action that prevents escalation;
- inherent safety features of the facility, fail-safe design and safety measures are provided to prevent fault conditions that occur from progressing to accidents;
- additional measures are provided to mitigate the consequences of severe accidents.

18.13. An important aspect of the implementation of defence in depth is the provision of multiple barriers. The physical barriers preventing uncontrolled release of radioactive materials are dependent on the specific reactor. However they all include:

- Fuel matrix;
- Fuel cladding;
- Pressure circuit;
- Containment;
- Control and protection system; and the
- Use of single failure criteria.

18.14. HSE's SAPs fully reflect the five levels of defence in depth that are described in detail in IAEA Safety Requirement NS-R-1.

18.15. The SAPs expect that safety barriers should, as far as reasonably practicable, ensure diversity, redundancy and segregation in the structures, systems and components that are important to safety.

Safety classification and standards

18.16. The effective implementation of defence in depth needs support from a number of general principles and related measures. It is important that structures, systems and components, including software for instrumentation and control, are classified on the basis of their safety significance, and are designed, manufactured, installed, and then subsequently commissioned, operated and maintained to a level of quality commensurate with their classification. HSE's SAPs (paragraphs 148 – 161) address the categorisation and classification.

18.17. The SAPs expect that the safety functions to be delivered within the facility, both during normal operation and in the event of a fault or accident, should be categorised, based on their significance with regard to safety. Structures, systems and components that have to deliver safety functions should be identified and classified on the basis of those functions, and their significance with regard to safety.

For the highest classification, nuclear-specific national or international codes and standards should be used in their design. The SAPs expect that appropriately designed interfaces should be provided between structures, systems and components of different classes to ensure that any failure in a lower class item will not propagate to an item of a higher class. Auxiliary services that support components of a system important to safety should be considered part of that system, and should be classified accordingly unless failure does not prejudice successful delivery of the safety function. SAP EKP.5 addresses the identification of safety measures to deliver required safety functions.

18.18. A qualification procedure confirms that all safety systems and safety-related equipment will perform their required safety functions throughout their operational lives under the operational, environmental and accident conditions specified in the design. The procedure, where reasonably practicable, includes a demonstration that individual items can perform their required functions under the specified conditions.

External and internal hazards

18.19. HSE SAP EHA.1 expects that external and internal hazards that could affect the safety of the facility should be identified and treated as events that can give rise to possible initiating faults. This identification should include consequential events and, as appropriate, combinations of consequential events from a common initiating event.

18.20. External hazards are those natural or man-made hazards to a site and facilities that originate externally to both the site and its processes, i.e. the licensee may have very little or no control over the initiating event. External hazards include earthquake, aircraft impact, extreme weather, electromagnetic interference (off-site cause) and flooding as a result of extreme weather/climate change (this list is not exhaustive). Terrorist or other malicious acts are assessed as external hazards.

18.21. Internal hazards are those hazards to plant and structures that originate within the site boundary but are, for example, external to the process in the case of nuclear chemical plant, or external to the primary circuit in the case of power reactors. That is, the licensee has control over the initiating event in some form. Internal hazards include internal flooding, fire, toxic gas release, dropped loads and explosion/missiles.

18.22. The SAPs expect that the layout of safety system equipment and safety-related plant and services minimises the effects of internal and external hazards and of any interactions between a failed structure, system or component and other safety-related structures, systems or components

18.23. HSE SAPs paragraphs 208 – 233 address specific hazards.

Design for reliability

18.24. Engineered structures, systems and components should be designed to deliver their required safety functions with adequate reliability, according to the magnitude and frequency of the radiological hazard, to provide confidence in the robustness of the overall design. Ideally, the structures, systems and components important to safety should be fail-safe, i.e. they should have no unsafe failure modes.

18.25. The design should incorporate redundancy to avoid the effects of random failure, and diversity and segregation to avoid the effects of common cause failure. Examples of diversity are different operating conditions, different working principles or different design teams, different sizes of equipment, different manufacturers, different components, and types of equipment that use different physical methods. The design should also be tolerant of random failure occurring anywhere within the safety systems provided to secure each safety function.

18.26. SAP EDR.4 expects that no single random failure, assumed to occur anywhere within the safety systems provided to perform a safety function, should prevent that function being performed during any normally permissible state of plant availability. Where the single failure criterion is not appropriate (e.g. the reactor pressure vessel) the licensee and HSE require a special case procedure for design and construction to give confidence that failure is incredible (SAP paragraphs 238 – 279).

18.27. The SAPs expect (EDR.3) that common cause failure (CCF) should be explicitly addressed where a structure, system or component important to safety employs redundant or diverse components, measurements or actions to provide high reliability. CCF claims should be substantiated and, in general, claims for CCF should not be better than one failure per 100,000 demands.

Fault and accident analysis

18.28. The SAPs expect (FA.1) that a fault analysis should be carried out comprising design basis analysis, suitable and sufficient PSA, and suitable and sufficient severe accident analysis.

18.29. The fault analysis process leads to the determination of the Design Basis Accidents (DBA) 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 and meet the following criteria:

i) internal plant faults which have an expected frequency lower than about 10^5 per year;

ii) failures of structures, systems or components which form a principal means of ensuring nuclear safety and which have been accepted by a comprehensive examination, using relevant scientific and technical issues, to ensure an acceptable standard of integrity commensurate with the potential radioactive consequences if they fail;

iii) external hazards to the plants where it can be demonstrated that their frequency is less than once in 10,000 years; and

iv) those faults leading to unmitigated consequences which do not exceed the Basic Safety Limit for the respective initiating fault frequency in SAP Target 4 (effective doses received by any person arising from a design basis fault sequence).

18.30. Rigorous application of design basis analysis should ensure that severe accidents are highly unlikely. Nevertheless suitable and sufficient severe accident analysis is still required to ensure that risks are reduced so far as is reasonably practicable. SAPs FA.15 and FA.16 address severe accidents.

18.31. The SAPs expect that licensees will analyse those fault sequences beyond the design basis that have a potential to lead to severe accidents. These analyses should determine the magnitude and radiological consequences of such an accident and demonstrate that there is not a sudden escalation of consequences just beyond design basis. The analysis will inform the preparation of accident mitigation strategies and support emergency plans.

Use of established/proven engineering practice

18.32. The knowledge used at the time of writing the safety case needs to be supplemented by continued monitoring of the plant and data from commissioning, operation, periodic inspection and testing, as well as longer-term research or experience from other facilities. For example, Sizewell B and the more recent AGRs included the qualification of equipment for all DBAs within their safety cases. This qualification often involved arduous testing or comprehensive analysis or both,

usually in line with modern national or international standards or other specific regulatory requirements.

18.33. SAP ECS.3 expects that structures, systems and components that are important to safety should be designed, manufactured, constructed, installed, commissioned, quality assured, maintained, tested and inspected to the appropriate standards.

18.34. The SAPs paragraphs 99 - 100 and 552 – 559 address the processes that are followed to ensure that appropriate design data and models are used. These principles also address the validation of models and the need for conservative design, in case of uncertainty in the accuracy of data. The SAPs note that the provisions should be made to review new data, scientific knowledge and operating experience.

18.35. Before any new design or feature is introduced, the licensee must submit a safety case to show that appropriate safety standards have been met. This can include type testing, experiments or other means to indicate clearly that the proposal is safe. HSE will only allow construction to commence when it is satisfied that the safety case is adequate.

18.36. SAPs EQU.1 and paragraphs162 – 169 address equipment qualification. The SAPs expect that a qualification procedure should confirm that the equipment will perform its required function under the operational, environmental and accident conditions throughout its operational life.

18.37. SAPs EAD.3 – EAD. 5 expect that arrangements should be in place for the recording and retrieval of lifetime data. This is supported by LC28 that requires the licensee to make adequate arrangements for the examination, inspection, maintenance and testing of all plant that may effect safety. Spurious operation and unsafe failure modes are addressed in the fault analysis that is part of the safety case. Anticipated failure or expected lifetimes of component are taken into account as part of routine maintenance programmes.

18.38. Where there is relevant operating experience to support design assumptions, this is included in the licensees' safety case as part of the evidence to show the safety of the plant. The responses to Article 19 address operational feedback and nuclear safety research. Application of the SAPs ensures that this is incorporated in the design of a new plant.

Operability, man/machine interface

Operability

18.39. Operability is a key factor in the design of a plant. This has been reflected for existing plant by use of the licensees' design safety guidelines and assessed as necessary by the regulators using earlier versions of the SAPs. The SAPs 2006 will be used to assess operability of new plant and upgrading the operability of existing plant.

18.40. Specifically, SAPs EHF.6 and EHF.7 expect that workspaces in which plant operations and maintenance are conducted should support reliable task performance by taking account of human perceptual and physical characteristics and the impact of environmental factors. User interfaces, comprising controls, indications, recording instrumentation and alarms, should be provided at appropriate locations, and should be suitable and sufficient to support effective monitoring and control of the plant during all plant states.

18.41. Inherent passive safety is an essential feature of design. This is supported by specific design features that enhance operability (SAP EKP.5). Examples are:

- Safety systems are available to reduce the frequency, or limit the consequences, of fault sequences. No fault or hazard should disable the safety systems provided to safeguard against that event.
- UK nuclear installations are provided with the facility to shutdown the reactor operations should the control room become unavailable to operators.
- At the most recent nuclear installations in the UK and for any potential new plant, a safety system is automatically initiated and no human action should be necessary for a period following the start of the requirement for protective action. The design, however, is such that plant personnel can initiate safety system functions and can perform necessary actions to deal with circumstances that might prejudice safety, but cannot negate correct safety system action at any time.
- The layout of safety system equipment and safety-related plant and services minimises the effects of internal and external hazards and of any interactions between a failed structure, system or component and other safety-related structures, systems or components.
- Provisions are made for monitoring and inspecting safety systems, safety-related structures, and components in service, or at intervals throughout plant life commensurate with the reliability required of each item. In especially difficult circumstances where this cannot be done, either additional design measures are incorporated to compensate for the deficiency, or adequate long-term performance is achieved without such measures.

18.42. The HSE, during its assessment of the licensee's safety case, checks that the above approach has been followed, so far as is reasonably practicable.

Man/machine interface

18.43. A statement of the UK approach to ensuring an adequate treatment of human factors throughout the life cycle of the plant is provided under Article 12 above.

18.44. SAPs EHF.1 – EHF.10 place particular emphasis on identifying the safety actions required of the operators and specifying the user interface during the design stage of the UK's nuclear installations.

18.45. Specifically, SAP EHF.2 expects that when designing systems, the allocation of safety actions between humans and technology should be substantiated and dependence on human action to maintain a safe state should be minimised.

18.46. SAP EHF.3 expects that analysis should be carried out of tasks important to safety to determine demands on personnel in terms of perception, decision making and action.

18.47. LC23 requires that the plant Safety Case identifies the safe limits and conditions for operation. These are known as the operating rules (or technical specifications). LC24 requires the production of operating instructions that plant operators use to implement the operating rules.

18.48. At the time the current fleet of nuclear installations were built in the UK, the licensee was fully involved in the design of its reactors, and was able to retain comprehensive details of the design, which have been used and updated when subsequent plant modifications have been made. This could change in future if the licensees buy "off-the-shelf" designs. Rigorous enforcement of the licence conditions will ensure that the licensee will be responsible for the production or acquisition of all necessary safety documentation.

Article 19 - Operation

Each Contracting Party shall take the appropriate steps to ensure that:

(i) the initial authorization to operate a nuclear installation is based upon an appropriate safety analysis and a commissioning programme demonstrating that the installation, as constructed, is consistent with design and safety requirements;

(ii) operational limits and conditions derived from the safety analysis, tests and operational experience are defined and revised as necessary for identifying safe boundaries for operation;

(iii) operation, maintenance, inspection and testing of a nuclear installation are conducted in accordance with approved procedures;

(iv) procedures are established for responding to anticipated operational occurrences and to accidents;

(v) necessary engineering and technical support in all safety-related fields is available throughout the lifetime of a nuclear installation;

(vi) incidents significant to safety are reported in a timely manner by the holder of the relevant licence to the regulatory body;

(vii) programmes to collect and analyse operating experience are established, the results obtained and the conclusions drawn are acted upon and that existing mechanisms are used to share important experience with international bodies and with other operating organizations and regulatory bodies;

(viii) the generation of radioactive waste resulting from the operation of a nuclear installation is kept to the minimum practicable for the process concerned, both in activity and in volume, and any necessary treatment and storage of spent fuel and waste directly related to the operation and on the same site as that of the nuclear installation take into consideration conditioning and disposal.

Under this Article, compliance with the Convention is demonstrated in a way that has not substantially changed since the third UK report (i.e. in a way that has implications for the Convention obligations), but has been updated to reflect the issues raised at the third Review Meeting.

19.1. The following report under Article 19 has been based on the IAEA requirement document NS-R-2.

19.2. In the UK, the safety of a nuclear installation throughout its lifetime is regulated principally through the Licence Conditions (LCs) (see Annex 5) that are attached to the nuclear site licence (see Article 7). Compliance with these Conditions is monitored and enforced by the HSE through inspection and assessment (see Article 14). The LCs cover all aspects of operation that have a relevance to safety, and it is an offence for a licensee to contravene the requirements of a nuclear site licence. The powers under the licence by which HSE can control the operation of UK nuclear plant are described under Article 8 and in Annex2. The relevant LCs for each requirement of Article 19 are discussed below.

Safety analysis and commissioning programme

19.3. This report addresses under Articles 14 and 18 the safety analysis undertaken during the design and prior to the initial authorisation to operate a nuclear installation.

19.4. LC21 requires the licensee to make and implement adequate arrangements for the commissioning of new or modified plant or processes that may affect safety. These arrangements allow the commissioning to be divided into stages and for HSE to specify that the licensee should not proceed from one stage to the next without HSE Consent (see Annex 2). Such Consent is dependent upon the licensee providing adequate documentation to justify the safety of plant at that stage. The LC also requires a suitably qualified person or persons to be appointed to control, witness, record and assess the result of the commissioning tests. Full and accurate records are kept for the commissioning programme.

19.5. The Pre-commissioning Safety Report builds on the Pre-construction Safety Report to reflect the plant as built (i.e. including modifications to the initial design, or those made during the course of construction). The commissioning programme required under LC21 is produced by the licensee to ensure that all systems important to safety are tested to demonstrate that the plant complies with the design intent and is ready for operation. Properly designed commissioning testing may also allow the detection of unintended or undesirable modes of operation that the initial design had not anticipated. In addition to plant hardware, key management functions are established prior to commissioning and are tested during the commissioning process. LC23 requires operating limits to be derived from the safety cases, and these in turn provide the basis for operating rules and operating procedures. These are tested as part of the commissioning programme. Any changes to the plant or procedures found to be necessary during the commissioning process are implemented under the arrangements established under LC21.

19.6. There are regulatory controls in place to ensure major activities do not take place without the Consent of HSE. The Commissioning Programme identifies key stages when HSE Consent is required before further progress towards operation can be made. These are such times as: the bringing of nuclear fuel onto site; loading fuel into the reactor; bringing the reactor to its first criticality; and various power levels up to full power. The final Consent of the Commissioning phase is the Consent to move to routine operation. This is not issued until the commissioning tests and the test results are available to substantiate the safety case, and all the necessary documents and systems are in place for the continued operation and maintenance of the plant.

19.7. The licensee collects and retains all data on systems and components that are acquired during commissioning. LC6 requires that all records associated with the demonstration of any licence condition are preserved for 30 years or for any other period which HSE may Direct. Specifically, LC25 requires that records are made of the operation, inspection and maintenance of any safety related plant. These records, which can originate the design, construction, commissioning and operation phases of the plant's lifetime, provide a significant input to safety reviews required by LC15.

Operating limits and conditions

19.8. LC23 requires the licensee to produce an adequate safety case to demonstrate the safety of a plant and to identify the conditions and limits that are necessary in the interests of safety. The safety case limits are the measurable plant parameters that define the envelope for safe operation, and the conditions (plant configurations, availability and operator actions) necessary to keep plant within this envelope. These limits and conditions are referred to as the Operating Rules (ORs). Licensees' compliance with the ORs is mandatory.

19.9. LC24 requires the licensee to ensure that the safety case limits and conditions of the ORs are an integral part of the written instructions to operators. The licensee will ensure that the limits and conditions in the Operating Instructions have a safety margin. The safety margin is established having regard to the plant transients

arising in normal operation, or in the event of a plant system breakdown, so that there is high confidence that no transgression of the OR limits will occur and safety will not be jeopardised. In order to mitigate the consequences of an accident, the Operating Instructions for normal operation are supplemented by Emergency Operating Procedures (see under Article 16). HSE has agreed that, at some nuclear installations, ORs can be replaced by Technical Specifications. These serve the same function, using internationally accepted terminology.

19.10. LC10 requires the licensee to make and implement adequate arrangements for the training of any person who has any responsibility for operations that may affect safety. Under these arrangements, the training of operations personnel includes familiarisation with the background to operating limits and conditions. An integral part of any proposed changes to the limits and conditions (Operating Rules) includes appropriate operator training on the changes and their effects. Training of operators is fully addressed under Article 11.

19.11. Under LC25 (Operational Records), the licensee ensures that adequate records of operation, inspection and maintenance of plant important to safety are made and kept. Under the Quality Assurance arrangements required under LC17, the Licensees' safety staff periodically audit these records to ensure compliance with procedures, including Operating Rules and Operating Instructions. HSE inspectors will also routinely monitor compliance with Operating Rules and Instructions during inspection visits. Periodic review of procedures and processes is required under LC15.

Operating, maintenance, inspection and testing procedures

Operations

19.12. Paragraph 19.9 above describes identification of operating limits and conditions and the subsequent derivation of Operating Rules and Instructions. The administrative procedures for this are controlled by the licensees' arrangements made under LC14. The arrangements under LC14 include internal peer review, discussion and endorsement by the Licensee's Nuclear Safety Committee (LC13) and, where appropriate, submission to HSE for agreement or Approval. Subsequent changes to operating rules and operating instructions are processed via the arrangements made under LC22 (Modification or Experiment on existing Plant).

19.13. When the need to change an Operating Rule is identified, LC23 requires the licensee submits a safety case to HSE that substantiates the proposed change. Normally, HSE would only approve the limits and conditions defining the nuclear safety envelope in the form of the operating rules. Once approved, no alteration or amendment can be made to such operating rules unless the HSE has approved the alteration or amendment.

19.14. In the particular case where the results of operation, maintenance or inspection show that the safe condition or safe operation of the plant may be affected, the licensees' arrangements ensure that HSE receives a safety case that substantiates the continued operation of a reactor, whether or not the Operating Rule limits and conditions need to be changed.

19.15. LC12 requires that all people who carry out safety related activities to be suitably qualified and experienced. LC24 ensures that all operations that may affect safety, including any instructions to implement ORs, are undertaken in accordance with written operating instructions. In addition to these requirements, LC26 (Control and Supervision of Operations) requires that no operations are carried out which may affect safety, except under the control and supervision of suitably qualified and experienced persons appointed by the Licensee for that purpose.

19.16. The arrangements made under LC22 (Modification or Experiment on existing Plant) prescribe the procedures for carrying out a non-routine operation or a test.

Such activities are managed in the same way as any other change (such as a plant modification) that may affect the safety case. The arrangements will require a full justification for the non-routine operation or test, and clearly demonstrate that all safety implications have been addressed, including the development of appropriate operating procedures. Before implementation, the safety case will be internally peer reviewed and endorsed by the licensee's Nuclear Safety Committee. The licensee will also need the agreement of HSE before the non-routine operation is carried out.

Maintenance, inspection and testing

19.17. LC28 requires licensees to make and implement arrangements for the regular and systematic examination, inspection, maintenance and testing of all plant which may affect safety. This work is set out in a Maintenance Schedule that details the scope and frequency of maintenance. This Schedule identifies those examinations, inspections, maintenance and tests that are required to demonstrate the continued ability of the plant to meet claims in the safety case. The intervals between Maintenance Schedule activities are determined by the safety case, operational experience engineering judgement and manufacturers' recommendations. The work is carried out in accordance with schemes laid down in writing by suitably qualified and experienced persons under the control and supervision of an appropriate person specifically appointed for that task, who must sign a full and accurate report on completion of the work. Any examination, inspection, maintenance or test that shows that the safety of the plant may be affected is reported to the licensee, who takes appropriate action.

19.18. In addition to the requirements of LC28, HSE also has powers under LC29 (duty to carry out tests and inspections). After consultation with the licensee, HSE may require the licensee to perform any tests, inspections or examinations that it may specify. This may be instigated, for example, by the findings on other reactors, by new safety analysis or by research findings.

19.19. All UK nuclear reactors must shut down at regular intervals for inspection and testing. These statutory shutdowns occur every 2 or 3 years, depending on the reactor type. Once shutdown, the reactor cannot be restarted without the Consent of HSE. Before issuing a Consent to restart a reactor, HSE will need to be satisfied that all necessary maintenance, inspection and testing had been completed and the licensee has fully evaluated the findings. This evaluation will identify any need for changes to the type and frequency of maintenance, inspection and testing.

19.20. UK has an ageing reactor population and inevitably some items become obsolete. At present, there is adequate support for the plants that were built to older standards. Where obsolete equipment cannot be replaced directly as part of routine maintenance (for example some of the instrumentation and control equipment), alternative equipment must be evaluated using established procedures for plant modifications and HSE approval obtained. The process for modifications is prescribed in the licensees' arrangements made under LC22. Significant safety changes need to be agreed by HSE before implementation, while others need to be reported to HSE.

Operational occurrences

19.21. The plant protection system will ensure that, after an operational occurrence, the plant is brought back into a safe state. The safety case identifies a range of fault conditions that will generate plant alarms for operator action or automatic response. The Operating Instructions and emergency operating procedures required by LC 24 identify the necessary operator actions. Beyond the design basis, reasonably foreseeable but remote fault conditions are addressed by providing strategies and guidelines to help operators decide on their emergency response. The administrative

process for development of emergency operating procedures is the same as those for other operating procedures described above in paragraphs 19.12 – 19.14.

19.22. HSE's SAPs[14] expect that licensees will analyse those fault sequences beyond the design basis that have a potential to lead to severe accidents. These analyses should determine the magnitude and radiological consequences of such an accident and demonstrate that there is not a sudden escalation of consequences just beyond design basis. These analyses will inform preparation of accident mitigation strategies and emergency plans.

19.23. The arrangements for dealing with Accidents and Emergencies are set out under Article 16. The licensee has key responsibilities under these arrangements and, in particular, for bringing the plant back to a safe condition. To this end, the licensee, under LC11 (Emergency Arrangements), ensures that all persons who might be involved are properly instructed and rehearsed in the procedures.

19.24. In the event of an incident on site, arrangements made under LC7 require that the licensee notifies HSE, as well as recording, investigating and preparing a report on such incidents. If appropriate, HSE will enforce corrective action.

Engineering and technical support

19.25. The nuclear site licence ensures that the licensees have access to sufficient technical expertise for all stages of a plant's life. The licensees' in-house technical resource has significantly reduced over a number of years, and the tendency has been for expertise to be bought in, as and when required, from contractors. The HSE view is that this is acceptable, providing that the licensees retain sufficient expertise to be an 'intelligent customer'.

19.26. The maintenance of technical expertise in the nuclear industry was an issue that was discussed in detail at previous Convention review meetings. The following paragraphs present the UK position.

19.27. At a time when there has been little investment in new plant for a number of years, the number of scientists and engineers choosing careers in the nuclear industry has declined and, combined with the high number of people retiring from the industry, this has resulted in a shortage of nuclear skills. Although at present there are no major difficulties in the UK, there are indications that unless the situation is reversed, there could be significant future problems, particularly if there is a decision to build new nuclear power installations. There are several initiatives in the UK to try and remedy this situation.

19.28. HSE continues to oversee the safety competence of the licensees, and monitors their level of safety expertise in relation to present and future business needs.

19.29. At the national level, the Government has responded to the recommendations from the Nuclear Skills Group, which was set up in response to an OECD report. Responsibility for implementing the necessary changes to the nuclear sector's skills has been given to the Cogent Sector Skills Council. Cogent is advised by a Nuclear Employers Group and Advisory Council on matters to do with supply and demand of nuclear skills. In addition, a National Skills Academy for Nuclear has been established to address the demand for nuclear skills. There is clear evidence that skills requirements for the future are better understood and initiatives are in train to start filling the gaps.

19.30. At the 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, and there has been an increase in the number of students taking up places on these courses. 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. Also the number of students undertaking

postgraduate research is also increasing. Finally Manchester University is setting up a Nuclear Centre which will offer a range of courses and research on nuclear (fission and fusion) topics.

19.31. The Energy Act 2004 recognises the need to maintain nuclear skills which might be needed by the UK nuclear industry in the future.

19.32. Research and development in nuclear safety is supported in UK. This provides a source of knowledge and expertise as well as helping to maintain nuclear competencies.

19.33. Under the LCs, there are a number of requirements aimed at ensuring that there is sufficient engineering and technical support available in all safety-related fields throughout the life of a nuclear installation. In particular, LC12 (Duly Authorised and other Suitably Qualified and Experienced Persons) has a general requirement that only suitably qualified and experienced persons should perform any duties that may affect the safety of operations on the site. Within this overall provision, there is the specific requirement under LC26 (Control and Supervision of Operations) for the appointment, in appropriate cases, of persons to control and supervise operations that may affect plant safety.

19.34. Licensees' arrangements under LC17 (Quality Assurance) ensure appropriate control and supervision of contractors' staff.

Research and development

19.35. There are issues associated with operating reactors that require technical substantiation. This substantiation is obtained by research and development programmes. The licensees commission and undertake research to support the safe operation of their nuclear installations. In addition, the UK Government has given HSE the responsibility to co-ordinate a long-term generic (i.e. not site specific) safety research programme with the primary objectives of ensuring that:

(i) adequate and balanced programmes of nuclear safety research continue to be carried out, based on issues likely to emerge both in the short and long term;

(ii) as far as reasonably practicable, the potential contribution that research can make to securing higher standards of nuclear safety is maximised; and

(iii) the results of the research having implications for nuclear safety are disseminated as appropriate.

19.36. There are two secondary objectives of this research programme that recognise the need to maintain technical competence at a time when fewer people are choosing nuclear engineering as a career in the UK. These are:

(i) to take account of the desirability of maintaining a sufficient range of independent technical capability to ensure the attainment of the primary objectives; and

(ii) to ensure that proper account is taken of the advantages of international collaboration in furthering the primary objectives.

19.37. HSE directs the programme, on behalf of the Health and Safety Commission, by identifying safety issues that are expressed in the Nuclear Research Index and in technical strategies. It is expected that the nuclear licensees commission research to address issues raised by HSE. HSE also commissions its own research (under the Levy Programme) and the costs of this are recovered from the nuclear licensees. The Levy Programme undertakes research to maintain independent technical capability, to collaborate internationally, and to tackle safety issues not addressed by the licensees in their programmes. The Programme currently embraces the full range of safety issues on nuclear reactor plant and on sites that are being

decommissioned and where nuclear waste being stored or treated. Information on each of topics addressed by the programme is available from HSE's website[66].

Reporting of incidents

19.38. 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 the HSE may specify; and

(iii) as the licensee considers necessary.

19.39. 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, and the IRR99 Regulations 25 and 30. In making the arrangements required under LC7, the licensees include the need to notify incidents which fall into any of the following categories:

(i) Occurrences on a nuclear installation site, under section 22(1) of the NIA65, which are to be reported by the quickest means possible under section 4(1) of the Nuclear Installations (Dangerous Occurrences) Regulations 1965, to BERR and HSE;

(ii) A confirmed breach of, or discharge expected to breach quantitative limits of a Certificate of Authorisation for the disposal of radioactive waste issued under the RSA93[32];

(iii) 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 Authorisation under RSA93) to be notified forthwith to HSE; and

(iv) A confirmed or suspected over exposure of a worker to ionising radiation under Section 25 of the IRR99, to be notified as soon as practicable to HSE.

19.40. HSE has made arrangements with licensees to be informed of incidents covered by international reporting arrangements, for which HSE is the UK reporting authority, i.e.

(i) the International Nuclear Event Scale (INES); and

(ii) the IAEA/NEA Incident Reporting System (IRS).

19.41. Certain incidents are covered by agreements for Ministerial reporting to Parliament, and these are published by HSE in a Quarterly Statement. The criteria for Ministerial reporting are:

(i) dangerous occurrences reportable under Nuclear Installations (Dangerous Occurrences) Regulations 1965;

(ii) confirmed exposure to radiation of individuals which exceed or which are expected to exceed the dose limits specified in Schedule 4 to IRR99;

(iii) 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;

(iv) 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 Authorisation under RSA93); and,

(v) a confirmed breach of, or discharge expected to breach quantitative limits of, a Certificate of Authorisation for the disposal of radioactive waste issued under RSA93.

19.42. The UK is a signatory to the 1986 IAEA Convention on 'Early Notification of a Nuclear Accident' which requires notifying the IAEA when ".. a release of radioactive materials occurs or is likely to occur and which has resulted or may result in an international transboundary release that could be of radiological safety significance for another state". The UK competent authority and contact points for issuing and receiving notification and information on the nuclear accident are BERR and Defra, respectively.

19.43. In addition to reporting nuclear incidents, HSE publishes a quarterly newsletter that reports key events at nuclear installations in the UK as well as the current activities of the Regulatory Authority.

Analysis of operating experience

19.44. 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 and other regulatory requirements, but also constitute part of the plant history that operators need to make safety and commercial judgements. For example, the results of routine examinations of the plant under LC28 may be used to justify a change to the interval between maintenance, or a change from preventive maintenance to condition-based maintenance.

19.45. 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 by all nuclear installation licensees. The outcome of this review could be a dissemination of a plant event on one installation with a requirement on each other installation to assess and report formally on its impact on their plant.

19.46. 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 every 10 years, but other reviews also take place before start-up after statutory outages.

19.47. HSE is responsible for national publication of the results of its regulatory activities (such as the assessment of licensees' Periodic Safety Reviews) and international reporting of events. HSE brings to the attention of licensees any international events of significance. Licensees distribute information through WANO and other organisations, which also provide international experience that might be relevant to UK operators.

Radioactive waste

19.48. LC34 requires radioactive material or waste to be controlled and contained so that it does not leak or escape. Licensees have to demonstrate to the satisfaction of the regulator that this is the case. Any leak or escape must be notified, recorded, investigated and reported, as required by the arrangements made under LC7. Each site has a discharge authorisation issued by the appropriate environment agency. The licensee must demonstrate how it complies with such authorisations.

19.49. The independent Committee on Radioactive Waste Management (CoRWM) has considered various management options for the long term management of radioactive wastes, and has held widespread public consultation. This committee reported in 2006. Its key recommendations were that radioactive waste should be

managed by means of geological disposal, and that the choice of any site for geological disposal should be based on the concepts of partnership and voluntarism. More details on the CoRWM recommendations and the Government's response can be found in the introduction to this report.

19.50. In the meantime, LC4 (Restriction of Nuclear Matter on the Site) requires that there must be adequate arrangements for the storage of nuclear matter (which includes radioactive waste generated on the site). These arrangements include the preparation and assessment of a safety case, and the identification of limits and conditions necessary in the interests of safety. In addition, HSE, EA and SEPA have been working on improved regulatory arrangements to ensure that ILW is managed in a sustainable way, taking account of long-term environmental considerations.

19.51. LC32 (Accumulation of Radioactive Waste) requires that, as far as is reasonably practicable, the rate of production and the total quantity of radioactive waste on the site at any one time is minimised. The quantity, type and form of the radioactive waste accumulated or stored may be subject to limitations specified by HSE. HSE's assessment of PSRs currently includes consideration of radioactive waste management and associated safety cases.

19.52. LC33 (Disposal of Radioactive Waste) requires the disposal of radioactive waste to be in accordance with an Authorisation granted under RSA93. Hence, discharges of liquid and gaseous radioactive waste, and disposals of solid waste, are regulated by conditions and limitations attached to an Authorisation granted by the appropriate regulatory body under RSA93. These authorisations also require that operators use the best practicable means (BPM) to minimise the creation of radioactive waste. However, nuclear licensed sites are exempt from the requirement to have a RSA93 authorisation to accumulate radioactive waste on the sites. The regulation of such accumulation of radioactive waste is undertaken using licence conditions (see paragraph 19.41 above) at least as stringently as it would if it were subject to RSA93.

19.53. In the UK, regulation under RSA93 is a devolved matter. Therefore, there are three regulatory authorities in the UK that have responsibility for issuing authorisations under RSA93 for disposals of radioactive wastes. These authorities are: the EA, for disposals made in England and Wales; the SEPA, for disposals made in Scotland; and the Environment and Heritage Service of the Department of the Environment, for disposals made in Northern Ireland. In addition, the Food Standards Agency has responsibility for all aspects of food safety and is consulted on the setting of authorisations to assess the impact and uptake of radioactive discharges to the food chain.

19.54. Authorisations for nuclear licensed sites granted by the environment agencies generally set limits on the discharge of specific radionuclides, or groups of radionuclides. The EA incorporates conditions for annual, quarterly and monthly limits according to the circumstances. SEPA places conditions on annual limits when granting authorisations. In addition, the environment agencies can include conditions in authorisations that require the site operator to notify the regulator, explain reasons why and take action if either weekly or monthly discharge levels are higher than normal. In addition to the limit setting conditions other conditions require operators to use BPM to minimise the volume of radioactive waste produced and the activity of waste discharged, and to minimise the radiological impacts of those discharges. Authorisations require operators to monitor compliance with the authorisation and may also impose requirements on the operators to carry out monitoring of levels of discharged radionuclides in the surrounding environment.

19.55. The UK has a general policy to progressively reduce discharges overall. In general, limits are set with minimum headroom above the level of actual discharges that would be consistent with "normal operation". The UK published a 'Strategy for

Radioactive Discharges'[67] to cover the period to 2020. In parallel, the Government is producing Statutory Guidance to be issued to the EA, to help it to take account of radiological principles and environmental policy objectives when determining discharge authorisations under RSA93, in England. Separate Guidance has been issued for the devolved administrations in the UK.

19.56. Information on radioactive discharges, and on the disposal of solid radioactive waste, is provided in the UK's national report for the Joint Convention.

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Annex 1 – UK Operational Civil Nuclear Power Stations – Key Parameters

Nuclear Installation	Calder Hall	Chapel-cross	Dungeness A	Dungeness B	Hartlepool	Heysham 1	Heysham 2
Licensee	SL	MEL	MEL	BEGL	BEGL	BEGL	BEGL
Reactor type	Magnox	Magnox	Magnox	AGR	AGR	AGR	AGR
No. of reactors	4	4	2	2	2	2	2
1st Power Operation	1956	1959	1965	1983	1983	1983	1988
Reactor Thermal Power (MWt)	270	265	725	1550	1500	1500	1600
Electrical Gen. Power (MWe)	61	60	210	630	660	600	690
Sent off site (MW)	50	50	202	570	615	550	625
Nuclear fuel	U rod	U rod	U rod	UO2	UO2	UO2	UO2
Fuel cladding	Magnox	Magnox	Magnox	S. Steel	S. Steel	S. Steel	S. Steel
Nuc moderator	Graphite	Graphite	Graphite	Graphite	Graphite	Graphite	Graphite
Reactor core							
Fuel channels	1696	1696	3932	408	324	324	332
Assemblies per channel	6	6	7	7	8	8	8
Fuel pins /assembly	-	-	-	36	36	36	36
Coolant	CO2	CO2	CO2	CO2	CO2	CO2	CO2
Coolant containment	Steel PV	Steel PV	Steel PV	PCPV	PCPV	PCPV	PCPV
Coolant pressure (Bar)	7	7	20	34	42	42	43
Coolant max. temp (C)	345	345	371	673	675	651	635
Steam turbine inlet pressure (Bar)	15.5	15.5	25	163	163	163	163
Steam turbine inlet temp. (C)	321/193	329/185	371	555	538	538	538
Total power generated	200	200	404	1140	1230	1100	1250

Key:

SL	Sellafield Ltd	MEL	Magnox Electric Ltd
BEGL	British Energy Generation Ltd		
U Rod	Natural Uranium Rod	UO2	Enriched Uranium Oxide Pellet
Steel PV	Welded Steel Pressure Vessel	PCPV	Pre-stressed concrete pressure vessel

For AGRs there is one fuel assembly per channel of 8 elements and the table indicates the number of pins per element

Annex 1 - continued

Nuclear Installation	Hinkley Point B	Hunterston B	Oldbury on Severn	Sizewell A	Sizewell B	Torness	Wylfa
Licensee	BEGL	BEGL	MEL	MEL	BEGL	BEGL	MEL
Reactor type	AGR	AGR	Magnox	Magnox	PWR	AGR	Magnox
No. of reactors	2	2	2	2	1	2	2
1st Power Operation	1976	1976	1967	1966	1994	1988	1971
Reactor Thermal Power (MWt)	1494	1496	893	948	3411	1555	1875
Electrical Gen. Power (MWe)	665	660	225	250	1256	682	550
Sent off site (MW)	622	624	217	210	1188	625	475
Nuclear fuel	UO2	UO2	U rod	U	UO2	UO2	U
Fuel cladding	S. Steel	S. Steel	Magnox	Magnox	Zr-4	S. Steel	Magnox
Nuc moderator	Graphite	Graphite	Graphite	Graphite	Graphite	Graphite	Graphite
Reactor core							
Fuel channels	308	308	3320	3788	-	332	6156
Assemblies per channel	8	8	8	8	193	8	8
Fuel pins /assembly	36	36	-	-	264	36	-
Coolant	CO2	CO2	CO2	CO2	Water	CO2	CO2
Coolant containment	PCPV	PCPV	PCPV	Steel PV	Steel PV	PCPV	PCPV
Coolant pressure (Bar)	42	40	27	20	158	43.3	27.6
Coolant max. temp (C)	648	639	365	360	323	635	370
Steam turbine inlet pressure (Bar)	160	163	27	46.6	67	160	35
Steam turbine inlet temp. (C)	495	538	350	354	283	538	320
Total power generated	1244	1248	434	420	1188	1250	950

Key:

SL	Sellafield Ltd	MEL	Magnox Electric Ltd
BEGL	British Energy Generation Ltd		
U Rod	Natural Uranium Rod	UO2	Enriched Uranium Oxide Pellet
Steel PV	Welded Steel Pressure Vessel	PCPV	Pre-stressed concrete pressure vessel

For AGRs there is one fuel assembly per channel of 8 elements and the table indicates the number of pins per element

Annex 2 - HSE's Powers under a Nuclear Site Licence

Consent - A Consent is required before the licensee can carry out any activity which is specifically identified in the licence as requiring prior Consent. For example, consent is required before a reactor is allowed to be started up again following its periodic shutdown. Before being granted a Consent the licensee must satisfy HSE that the proposed action is safe and that all procedures necessary for control are in place.

Approval - An Approval is used to freeze a licensee's arrangements. If HSE so specifies, the licensee is required to submit the arrangements and cannot carry them out until HSE has given its approval. Once approved, the procedures cannot be changed without HSE's agreement, and the procedure itself must be carried out as specified; failure to do so would infringe the licence condition and would be an offence. For example, for nuclear power stations, HSE has approved operating rules important to safety in order to ensure that licensees cannot change these without seeking HSE's agreement to the change.

Direction - A Direction is issued by HSE when it requires the licensee to take a particular action. For example, LC31(1) gives HSE the power to Direct a licensee to shut down any plant, operation or process. Such a Direction would relate to a matter of major or immediate safety importance and has been used rarely.

Agreement - An Agreement issued by HSE allows a licensee, in accordance with its own arrangements, to proceed with an agreed course of action. For example, LC22 requires a licensee to have adequate arrangements to control modifications to safety related plant. Such arrangements will often state that for modifications which, if inadequately conceived or implemented, there could be serious nuclear safety implications, the modification cannot be carried out without the agreement of HSE. Hence, the licensee submits a safety case justifying the modification and does not proceed until HSE has written agreeing to this proposal.

Notification - The standard licence gives HSE powers to request the submission of information by notifying the licensee of the requirement. For example in LC21(8) the licensee shall, if notified by HSE, submit a safety case and shall not commence operation of the relevant plant or process without the consent of HSE.

Specification - The standard licence gives HSE discretionary controls with regard to a licensee's arrangements and these are implemented through Specifications. For example, in LC23(2), if HSE specifies, the licensee is required to refer operating rules to its Nuclear Safety Committee for consideration.

Licence Instruments - Agreements, notifications, and specifications are all legally binding communications between HSE and the licensee which allow the licensee to carry out an activity or require some form of action to be taken. To administer these requests/authorisations, HSE has produced a standard form of letter known as a licence instrument.

Additional powers under the Health and Safety at Work etc. Act 1974

Improvement notice – HSWA74 provides (s.21) for an inspector, if of the opinion that a statutory provision is being or has been contravened (and the contravention will continue), to serve a notice requiring the person to remedy the contravention.

Prohibition notice – HSWA74 also provides (s.22) for an inspector, if of the opinion that activities are being carried out which risk causing serious personal injury, to serve a notice with immediate effect to prohibit the activity.

Annex 3 - Extracts from HSWA74 relevant to this Convention

Section 2 places the following duties on employers to their employees:

(1) It shall be the duty of every employer to ensure, so far as is reasonably practicable, the health, safety and welfare at work of all his employees.

(2) Without prejudice to the generality of an employer's duty under the preceding subsection, the matters to which that duty extends include in particular -

(a) the provision and maintenance of plant and systems of work that are, so far as is reasonably practicable, safe and without risks to health;

(b) arrangements for ensuring, so far as is reasonably practicable, safety and absence of risks to health in connection with the use, handling, storage and transport of articles and substances;

(c) the provision of such information, instruction, training and supervision as is necessary to ensure, so far as is reasonably practicable, the health and safety at work of his employees;

(d) as far as is reasonably practicable as regards any place of work under the employer's control, the maintenance of it in a condition that is safe and without risks to health and the provision and maintenance of means of access to and egress from it that are safe and without such risks;

(e) the provision and maintenance of a working environment for his employees that is, so far as is reasonably practicable, safe, without risks to health, and adequate as regards facilities and arrangements for their welfare at work.

Under Section 3 employers have the following duties to persons other than their employees:

(1) It shall be the duty of every employer to conduct his undertaking in such a way as to ensure, so far as is reasonably practicable, that persons not in his employment who may be affected thereby are not exposed to risks to their health or safety.

(2) It shall be the duty of every self-employed person to conduct his undertaking in such a way as to ensure, so far as is reasonably practicable, that he and other persons (not being his employees) who may be affected thereby are not thereby exposed to risks to their health or safety.

(3) In such cases as may be prescribed, it shall be the duty of every employer and every self-employed person, in the prescribed circumstances and in the prescribed manner, to give to persons (not being his employees) who may be affected by the way in which he conducts his undertaking the prescribed information about such aspects of the way in which he conducts his undertaking as might affect their health or safety.

Section 7 places general duties on employees:

(a) to take reasonable care of the health and safety of himself and of other persons who may be affected by his acts or omissions at work; and

(b) as regards any duty or requirement imposed on his employer or any other person by or under any of the relevant statutory provisions, to co-operate with him so far as is necessary to enable that duty or requirement to be performed or complied with.

Section 8 places a duty on persons not to interfere with or misuse things provided pursuant to certain provisions:

'No person shall intentionally or recklessly interfere with or misuse anything provided in the interests of health, safety or welfare in pursuance of any of the relevant statutory provisions.'

Section 14 gives powers to investigate and make a special report on any accident, occurrence, situation or other matter.

Section 15 allows health and safety regulations to be made that:

repeal or modify any existing statutory provisions;

impose requirements for approval by a specified body or person;

provide for exemptions from any requirement or prohibition imposed by or under any of the relevant statutory provisions.

Section 16: allows, for the purpose of providing practical guidance on meeting the HSWA74 Regulations made under the Act and of the relevant statutory provisions, the issuing of codes of practice.

Section 19: allows the enforcing authority to appoint as inspectors such persons having suitable qualifications as it thinks necessary for carrying into effect the relevant statutory provisions within its field of responsibility. Every appointment of a person as an inspector must be made by an instrument in writing specifying which of the powers conferred on inspectors by the relevant statutory provision are to be exercisable by the person appointed.

Section 20 gives an inspector the following powers:

(1) ……for the purpose of carrying into effect any of the relevant statutory provisions within the field of responsibility of the enforcing authority which appoints him, exercise the powers set out in subsection (2) below.

(2) ….., namely -

(a) at any reasonable time (or, in a situation which in his opinion is or may be dangerous, at any time) to enter any premises which he has reason to believe it is necessary for him to enter for the purpose mentioned in subsection (1) above;

(b) to take with him a constable if he has reasonable cause to apprehend any serious obstruction in the execution of his duty;

(c) without prejudice to the preceding paragraph, on entering any premises by virtue of (a) above to take with him -

(i) any other person duly authorised by his (the inspector's) enforcing authority; and

(ii) any equipment or materials required for any purpose for which the power of entry is being exercised;

(d) to make such examination and investigation as may in any circumstances be necessary for the purpose mentioned in subsection (1) above;

(e) as regards any premises which he has power to enter, to direct that those premises or any part of them, or anything therein, shall be left undisturbed (whether generally or in particular respects) for so long as is reasonably necessary for the purpose of any examination or investigation under paragraph (d) above;

(f) to take such measurements and photographs and make such recordings as he considers necessary for the purpose of any examination or investigation under paragraph (d) above;

(g) to take samples of any articles or substances found in any premises which he has power to enter, and of the atmosphere in or in the vicinity of any such premises;

(h) in the case of any article or substance found in any premises which he has power to enter, being an article or substance which appears to him to have caused or to be likely to cause danger to health or safety, to cause it to

be dismantled or subjected to any process or test (but not so as to damage or destroy it unless this is in the circumstances necessary for the purpose mentioned in subsection (1) above);

(i) in the case of any such article or substance as is mentioned in the preceding paragraph, to take possession of it and detain it for so long as is necessary for all or any of the following purposes, namely -

(i) to examine it and do to it anything which he has power to do under that paragraph;

(ii) to ensure that it is not tampered with before his examination of it is completed;

(iii) to ensure that it is available for use as evidence in any proceedings for an offence under any of the relevant statutory provisions or any proceedings relating to a notice under section 21 or 22;

(j) to require any person whom he has reasonable cause to believe to be able to give any information relevant to any examination or investigation under paragraph (d) above to answer (in the absence of persons other than a person nominated by him to be present and any persons whom the inspector may allow to be present) such questions as the inspector thinks fit to ask and to sign a declaration of the truth of his answers;

(k) to require the production of, inspect, and take copies of or any entry in -

(i) any books or documents which by virtue of any of the relevant statutory provisions are required to be kept; and

(ii) any other books or documents which it is necessary for him to see for the purposes of any examination or investigation under paragraph (d) above;

(l) to require any person to afford him such facilities and assistance with respect to any matter or things within that person's control or in relation to which that person has responsibilities as are necessary to enable the inspector to exercise any of the powers conferred on him by this section;

(m) any other power which is necessary for the purpose mentioned in subsection (1) above."

Section 21 gives an inspector the power to serve improvement notices.

Section 22 gives an inspector the power to serve prohibition notices.

Section 25 gives an inspector the power to deal with cause of an imminent danger

Section 28 places restrictions on the disclosure of information.

Section 39 gives an inspector the power in England and Wales to prosecute before a magistrates' court proceedings for an offence under any of the relevant statutory provisions.

Annex 4 - Extracts from NIA65 relevant to this Convention

Sections 1, 3 to 6, 22 and 24A of the NIA65[27] are relevant statutory provisions of the HSWA74. The relevant parts of each of these sections to this Convention are:

Section 1 restricts certain nuclear installations to licensed sites:

(1) Without prejudice to the requirements of any other Act, no person shall use any site for the purpose of installing or operating

(a) any nuclear reactor (other than such a reactor comprised in a means of transport, whether by land, water or air)

unless a licence so to do (a 'nuclear site licence') has been granted in respect of that site by the HSE and is for the time being in force.

Section 3 concerns the granting and variation of nuclear site licences:

(1) A nuclear site licence shall not be granted to any person other than a body corporate and shall not be transferable.

(1A) The HSE shall consult the appropriate Agency [the Environment Agency (EA) in England and Wales and the Scottish Environment Protection Agency (SEPA) in Scotland] before granting a nuclear site licence in respect of a site in Great Britain.

(2) Two or more installations in the vicinity of one another may, if the HSE thinks fit, be treated for the purposes of the grant of a nuclear site licence as being on the same site.

(6) The HSE may from time to time vary any nuclear site licence by excluding therefrom any part of the licensed site -

(a) which the licensee no longer needs for any use requiring such a licence; and

(b) with respect to which the HSE is satisfied that there is no danger from ionising radiations from anything on that part of the site.

(6A) The HSE shall consult the appropriate Agency [EA or SEPA] before varying a nuclear site licence in respect of a site in Great Britain if the variation relates to or affects the creation, accumulation or disposal of radioactive waste, within the meaning of the Radioactive Substances Act 1993."

Section 4 allows HSE to attach conditions to licences:

(1) The HSE by instrument in writing shall on granting any nuclear site licence, and may from time to time thereafter, attach to the licence such conditions as may appear to the HSE to be necessary or desirable in the interests of safety, whether in normal circumstances or in the event of any accident or other emergency on the site, which conditions may in particular include provision -

(a) for securing the maintenance of an efficient system for detecting and recording the presence and intensity of any ionising radiations from time to time emitted from anything on the site or from anything discharged on or from the site;

(b) with respect to the design, siting, construction, installation, operation, modification and maintenance of any plant or other installation on, or to be installed on, the site;

(c) with respect to preparations for dealing with, and measures to be taken on the happening of, any accident or other emergency on the site;

(d) without prejudice to Sections 13 and 16 of the Radioactive Substances Act 1993[32], with respect to the discharge of any substance on or from the site.

(2) The HSE may at any time by instrument in writing attach to a nuclear site licence such conditions as the HSE may think fit with respect to the handling, treatment and disposal of nuclear matter.

(3) The HSE may at any time by a further instrument in writing vary or revoke any condition for the time being attached to a nuclear site licence by virtue of this section.

(3A) HSE shall consult the appropriate Agency [EA or SEPA]

(a) before attaching any condition to a nuclear site licence in respect of a site in Great Britain or

(b) before varying or revoking any condition attached to such a nuclear site licence,

if the condition relates to or affects the creation, accumulation or disposal of radioactive waste, within the meaning of the Radioactive Substances Act 1993.

(5) At all times while a nuclear site licence remains in force, the licensee shall cause copies of any conditions for the time being in force under this section to be kept posted upon the site, and in particular on any part thereof which an inspector may direct, in such characters and in such positions as to be conveniently read by persons having duties upon the site which are or may be affected by those conditions.

Section 5 deals with the revocation and surrender of licences:

(1) A nuclear site licence may at any time be revoked by the HSE or surrendered by the licensee.

(1A) HSE shall consult the appropriate Agency before revoking a nuclear site licence in respect of a site in Great Britain.

(2) Where a nuclear site licence has been revoked or surrendered, the licensee shall, if so required by the HSE, deliver up or account for the licence to such person as the HSE may direct, and shall during the remainder of the period of his responsibility cause to be kept posted upon the site such notices indicating the limits thereof in such positions as may be directed by an inspector; and the HSE may on revocation or surrender and from time to time thereafter until the expiration of the said period give to the licensee such other directions as the HSE may think fit for preventing or giving warning of any risk of injury to any person or damage to any property by ionising radiations from anything remaining on the site.

(3) In this Act, the expression 'period of responsibility' in relation to the licensee under a nuclear site licence means, as respects the site in question or any part thereof, the period beginning with the grant of the licence and ending with which ever of the following dates is the earlier, that is to say -

(a) the date when the HSE gives notice in writing to the licensee that in the opinion of the HSE there has ceased to be any danger from ionising radiations from anything on the site or, as the case may be, on that part thereof;

(b) the date when a new nuclear site licence in respect of a site comprising the site in question or, as the case may be, that part thereof is granted either to the same licensee or to some other person.

Section 6 refers to the maintenance of a list of licensed sites by the Secretary of State for Business, Enterprise and Regulatory Reform.

Section 22 refers to reporting of and inquires into dangerous occurrences:

(1) The provisions of this section shall have effect on the happening of any occurrence of any description as may be prescribed, being an occurrence -

(a) on a licensed site

(2) The licensee shall cause the occurrence to be reported forthwith in the prescribed manner to the HSE and to such other persons, if any, as may be prescribed in relation to occurrences of that class or description, and if the occurrence is not so reported the licensee shall be guilty of an offence.

Section 24A covers the recovery of expenses by the HSE.

Annex 5 - Nuclear Site Licence: Standard Licence Conditions

In this Annex, compliance with the Convention is demonstrated in a way that has not substantially changed since the third UK report (i.e. in a way that has implications for the Convention obligations), except the minor change in LC3 below.

1: Interpretation

The purpose of Licence Condition (LC) 1 is to ensure that there is no ambiguity in the use of certain specified terms which are found in the text of the Conditions. It also contains important powers for the Executive to modify, revise or withdraw approvals, etc. and to approve modifications to any matter currently approved. Where appropriate reference is made back to the relevant statutory Acts of Parliament.

2: Marking of the Site Boundary

(1) The licensee shall make and implement adequate arrangements to prevent unauthorised persons from entering the site or, if so directed by the Executive, from entering such part or parts thereof as the Executive may specify.

(2) The licensee shall submit to the Executive for approval such part or parts of the aforesaid arrangements as the Executive may specify.

(3) The licensee shall ensure that once approved no alteration is made to the approved arrangements unless the Executive has approved such alteration or amendment.

(4) The licensee shall mark the boundaries of the site by fences or other appropriate means, and any such fences or other means used for this purpose shall be properly maintained.

(5) The licensee shall, if so directed by the Executive, erect appropriate fences on the site in such positions as the Executive may specify and shall ensure that all such fences are properly maintained.

The purpose of LC2 is to delineate the extent of the site in order to prevent unauthorised access in order to limit the risk of injury to intruders and to other persons or damage to their property.

3: Restriction on Dealing with the Site

The licensee shall not convey, assign, transfer, let or part with possession of the site or any part thereof or grant any licence in relation thereto without the consent of the Executive.

The purpose of LC3 is to ensure that nothing confuses the absolute responsibility of the licensee under NIA65 in respect of safety on the whole licensed site. The licensee should be able to demonstrate that there are organisational procedures to prevent individuals within the company from conveying, assigning, transferring, letting, feuing or granting any licences in relation to the site or parts of the site without first obtaining the Consent of the Executive.

For sites operated under contract to the NDA, LC3 has been modified to reflect the site's ownership by the NDA and not the licensee and to take account of the formation of the Civil Nuclear Police Authority under the Energy Act 2004. For the Magnox sites LC3 reads:

(1) No person shall convey, assign, transfer, let or part with possession of the site or any part thereof or grant any licence in relation thereto, except to the Civil Nuclear Police Authority, without the consent of the Executive.

(2) The licensee shall notify the Executive forthwith if occupancy of any part of the site is taken by the Civil Nuclear Police Authority.

(3) The licensee shall make and implement adequate arrangements to control all property transactions affecting the site or parts thereof.

(4) The licensee shall submit to the Executive for approval such part or parts of the aforesaid arrangements as the Executive may specify.

(5) The licensee shall ensure that once approved no alteration or amendment is made to the approved arrangements unless the Executive has approved such alteration or amendment.

4: Restrictions on Nuclear Matter on the Site

(1) The licensee shall ensure that no nuclear matter is brought onto the site except in accordance with adequate arrangements made by the licensee for this purpose.

(2) The licensee shall ensure that no nuclear matter is stored on the site except in accordance with adequate arrangements made by the licensee for this purpose.

(3) The licensee shall submit to the Executive for approval such part or parts of the aforesaid arrangements as the Executive may specify.

(4) The licensee shall ensure that once approved no alteration or amendment is made to the approved arrangements unless the Executive has approved such alteration or amendment.

(5) For new installations, if the Executive so specifies, the licensee shall ensure that no nuclear matter intended for use in connection with the new installation is brought onto the site for the first time without the consent of the Executive.

The purpose of LC4 is to ensure that the licensee carries out its responsibilities to control the introduction and storage of nuclear matter on the licensed site (nuclear matter being fuel, sources, radioactive waste, etc., as defined by NIA65).

5: Consignment of Nuclear Matter

(1) The licensee shall not consign nuclear matter (other than excepted matter and radioactive waste) to any place in the United Kingdom other than a relevant site except with consent of the Executive.

(2) The licensee shall keep a record of all nuclear matter (including excepted matter and radioactive waste) consigned from the site and such record shall contain particulars of the amount, type and form of such matter, the manner in which it was packed, the name and address of the person to whom it was consigned and the date when it left the site.

(3) The licensee shall ensure that the aforesaid record is preserved for 30 years from the date of dispatch or such other period as the Executive may approve except in the case of any consignment or part thereof subsequently stolen, lost, jettisoned or abandoned, in which case the record shall be preserved for a period of 50 years from the date of such theft, loss, jettisoning or abandoning.

The purpose of LC5 is to ensure that the transfer of nuclear matter, other than excepted matter and radioactive waste, to sites in the UK other than relevant sites:

(a) is carried out only with the consent of the Executive; and that

(b) the licensee has adequate records of where such nuclear matter has been sent.

The licensee should also be able to demonstrate that there are organisational procedures to prevent individuals from inadvertently consigning such matter to non-relevant sites without first obtaining a Consent from the Executive.

[Relevant sites are other licensed or Crown sites as defined in NIA65 and excepted matter is defined in NIA65 and Statutory Instrument (S.I.) 1965/1826 and S.I. 1978/1779].

6: Documents, Records, Authorities and Certificates

(1) The licensee shall make adequate records to demonstrate compliance with any of the conditions attached to this licence.

(2) Without prejudice to any other requirements of the conditions attached to this licence, the licensee shall make and implement adequate arrangements to ensure that every document required, every record made, every authority consent or approval granted and every direction or certificate issued in pursuance of the conditions attached to this licence is preserved for 30 years or such other periods as the Executive may approve.

(3) The licensee shall submit to the Executive for approval such part or parts of the aforesaid arrangements as the Executive may specify.

(3) The licensee shall ensure that once approved no alteration or amendment is made to the approved arrangements unless the Executive has approved such alteration or amendment.

(4) The licensee shall furnish to the Executive copies of any such document, record, authority or certificate as the Executive may specify.

The purpose of LC6 is to ensure that adequate records are held by the licensee for a suitable period to demonstrate compliance with licence conditions.

7: Incidents on the Site

(1) The licensee shall make and implement adequate arrangements for the notification, recording, investigation and reporting of such incidents occurring on the site:

(a) as is required by any other condition attached to this licence;

(b) as the Executive may specify; and

(c) as the licensee considers necessary.

(2) The licensee shall submit to the Executive for approval such part or parts of the aforesaid arrangements as the Executive may specify.

(3) The licensee shall ensure that once approved no alteration or amendment is made to the approved arrangements unless the Executive has approved such alteration or amendment.

The purpose of LC7 is to ensure that incidents are notified, recorded, investigated and reported as required by other licence conditions, as may be specified by the Executive and as the licensee considers necessary.

8: Warning Notices

The licensee shall ensure that suitable and sufficient notices are kept on the site for the purposes of informing persons thereon of each of the following matters, that is to say :

(a) the meaning of any warning signal used on the site;

(b) the location of any exit from any place on the site, being an exit provided for use in the event of an emergency;

(c) the measures to be taken by such persons in the event of fire breaking out on the site or in the event of any other emergency;

and that such notices are kept posted in such positions and in such characters as to be conveniently read by those persons.

The purpose of LC8 is to ensure the safety of all people on site in respect of their ability to be able to respond appropriately and without delay to an emergency situation. The licensee therefore needs to ensure that all warning notices are in appropriate places to advise people on what to do in that area in the event of fire or any other emergency.

9: Instructions to Persons on the Site

The licensee shall ensure that every person authorised to be on the site receives adequate instructions (to the extent that is necessary having regard to the

circumstances of that person being on the site) as regards the risks and hazards associated with the plant and its connection therewith and the action to be taken in the event of an accident or emergency on the site.

The purpose of LC9 is to ensure that the licensee provides all persons allowed on the site with adequate instruction where necessary so that they are aware of the risks and hazards associated with the plant and its operations, the precautions that must be taken to minimise the risk to themselves and others and the actions to be taken in the event of an accident or emergency.

10: Training

(1) The licensee shall make and implement adequate arrangements for suitable training of all those on site who have responsibility for any operations which may affect safety.

(2) The licensee shall submit to the Executive for approval such part or parts of the aforesaid arrangements as the Executive may specify.

(3) The licensee shall ensure that once approved no alteration is made to the approved arrangements unless the Executive has approved such alteration or amendment.

The purpose of LC10 is to ensure that all those people on the site who have responsibility for an action which may affect safety are adequately trained for that purpose. This Condition is in addition to the general duty under HSWA74 s. 2(2)(c) and IRR99 Regulation 12(a).

11: Emergency Arrangements

(1) Without prejudice to any other requirements of the conditions attached to this licence the licensee shall make and implement adequate arrangements for dealing with any accident or emergency arising on the site and their effects.

(2) The licensee shall submit to the Executive for approval such part or parts of the aforesaid arrangements as the Executive may specify.

(3) The licensee shall ensure that once approved no alteration or amendment is made to the approved arrangements unless the Executive has approved such alteration or amendment.

(4) Where any such arrangements require the assistance or co-operation of, or render it necessary or expedient to make use of the services of any person, local authority or other body the licensee shall ensure that each person, local authority or other body is consulted in the making of such arrangements.

(5) The licensee shall ensure that such arrangements are rehearsed at such intervals and at such times and to such extent as the Executive may specify or, where the Executive has not so specified, as the licensee considers necessary.

(6) The licensee shall ensure that such arrangements include procedures to ensure that all persons in his employ who have duties in connection with such arrangements are properly instructed in the performance of the same, in the use of the equipment required and the precautions to be observed in connection therewith.

The purpose of LC11 is to ensure that the licensee has adequate arrangements in place to respond effectively to any incident ranging from a minor on-site event to a significant release of radioactive material.

12: Duly Authorised and Other Suitably Qualified and Experienced Persons

(1) The licensee shall make and implement adequate arrangements to ensure that only suitably qualified and experienced persons perform any duties which may affect the safety of operations on the site or any duties assigned by or under these conditions or any arrangements required under these conditions.

(2) The aforesaid arrangements shall also provide for the appointment, in appropriate cases, of duly authorised persons to control and supervise operations which may affect plant safety.

(3) The licensee shall submit to the Executive for approval such part or parts of the aforesaid arrangements as the Executive may specify.

(4) The licensee shall ensure that once approved no alteration is made to the approved arrangements unless the Executive has approved such alteration or amendment.

(5) The licensee shall ensure that no person continues to act as a duly authorised person if, in the opinion of the Executive, he is unfit to act in that capacity and the Executive has notified the licensee to that effect.

The purpose of LC12 is to ensure that only suitably qualified and experienced persons perform duties which may affect the safety of any operations on the site or any duties required by other licence conditions or the arrangements made thereunder.

13: Nuclear Safety Committee

(1) The licensee shall establish a nuclear safety committee or committees to which it shall refer for consideration and advice the following:

(a) all matters required by or under these conditions to be referred to a nuclear safety committee;

(b) such arrangements or documents required by these conditions as the Executive may specify and any subsequent alteration or amendment to such specified arrangements or documents;

(c) any matter on the site affecting safety on or off the site which the Executive may specify; and

(d) any other matter which the licensee considers should be referred to a nuclear safety committee.

(2) The licensee shall submit to the Executive for approval the terms of reference of any such nuclear safety committee and shall not form a nuclear safety committee without the aforesaid approval.

(3) The licensee shall ensure that once approved no alteration or amendment is made to the terms of reference of such a nuclear safety committee unless the Executive has approved such alteration or amendment.

(4) The licensee shall appoint at least seven persons as members of a nuclear safety committee including one or more members who are independent of the licensee's operations and shall ensure that at least five members are present at each meeting including at least one independent member.

(5) The licensee shall furnish to the Executive the name, qualifications, particulars of current posts held and the previous relevant experience of every person whom he appoints as a member of any nuclear safety committee forthwith after making such appointment. Notwithstanding such appointment the licensee shall ensure that a person so appointed does not remain a member of any nuclear safety committee if the Executive notifies the licensee that it does not agree to the appointment.

(6) The licensee shall ensure that the qualifications, current posts held and previous relevant experience of the members of any such committee, taken as a whole, are such as to enable that committee to consider any matter likely to be referred to it and to advise the licensee authoritatively and, so far as practicable, independently.

(7) The licensee shall ensure that a nuclear safety committee shall consider or advise only during the course of a properly constituted meeting of that committee.

(8) The licensee shall send to the Executive within 14 days of any meeting of any such committee a full and accurate record of all matters discussed at that meeting including in particular any advice given to the licensee.

(9) The licensee shall furnish to the Executive copies of any document or any category of documents considered at any such meetings that the Executive may specify.

(10) The licensee shall notify the Executive as soon as practicable if it is intended to reject, in whole or in part, any advice given by any such committee together with the reasons for such rejection.

(11) Notwithstanding paragraph (7) of this condition, where it becomes necessary to obtain consideration of or advice on urgent safety proposals (which would normally be considered by a nuclear safety committee) the licensee may do so in accordance with appropriate arrangements made for the purpose by the licensee, considered by the relevant nuclear safety committee and approved by the Executive.

(12) The licensee shall ensure that once approved no alteration or amendment is made to the approved arrangements described in paragraph (11) of this condition unless the relevant nuclear safety committee has considered and the Executive has approved such alteration or amendment.

The purpose of LC13 is to ensure that the licensee sets up a senior level committee which should consider and advise on matters which affect the safe design, construction, commissioning, operation and decommissioning of the installations on the licensed site and any other matter relevant to safety. The committee must have members who are adequately qualified to perform this task and to provide a source of authoritative advice to the licensee. The committee, however, is purely advisory and must not be considered to have an executive function, but the Executive must be informed if the advice of the committee is not to be followed by the licensee.

14: Safety Documentation

(1) Without prejudice to any other requirements of the condition attached to this licence the licensee shall make and implement adequate arrangements for the production and assessment of safety cases consisting of documentation to justify safety during the design, construction, manufacture, commissioning, operation and decommissioning phases of the installation.

(2) The licensee shall submit to the Executive for approval such parts or parts of the aforesaid arrangements as the Executive may specify.

(3) The licensee shall ensure that once approved no alteration or amendment is made to the approved arrangements unless the Executive has approved such alteration or amendment.

(4) The licensee shall furnish to the Executive copies of any such documentation or any such category of documentation as the Executive may specify.

The purpose of LC14 is to ensure that the licensee sets 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.

15: Periodic Review

(1) The licensee shall make and implement adequate arrangements for the periodic and systematic review and reassessment of safety cases.

(2) The licensee shall submit to the Executive for approval such part or parts of the aforesaid arrangements as the Executive may specify.

(3) The licensee shall ensure that once approved no alteration or amendment is made to the approved arrangements unless the Executive has approved such alteration or amendment.

(4) The licensee shall, if so directed by the Executive, carry out a review and reassessment of safety and submit a report of such review to the Executive at such intervals, within such a period and for such of the matters or operations as may be specified in the direction.

The purpose of LC15 is to ensure that the plant remains adequately safe and that the safety cases are kept up to date throughout its lifetime. The safety cases should be periodically reviewed in a systematic manner against the original design intent and current safety objectives and practices.

16: Site Plan, Designs and Specifications

(1) The licensee shall submit to the Executive an adequate plan of the site (hereinafter referred to as the site plan) showing the location of the boundary of the licensed site and every building or plant on the site which might affect safety.

(2) The licensee shall submit to the Executive with the site plan a schedule giving particulars of each building and plant thereon and the operations associated therewith.

(3) If any changes are made on the site which may affect the said buildings, plant or operations, the licensee shall forthwith send an amended site plan and schedule to the Executive incorporating these changes.

(4) The licensee shall furnish to the Executive such plans, designs, specifications or any other information relating to such buildings, plant and operations as the Executive may specify.

The purpose of LC16 is to ensure that the licensee indicates, using a site plan, all buildings and plant or areas which might affect safety and provides a schedule updated as necessary, giving details of each building and its associated operations.

17: Quality Assurance

(1) Without prejudice to any other requirements to the conditions attached to this licence the licensee shall make and implement adequate quality assurance arrangements in respect of all matters which affect safety.

(2) The licensee shall submit to the Executive for approval such part or parts of the aforesaid arrangements as the Executive may specify.

(3) The licensee shall ensure that once approved no alteration or amendment is made to the approved arrangements unless the Executive has approved such alteration or amendment.

(4) The licensee shall furnish to the Executive such copies of records or documents made in connection with the aforesaid arrangements as the Executive may specify.

The purpose of LC17 is to ensure that the licensee sets out the managerial and procedural arrangements that will be used to control and monitor those actions necessary in the interests of safety, and to demonstrate compliance with the site licence conditions (and in particular the arrangements made under them) and any other relevant legislation.

18: Radiological Protection

(1) The licensee shall make and implement adequate arrangements for the assessment of the average effective dose equivalent (including any committed effective dose equivalent) to such class or classes of persons as may be specified in the aforesaid arrangements and the licensee shall forthwith notify the Executive if the

average effective dose equivalent to such class or classes of persons exceeds such level as the Executive may specify.

(2) The licensee shall submit to the Executive for approval such part or parts of the arrangements as the Executive may specify.

(3) The licensee shall ensure that once approved no alteration or amendment is made to the approved arrangements unless the Executive has approved such alteration or amendment.

The purpose of LC18 is to ensure that the licensee makes and implements adequate arrangements to assess the average effective dose equivalent to specified classes of persons. Also the licensee shall notify the Executive if such dose exceeds the specified level. This is complementary to IRR99 Regulation 13.

19: Construction or Installation of New Plant

(1) Where the licensee proposes to construct or install any new plant which may affect safety the licensee shall make and implement adequate arrangements to control the construction or installation.

(2) The licensee shall submit to the Executive for approval such part or parts of the aforesaid arrangements as the Executive may specify.

(3) The licensee shall ensure that once approved no alteration or amendment is made to the approved arrangements unless the Executive has approved such alteration or amendment.

(4) The aforesaid arrangements shall where appropriate divide the construction or installation into stages. Where the Executive so specifies the licensee shall not commence nor thereafter proceed from one stage to the next of the construction or installation without the consent of the Executive. The arrangements shall include a requirement for the provision of adequate documentation to justify the safety of the proposed construction or installation and shall where appropriate provide for the submission of this documentation to the Executive.

(5) The licensee shall, if so directed by the Executive, halt the construction or installation of a plant and the licensee shall not recommence such construction or installation without the consent of the Executive.

The purpose of LC19 is to ensure that the licensee provides and implements adequate control over the construction and installation of new plant which may affect safety.

20: Modification to Design of Plant under Construction

(1) The licensee shall ensure that no modification to the design which may affect safety is made to any plant during the period of construction except in accordance with adequate arrangements made and implemented by the licensee for that purpose.

(2) The licensee shall submit to the Executive for approval such part or parts of the aforesaid arrangements as the Executive may specify.

(3) The licensee shall ensure that once approved no alteration or amendment is made to the approved arrangements unless the Executive has approved such alteration or amendment.

(4) The aforesaid arrangements shall provide for the classification of modifications according to their safety significance. The arrangements shall where appropriate divide modifications into stages. Where the Executive so specifies the licensee shall not commence nor thereafter proceed from one stage to the next of the modification without the consent of the Executive. The arrangements shall include a requirement for the provision of adequate documentation to justify the safety of the

proposed modification and shall where appropriate provide for the submission of this documentation to the Executive.

The purpose of LC20 is to ensure that where necessary adequate arrangements exist to control safety-related modifications during design and construction of plant or process.

21: Commissioning

(1) The licensee shall make and implement adequate arrangements for the commissioning of any plant or process which may affect safety.

(2) The licensee shall submit to the Executive for approval such part or parts of the aforesaid arrangements as the Executive may specify.

(3) The licensee shall ensure that once approved no alteration or amendment is made to the approved arrangements unless the Executive has approved such alteration and amendment.

(4) The aforesaid arrangement shall where appropriate divide the commissioning into stages. Where the Executive so specifies the licensee shall not commence nor thereafter proceed from one stage to the next of the commissioning without the consent of the Executive. The arrangements shall include a requirement for the provision of adequate documentation to justify the safety of the proposed commissioning and shall where appropriate provide for the submission of this documentation to the Executive.

(5) The licensee shall appoint a suitably qualified person or persons for the purpose of controlling, witnessing, recording and assessing the results of any tests carried out in accordance with the requirements of the aforesaid commissioning arrangements.

(6) The licensee shall ensure that full and accurate records are kept of the results of every test and operation carried out in pursuance of this condition.

(7) The licensee shall ensure that no plant or process which may affect safety is operated (except for the purpose of commissioning) until:

> *(a) the appropriate state of commissioning has been completed and a report of such commissioning, including any results and assessments of any tests as may have been required under the commissioning arrangements referred to in paragraph (1) of this condition, has been considered in accordance with those arrangements; and*
>
> *(b) a safety case or cases as appropriate, which shall include the safety implications of modifications made since the commencement of construction of the plant and those arising from the commissioning of the plant, and any matters whereby the operation of the plant may be effected by such modifications or commissioning, has been considered in accordance with the arrangements referred to in paragraph (1) of this condition.*

(8) The licensee shall, if so notified by the Executive, submit to the Executive the safety case for the aforesaid plant or processes prepared in pursuance of paragraph (7) of this condition and shall not commence operation of the relevant plant or process without the consent of the Executive.

The purpose of LC21 is to ensure that adequate arrangements exist for the commissioning of a new or modified plant or process which may affect safety and to ensure qualified supervision of this work.

22: Modification or Experiment on Existing Plant

(1) The licensee shall make and implement adequate arrangements to control any modification or experiment carried out on any part of the existing plant or process which may affect safety.

(2) The licensee shall submit to the Executive for approval such part or parts of the aforesaid arrangements as the Executive may specify.

(3) The licensee shall ensure that once approved no alteration or amendment is made to the approved arrangements unless the Executive has approved such alteration or amendment.

(4) The aforesaid arrangements shall provide for the classification of modifications or experiments according to their safety significance. The arrangements shall where appropriate divide the modification or experiment into stages. Where the Executive so specifies the licensee shall not commence nor thereafter proceed from one stage to the next of the modification or experiment without the consent of the Executive. The arrangements shall include a requirement for the provision of adequate documentation to justify the safety of the proposed modification or experiment and shall where appropriate provide for the submission of the documentation to the Executive.

(5) The licensee shall if so directed by the Executive, halt the modification or experiment and the licensee shall not recommence such modification or experiment without the consent of the Executive.

The purpose of LC22 is to ensure that adequate arrangements exist to ensure that all modifications and experiments that may affect safety are adequately controlled.

23: Operating Rules

(1) The licensee shall, in respect of any operation that may affect safety, produce an adequate safety case to demonstrate the safety of that operation and to identify the conditions and limits necessary in the interests of safety. Such conditions and limits shall hereinafter be referred to as operating rules.

(2) The licensee, where the Executive so specifies, shall refer the operating rules arising from paragraph (1) of this condition to the relevant nuclear safety committee for consideration.

(3) The licensee shall ensure that operations are at all times controlled and carried out in compliance with such operating rules. Where the person appointed by the licensee for the purposes of condition 26 identifies any matter indicating that the safety of any operation or the safe condition of any plant may be affected that person shall bring that matter to the attention of the licensee forthwith who shall take appropriate action and ensure the matter is then notified, recorded, investigated and reported in accordance with arrangements made under condition 7.

(4) The licensee shall submit to the Executive for approval such of the aforesaid operating rules as the Executive may specify.

(5) The licensee shall ensure that once approved no alteration or amendment is made to any approved operating rule unless the Executive has approved such alteration or amendment.

(6) Notwithstanding the preceding provisions of this condition the Executive may, if in its opinion circumstances render it necessary at any time, agree to the temporary suspension of any approved operating rule.

The purpose of LC23 is to ensure that all operations that may affect safety are supported by a safety case, and that the safety case identifies the conditions and limits that ensure that the plant is kept in a safe condition.

24: Operating Instructions

(1) The licensee shall ensure that all operations which may affect safety are carried out in accordance with written instructions hereinafter referred to as operating instructions.

(2) The licensee shall ensure that such operating instructions include any instructions necessary in the interests of safety and any instructions necessary to ensure that any operating rules are implemented.

(3) The licensee shall, if so specified by the Executive, furnish to the Executive copies of such operating instructions and when any alteration is made to the operating instructions furnished to the Executive, the licensee shall ensure that such alteration is furnished to the Executive within such time as may be specified.

(4) The licensee shall make and implement adequate arrangements for the preparation, review and amendment of such operating instructions.

(5) The licensee shall submit to the Executive for approval such part or parts of the aforesaid arrangements as the Executive may specify.

(6) The licensee shall ensure that once approved no alteration or amendment is made to the approved arrangements unless the Executive has approved such alteration or amendment.

The purpose of LC24 is to ensure that all operations as defined in Condition 1 which may affect safety, including any instructions to implement Operating Rules, are undertaken in accordance with written operating instructions.

25: Operational Records

(1) The licensee shall ensure that adequate records are made of the operation, inspection and maintenance of any plant which may affect safety.

(2) The aforesaid records shall include records of the amount and location of all radioactive material, including nuclear fuel and radioactive waste, used and processed, stored or accumulated upon the site at any time.

(3) The licensee shall record such additional particulars as the Executive may specify.

(4) The licensee shall furnish to the Executive such copies of extracts from such records as the Executive may specify.

The purpose of LC25 is to ensure that adequate records are kept regarding operation, inspection and maintenance of any safety-related plant.

26: Control and Supervision of Operations

The licensee shall ensure that no operations are carried out which may affect safety except under the control and supervision of suitably qualified and experienced persons appointed for that purpose by the licensee.

The purpose of LC26 is to ensure that safety-related operations are carried out only under the control and supervision of suitably qualified and experienced personnel.

27: Safety Mechanisms, Devices and Circuits

The licensee shall ensure that a plant is not operated, inspected, maintained or tested unless suitable and sufficient safety mechanisms, devices and circuits are properly connected and in good working order.

The purpose of LC27 is to ensure that plant is not used unless safety mechanisms, devices and circuits are installed and maintained to an adequate standard.

28: Examination, Inspection, Maintenance and Testing

(1) The licensee shall make and implement adequate arrangements for the regular and systematic examination, inspection, maintenance and testing of all plant which may affect safety.

(2) The licensee shall submit to the Executive for approval such part or parts of the aforesaid arrangements as the Executive may specify.

(3) The licensee shall ensure that once approved no alteration is made to the approved arrangements unless the Executive has approved such alteration or amendment.

(4) The aforesaid arrangements shall provide for the preparation of a plant maintenance schedule for each plant. The licensee shall submit to the Executive for its approval such part or parts of any plant maintenance schedule as the Executive may specify.

(5) The licensee shall ensure that once approved no alteration or amendment is made to any approved part of any plant maintenance schedule unless the Executive has approved such alteration or amendment.

(6) The licensee shall ensure in the interests of safety that every examination, inspection, maintenance and test of a plant or any part thereof is carried out:

(a) by suitably qualified and experienced persons;

(b) in accordance with schemes laid down in writing;

(c) within the intervals specified in the plant maintenance schedule; and

(d) under the control and supervision of a suitably qualified and experienced person appointed by the licensee for that purpose.

(7) Notwithstanding the above paragraph of this condition the Executive may agree to an extension of any interval specified in the plant maintenance schedule.

(8) When any examination, inspection, maintenance or test of any part of a plant reveals any matter indicating that the safe operation or safe condition of that plant may be affected, the suitably qualified and experienced person appointed to control and supervise any such examination, inspection, maintenance or test shall bring it to the attention of the licensee forthwith who shall take appropriate action and ensure that the matter is then notified, recorded, investigated and reported in accordance with the arrangements made under condition 7.

(9) The licensee shall ensure that a full and accurate report of every examination, inspection, maintenance or test of any part of a plant indicating the date thereof and signed by the suitably qualified and experienced person appointed by the licensee to control and supervise such examination, inspection, maintenance or test is made to the licensee forthwith upon completion of the said examination, inspection, maintenance or test.

The purpose of LC28 is to ensure that all plant that may affect safety is scheduled to receive regular and systematic examination, inspection, maintenance and testing, by and under the control of suitable personnel.

29: Duty to carry out Tests and Inspections

(1) The licensee shall carry out such tests, inspections and examinations in connection with any plant (in addition to any carried out under condition 28 above) as the Executive may, after consultation with the licensee, specify.

(2) The licensee shall furnish the results of any such tests, inspections and examinations carried out in accordance with paragraph (1) of this condition to the Executive as soon as practicable.

The purpose of LC29 is to enable the Executive, following consultation, to require the licensee to perform any tests, inspections and examinations which it may specify, and to be provided with the results.

30: Periodic Shutdown

(1) When necessary for the purpose of enabling any examination, inspection, maintenance or testing of any plant or process to take place, the licensee shall ensure that any such plant or process shall be shut down in accordance with the requirements of its plant maintenance schedule referred to in condition 28.

(2) Notwithstanding paragraph (1) of this condition the Executive may agree to an extension of a plant's operating period.

(3) The licensee shall, if so specified by the Executive, ensure that when a plant or process is shut down in pursuance of paragraph (1) of this condition it shall not be started up again thereafter without the consent of the Executive.

The purpose of LC30 is to ensure that any part of the plant or process shall, where necessary to allow examination, inspection, maintenance and testing to take place, be shut down in accordance with the plant maintenance schedule. The Executive has discretion to require its consent to start-up of any process shut down under this condition.

31: Shutdown of Specific Operations

(1) The licensee shall if so directed by the Executive shut down any plant, operation or process on the site within such period as the Executive may specify.

(2) The licensee shall ensure that when the plant, operation or process is shut down in pursuance of paragraph 1 of this condition it shall not be started up without the consent of the Executive.

The purpose of LC31 is to give discretionary powers to the Executive to shut down any plant, operation or process within a given period and to require its consent to start-up of any plant, operation or process shut down under this condition.

32: Accumulation of Radioactive Waste

(1) The licensee shall make and implement adequate arrangements for minimising so far as is reasonably practicable the rate of production and total quantity of radioactive waste accumulated on the site at any time and for recording waste so accumulated.

(2) The licensee shall submit to the Executive for approval such part or parts of the aforesaid arrangements as the Executive may specify.

(3) The licensee shall ensure that once approved no alteration or amendment is made to the approved arrangements unless the Executive has approved such alteration or amendment.

(4) Without prejudice to paragraph (1) of this condition the licensee shall ensure that radioactive waste accumulated or stored on the site complies with such limitations as to quantity, type and form as may be specified by the Executive.

(5) The licensee shall, if so specified by the Executive, not accumulate radioactive waste except in a place and in a manner approved by the Executive.

The purpose of LC32 is to ensure that the production rate and accumulation of radioactive waste on the site is minimised, held under suitable storage arrangements, and that adequate records are made.

33: Disposal of Radioactive Waste

The licensee shall, if so directed by the Executive, ensure that radioactive waste accumulated or stored on the site is disposed of as the Executive may specify and in accordance with an Authorisation granted under the Radioactive Substances Act 1960 or, as the case may be, the Radioactive Substances Act 1993.

The purpose of LC33 is to give discretionary powers to the Executive to direct that radioactive waste be disposed of in a specified manner. This is related to the powers available to the EA in England and Wales and SEPA in Scotland under RSA93, s. 13.

34: Leakage and Escape of Radioactive Material and Radioactive Waste

(1) The licensee shall ensure, as far as is reasonably practicable, that radioactive material and radioactive waste on the site is at all times adequately controlled or

contained so that it cannot leak or otherwise escape from such control or containment.

(2) Notwithstanding paragraph (1) of this condition the licensee shall ensure, so far as is reasonably practicable, that no such leak or escape of radioactive material or radioactive waste can occur without being detected, and that any such leak or escape is then notified, recorded, investigated and reported in accordance with arrangements made under condition 7.

(3) Nothing in this condition shall apply to discharges or releases of radioactive waste in accordance with an approved operating rule or with disposal authorisation granted under the Radioactive Substances Act 1960 or, as the case may be, the Radioactive Substances Act 1993.

The purpose of LC34 is to ensure so far as reasonably practicable that radioactive material and radioactive waste is adequately controlled or contained so as to prevent leaks or escapes, and that any unauthorised leak or escape can be detected and reported.

35: Decommissioning

(1) The licensee shall make and implement adequate arrangements for the decommissioning of any plant or process which may affect safety.

(2) The licensee shall make arrangements for the production and implementation of decommissioning programmes for each plant.

(3) The licensee shall submit to the Executive for approval such part or parts of the aforesaid arrangements or programmes as the Executive may specify.

(4) The licensee shall ensure that once approved no alteration or amendment is made to the arrangements or programmes unless the Executive has approved such alteration or amendment.

(5) The aforesaid arrangements shall where appropriate divide the decommissioning into stages. Where the Executive so specifies the licensee shall not commence nor thereafter proceed from one stage to the next of the decommissioning without the consent of the Executive. The arrangements shall include a requirement for the provision of adequate documentation to justify the safety of the proposed decommissioning and shall where appropriate provide for the submission of this documentation to the Executive.

(6) The licensee shall, if so directed by the Executive where it appears to them to be in the interests of safety, commence decommissioning in accordance with the aforesaid arrangements and decommissioning programmes.

(7) The licensee shall, if so directed by the Executive, halt the decommissioning of a plant and the licensee shall not recommence such decommissioning without the consent of the Executive.

The purpose of LC35 is to require the licensee to make adequate provisions for decommissioning. It also gives discretionary powers to the Executive to direct that decommissioning of any plant or process be commenced or halted.

36: Control of Organisational Change

(1) The licensee shall make and implement adequate arrangements to control any change to its organisational structure or resources which may affect safety.

(2) The licensee shall submit to the Executive for approval such part or parts of the aforesaid arrangements as the Executive may specify.

(3) The licensee shall ensure that once approved no alteration or amendment is made to the approved arrangements unless the Executive has approved such alteration or amendment.

(4) The aforesaid arrangements shall provide for the classification of changes to the organisational structure or resources according to their safety significance. The arrangements shall include a requirement for the provision of adequate documentation to justify the safety of any proposed change and shall where appropriate provide for the submission of such documentation to the Executive.

(5) The licensee shall if so directed by the Executive halt all change to its organisational structure or resources and the licensee shall not recommence such change without the consent of the Executive.

Annex 6 - Regulatory Organisations

In this Annex, compliance with the Convention is demonstrated in a way that has not substantially changed since the third UK report (i.e. in a way that has implications for the Convention obligations), except in paragraphs A6.4 and A6.47 below.

A6.1 This Annex provides further information to that supplied in Article 8 on the regulators that enforce health, safety and environmental regulation in the UK.

Health and Safety Regulation

Health and Safety Executive

(i) Mandate and Duties

Nuclear Installations Inspectorate (NII)

A6.2 The original Nuclear Installations Act, enacted in 1959, set up the NII, then called the Inspectorate of Nuclear Installations, in 1960. The 1959 Act was subsequently replaced by the NIA65[27] that, though amended in some details, retains essentially the same regulatory powers. In 1975, NII was incorporated into HSE and now forms part of HSE's Nuclear Directorate (ND). Those parts of NIA65 relating to licensing became relevant statutory provisions of HSWA74.

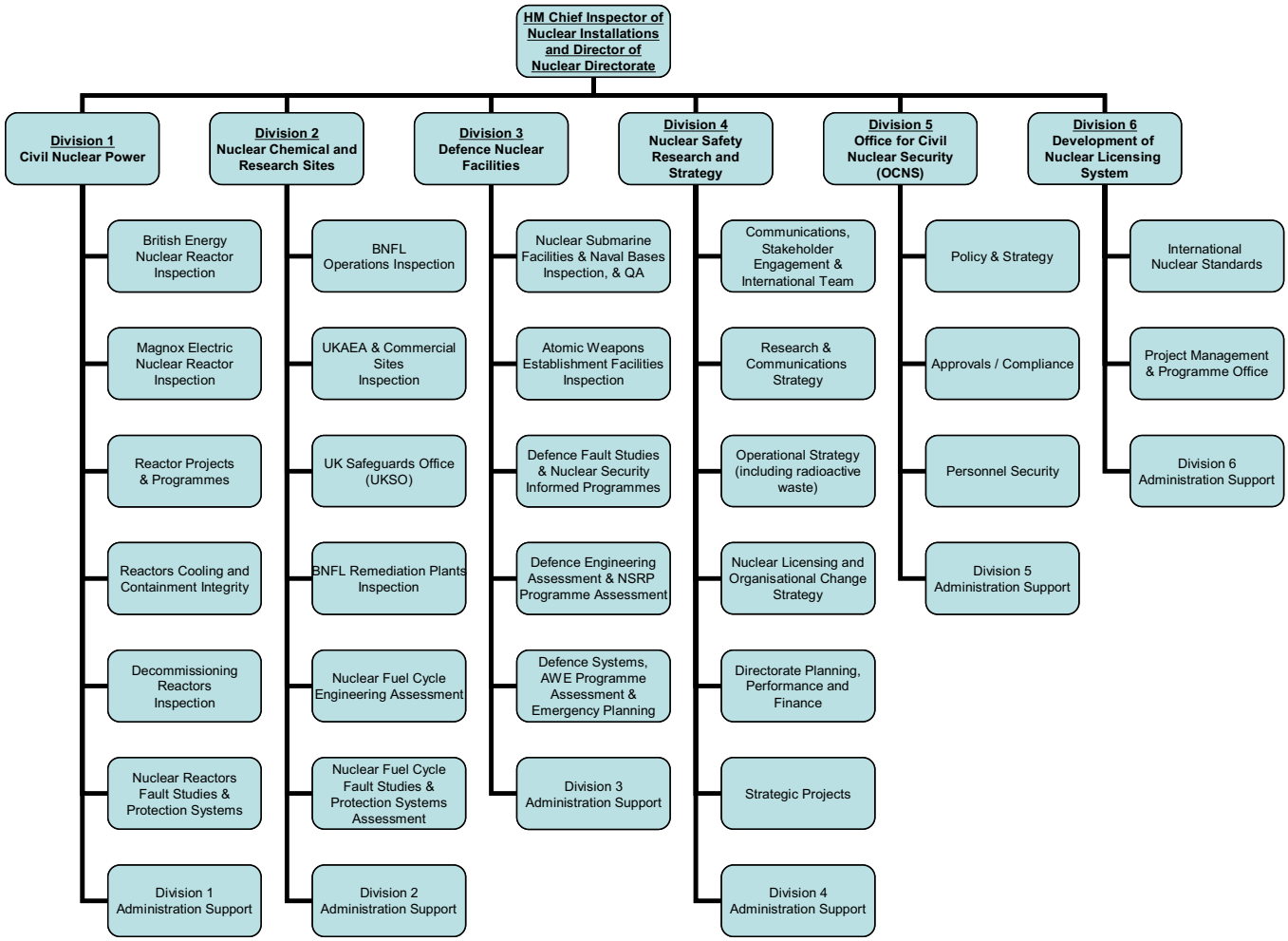
A6.3 NII operates the nuclear site licensing system under NIA65 on behalf of HSE. NII grants licences to corporate bodies to install or operate nuclear installation on a particular site. NII, on behalf of HSE, may attach to a nuclear site licence such conditions as appear necessary or desirable in the interest of safety, or such conditions as it may think fit with respect to the handling, treatment and disposal of nuclear matter.

A6.4 HSE's Nuclear Directorate is organised into six Divisions.

- Divisions 1-3 are the main operational Divisions which carry out the day-to-day regulation, and each has the inspection, technical and administrative resources relevant to their dealings with a particular licensee or group of licensees. They employ specialists in such areas as civil engineering, human factors, structural integrity, health physics, radioactive waste management, decommissioning, management of safety, and mechanical engineering. Division 2 includes the UK Safeguards Office (UKSO), which oversees the application of nuclear safeguards in the UK to ensure that the UK complies with its international safeguards obligations.
- Division 4 is responsible for nuclear safety research, regulatory strategy and the Directorate administrative support system.
- Division 5, ND's Office for Civil Nuclear Security (OCNS), is the security regulator for the UK's civil nuclear industry responsible for approving security arrangements within the industry and enforcing compliance.
- Division 6, formed in July 2007, is responsible for dealing with ND's Generic Design Assessment of potential new nuclear power reactors. If, following the current consultation (see Section 2), the Government decides to go ahead with new nuclear power reactor build, then this Division will need more resources to carry out the Overall Design Review and the Detailed Design Acceptance (as described in Annex 11).

A6.5 Each Division also has administrative and Information Technology (IT) support. An outline of this structure can be seen below in Fig. A6.1.

Fig. A6.1 – Structure of HSE's Nuclear Directorate



(iii) Financial resources

A6.6 ND is funded through HSE, which is a "non departmental public body", sponsored in Parliament by the Department for Work and Pensions (DWP). HSE is funded by Parliament, through grant-in-aid. NIA65 requires HSE to recover its 'expenses' from nuclear licensees for regulatory work in support of the licensing regime. HSE is required to operate a gross accounting arrangement and receipts from charges are treated as appropriation-in-aid. Parliament, through the Spending Review, sets the overall level of HSE's expenditure and therefore its receipts.

A6.7 The principal charges applied to nuclear licensees fall under the provisions of the NIA65. ND determines the exact amount to be recovered, in total, from the licensees and then, on the basis of the amount of regulatory effort each has consumed, apportions charges to each licensee. For example, if a licensee consumes 10% of the NII's effort, it will be charged 10% of ND's expenses.

A6.8 These charges are not for the provision of a "service" to the licensee; they are analogous to taxation. HSE also applies a Levy to the major nuclear licensees, in order to recover its expenses applied to the Nuclear Safety Research Programme.

A6.9 In 2007/08 ND's total expenditure forecast is £24.5 million, of which NII's expenditure forecast is £21 million (excluding central HSE overheads).

(iv) Human Resources

A6.10 For the efficient and effective delivery of its work, NII relies upon qualified and well trained staff from within ND and from other parts of HSE; also upon external sources of expert support and the results of research, and information exchange with other countries.

A6.11 On 1 August 2007 ND employed 305 staff. This included 165 nuclear safety inspectors and a further 31 staff in OCNS and 5 in Safeguards. All staff are based at Bootle in Merseyside, except for OCNS that is based at Harwell and Safeguards that are based in London.

(v) Inspectors' Qualifications

A6.12 All ND nuclear safety inspectors are technically qualified, educated to degree level and have at least 5-7 years experience in a responsible position in industry, normally nuclear but exceptionally other high hazard industries. Most are members of recognised professional institutions. They carry out site inspection or specialist/safety case assessment roles, delivering the regulatory functions required by the HSWA74 and nuclear legislation.

(vi) Inspectors' training

A6.13 All new ND staff receives a range of induction training. For inspectors this includes, within 12-18 months of their appointment, specific training to develop the skills and attitudes necessary to become an effective regulator. Linked activity includes several mandatory courses. For example:

- some modules of a Diploma in Occupational Health and Safety;
- familiarisation with IRR99;
- an introduction to health and safety law, relevant nuclear regulation and nuclear licence compliance;
- understanding the assessment of safety cases;
- awareness of radiological protection; and,
- awareness of personal safety on site.

A6.14 In addition to the mandatory courses identified above, all new inspectors receive on-the-job support. Many shadow experienced staff to benefit from the practical guidance that they can offer. Examples include participating in emergency exercises and being part of team inspections at nuclear sites.

A6.15 Once through the 12–18 month induction period, Continuous Professional Development (CPD) provides for the on-going training and development of ND staff - especially for the technical training of nuclear safety regulators. Opportunities are provided to help regulatory staff develop in their discipline or specialist area or to acquire new skills after a change of duties, examples are: ND runs its own Site Inspection Course for all regulators new to, or returning to, site inspection duties, and arranges for full-scale reactor simulator training to refresh the skills of reactor inspectors and assessors. Inspectors can also attend externally organised courses/ conferences both in the UK and abroad. Such events are usually designed to keep delegates abreast of the latest technological developments and ways of working in the nuclear and other high hazard industries. A range of non-technical training is also provided for management and personal development, examples include leadership training; effective management, team working; effective communication, and stress awareness workshops.

A6.16 As a further strand of CPD, each year there is a strategic overview of staffing and positioning of expertise in relation to delivery of the short-medium term business objectives. This is known as the Career Development Review process. Its aim is to ensure that ND continues to have the right expertise, in the right place, at the right

time to enable it to sustain delivery of its mission; and wherever possible, to achieve this by meeting individuals' development goals.

A6.17 ND senior management also review the Training and Development Plan each year; they are particularly concerned to see the impact that ND's investment in training and development has had on the delivery of ND's business. On average, that budget runs at around £250k per annum for the direct cost of off-job training activity, and when on-job activity is added, the total cost is about £750k per annum, with a significant proportion invested in the technical training and development of inspectors.

Technical support

A6.18 The 'expenses' recovered from licensees include the two major cost streams of expenditure associated with the NII's own operational activity (payroll, travel and subsistence, training and other staff related costs) and the costs of Nuclear Safety Studies (which enables NII to buy-in technical and scientific support in support of the regulatory function).

Statutory obligation to specify facilities and activities

A6.19 LC16 ensures the licensee indicates, using a site plan, all buildings and plant or areas that might affect safety and provides a schedule updated as necessary giving details of each building and its associated operations. This is to ensure that not only does the licensee understand the content and function of all safety related buildings on his site, but it also enables HSE to inspect the adequacy of activities and storage conditions across the site. The specification of facilities and activities covered by a nuclear site licence arises from the process of licensing itself. The assessment of an application for a nuclear site licence falls under three broad areas - the organisation, the location and the activities. Each of these areas is considered below.

The organisation

A6.20 Before granting a licence HSE must be satisfied that the applicant is to be the user of the installation and has an adequate management structure and resources to discharge the obligations and liabilities connected with having a nuclear site licence. The type of organisation and level of resource needs to be commensurate with the risk. A licence applicant demonstrates this by means of a management prospectus showing:

- lines of authority leading to adequate control of activities, whether carried out by the licensee's own staff or by contractors;
- adequate staff resources;
- precise definition and documentation of duties;
- integration of health and safety responsibilities into job functions;
- appropriately trained 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 peer review of the safety case, audit and review.

A6.21 The management prospectus is also the part of a licensee's safety case that deals with management issues. In this document HSE is looking for a clear statement about the company, its structure and how it proposes to operate. The management prospectus should therefore include:

- safety policy statement;
- company organisation, management structure and resources, including an estimate of its lifetime;

- the basis for corporate health and safety standards;
- proposals for providing health and safety services including:
  - safety case production (including modifications);
  - peer review of safety cases;
  - provision of independent advice to line management, e.g. Nuclear Safety Committee;
  - safety audit and inspection;
- description of liabilities or decommissioning assumed by the new licensee;
- provisions for financing continuing liabilities and decommissioning;
- proposals for, and anticipated extent of, the use of contractors; and
- leasing arrangements for land and/or plant.

A6.22 Note that a licensee has responsibility for the safe operation of an installation and absolute liability for injury to persons or damage to property under NIA65. It is therefore important that no doubt exists about the identity of the corporate body having this duty.

The location

A6.23 The main safeguard to the public from the risks arising from the operation of an installation is the high standard of design and its safe operation. Although a major accident is extremely unlikely it is prudent to consider the number of people who may be exposed to its consequences. For new sites, HSE will expect the licensee to submit details of present and predicted population around the site out to 30km for reactors but to a lesser distance for minor plants. Information on nearby schools, industry, hospitals, institutions and other places where people may congregate will be sought. HSE will assess this information against its criteria and will expect to see an allowance for natural population growth around the site over time.

A6.24 For reasons similar to those given when discussing the organisation to be licensed, it is important that the licensed site is defined clearly. The extent of the site must encompass the licensable activities and allow a sufficient margin for the maintenance of plant or buildings. The boundary should:

(a) be obvious and permanent, e.g. it should ideally not be across water;

(b) avoid so far as is practicable passing through a building, and in particular, avoid being 3-dimensional, i.e. the boundary should be a simple vertical limit; and

(c) wherever practicable encompass all underground workings.

A6.25 For a licensee to exercise control over a site requires adequate security of tenure. It is preferable for a licensee to own the site on which an installation is to be constructed but this is not essential. Any lease will need to be for the anticipated lifetime of the site, including decommissioning. Hence, 99 years is the norm although particular circumstances may require a longer period.

A6.26 An application may relate to a previously licensed site but exclude a part of that site which is no longer required for activities requiring a licence. The applicant will therefore be seeking to end the "period of responsibility" for that part of the site. In these circumstances, written justification for exclusion will be necessary, together with radiological data in support of the contention that there is no longer any danger from ionising radiations from anything on that part of the site.

The activities

A6.27 The power to grant nuclear site licences is limited to the types of installation described in the section "Licensable Activities". The nature and extent of the assessment of the design of an installation will depend on whether the plant is of an

established or new type. The standards of safety that the Executive expects a licensee to demonstrate in nuclear plant design are expressed in the SAPs[14]. HSE will assess proposals against this guidance.

A6.28 There are no formal rules or procedures for the processes, which lead to and follow the grant of a Nuclear Site Licence. However, as an example, the following may be regarded as a typical sequence of events for a new site for a power reactor.

A6.29 Safety guidelines for the station design prepared by the licence applicant must be acceptable to NII before a safety case for the design can be considered. The licence applicant usually maintains discussions with HSE during the development of the safety case. As aspects of the design reach the point where their safety can be assessed, submissions are made to HSE. These submissions may be discussed and further analysis or design modifications may be necessary before HSE acceptance. Major submissions may include the following:

(a) a reference design that includes an initial statement of design and the safety criteria to be applied;

(b) a preliminary safety report to show, in principle, the means by which the reference design can meet the applicant's safety criteria;

(c) a pre-construction safety report that is a more comprehensive statement on safety analysis;

(d) proposed research and development work in support of the safety case;

(e) proposals for quality assurance to ensure that design, manufacture, inspection and construction are carried out reliably to the required standard; and

(f) the design intended for construction.

A6.30 To help assess the applicant's submissions HSE may seek independent data and advice from external sources.

A6.31 With respect to inventories of radioactive material covered by the licence, LC4 is to ensure that the licensee carries out its responsibilities to control the introduction and storage of nuclear matter on the licensed site (nuclear matter being fuel, sources, radioactive waste, etc., as defined by NIA65). In addition, LC5 is to ensure that the transfer of nuclear matter, other than excepted matter and radioactive waste, to sites in the UK other than relevant sites:

(a) is carried out only with the consent of the Executive; and that

(b) the licensee has adequate records of where such nuclear matter has been sent.

A6.32 The licensee should also be able to demonstrate that there are organisational procedures to prevent individuals from inadvertently consigning such matter to non-relevant sites without first obtaining a Consent from the Executive. Relevant sites are other licensed or Crown sites as defined in NIA65 and excepted matter is defined in NIA65 and S.I. 1965/1826 and S.I. 1978/1779.

Statutory obligation to notify modifications

A6.33 LC20 ensures the licensee cannot change the design of an installation once HSE has given its consent or agreement to construction, without going through a proper design change process which assesses the modification in relation to its safety significance and defines the degree of safety justification required. The condition gives HSE the power to intervene and stop a modification if it believes there is inadequate safety justification.

A6.34 Many accidents across all industries have been caused by modifications to operating plant or changes to processes that have not been adequately assessed. LC22 ensures the licensee has adequate arrangements to control all modifications to its installations on a licensed site that may affect safety. The condition also gives

HSE the power to control such modifications to ensure that they cannot commence until the licensee has adequately demonstrated the safety of the proposal. These powers can be direct or indirect via the licensee's own voluntary hold points. This condition also gives HSE the power to halt a modification or intervene at any stage in the interest of safety.

Statutory obligation to limit operation and use

A6.35 The safe operation of a nuclear installation results from many factors including the design of the plant, its behaviour under fault or accident conditions and the functions of the operators. It is therefore essential that the totality of these interactions that are often complex, are fully understood. The method of doing this is to require the operator to produce a safety case to justify the operation of the installation. The purpose of LC23 is to ensure that the licensee produces such a safety case and that it identifies all the necessary conditions and limits that ensure that the plant is kept within parameters which ensure the safety of the plant during normal operation and fault and accident conditions.

A6.36 The safety of a nuclear installation is influenced by the actions of people who control, maintain or service the plant. It is important given the often complex nature of the safety case, for all actions carried out in accordance with procedures derived from the safety case. It is also important that actions are not carried out on an ad hoc basis without proper written procedures. Therefore LC24 ensures all operations as defined in LC1 that may affect safety, including any instructions to implement Operating Rules, are undertaken in accordance with written operating instructions.

Statutory obligation for incident reporting

A6.37 LC7 ensures that the licensee has adequate arrangements to deal with incidents that may occur on the nuclear licensed site. It also requires the licensee to keep a record of all such incidents, notify the HSE when appropriate, investigate the cause of each incident and produce a report of the investigation to ensure that lessons are learnt.

Statutory obligation to report to regulators

A6.38 Various LCs require the licensee to make reports to HSE. Where this occurs it becomes part of the licensee's arrangements, which once agreed with HSE cannot be changed without HSE's approval.

Statutory obligation to keep records

A6.39 LC6 ensures adequate records are held by the licensee for a suitable period to ensure that the safety case for operation is available at all times, design and construction information is available for decommissioning, operational records are available to assist investigations in the event of an accident or incident, and that operational records are available for the statutory number of years after the cessation of operations for the purpose of assisting any claims of damage to health as a result of exposure to ionising radiation.

Statutory obligation to ensure emergency preparedness

A6.40 Even though nuclear installations are designed and operated to high safety standards, it is prudent to plan for accidents. LC11 ensures the licensee has adequate arrangements in place to respond effectively to any incident or accident. The arrangements must cover a wide range of events, from minor incidents that are restricted to on-site locations, to large incidents or emergencies that can result in a significant release of radioactive material to the environment. This Condition gives HSE the powers to ensure that the licensee's emergency arrangements are exercised. HSE uses its powers to ensure the licensee's exercises demonstrate adequate performance to protect both workers and the public.

A6.41 More detailed information on emergency arrangements' requirements can be found under Article 16.

Statutory obligation for operating experience feedback

A6.42 The overall effect of several of the licence conditions is to ensure that operating experience is analysed and the results acted on. For example, LC25 ensures adequate records are kept regarding operation, inspection and maintenance of any safety-related plant. LC28 ensures all plant that may affect safety are scheduled to receive regular and systematic examination, inspection maintenance and testing, by and under the control of suitably qualified personnel and that records of maintenance activities are kept. LC29 enables HSE, following consultation, to require the licensee to perform any tests, inspections and examinations that it may specify, and to be provided with the results. LC30 ensures the plant is shut down in accordance with the plant maintenance schedule and these important examination and maintenance activities are carried out. This Condition also gives HSE the power to intervene and require the licensee to seek the HSE's consent to restart operations following the completion of the necessary maintenance. For nuclear reactors, the licensee is required to seek a Consent from HSE to restart after every statutory shut down. Finally, if HSE has concerns about the safety of any nuclear installation and the licensee is unable or unwilling to provide the necessary safety justification for continued operation, LC31 gives HSE the power to instruct the licensee to shut down any plant, operation or process within a given period. Following a direction to shut down, the licensee will require a Consent from HSE to restart operations.

Environmental Regulation

Environment Agency

(i) Mandate and Duties

A6.43 The Environment Agency (EA) was created by EA95[33] 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 the Defra and the Welsh Assembly Government (WAG). Its powers and duties relate to environmental protection, flood defence, water resources, fisheries, recreation, conservation and navigation. The Environment Act sets out the principal aim of the EA "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

A6.44 The EA has a board of up to 15 members, including the Chairman and Chief Executive, who are accountable to Government Ministers for the EA's organisation and performance. All are appointed by the Secretary of State for Environment, Food and Rural Affairs, except for one Board Member for Wales, who is appointed by the WAG. The Board delegates the EA's day-to-day management to its Chief Executive and staff.

A6.45 For most of its activities, the EA has broken down its work between 8 geographical regions. In each region, three statutory committees advise the EA about the operational performance of its functions, regional issues of concerns and regional implications of national policy proposals. These committees are the Regional Fisheries, Ecology and Recreation Advisory Committee (RFERAC), Regional Flood Defence Committee (RFDC) and the Regional Environment Protection Advisory Committee (REPAC). There is also an advisory committee for Wales.

A6.46 Committee members are appointed under statutory membership schemes designed to achieve representation from a wide range of the EA's stakeholders. All REPAC meetings are advertised locally and the public is welcome to attend.

A6.47 Following a reorganisation in mid-2002, the EA has established two specialist groups (North and South) to carry out the regulation of radioactive waste disposals, including discharges of liquid and gaseous wastes on and off of nuclear licensed sites and radioactive waste management on other sites. Associated with the northern group are two assessment teams providing national support on solid waste disposal and on generic designs of potential new nuclear reactors. Similarly, associated with the southern group, there is a small team providing national support on radiation incident management. The national groups, working within the EA's head office, include the Radioactive Substances Regulation Policy and Process Group, and the group responsible for checking, monitoring and assessment of discharges to the environment. The EA and the Food Standards Agency liaise closely to ensure that their environmental monitoring programmes in England and Wales are appropriate. Annual results from the environmental monitoring programme in the UK are published jointly by the environment agencies, the Food Standards Agency and the Environment and Heritage Service for Northern Ireland in a report entitled 'Radioactivity in Food and the Environment' (RIFE)[54]. The latest results published are from the 2005 environmental monitoring programme.

(iii) Financial resources

A6.48 The EA has a total budget of £1000 million, over half of which is spent on flood defence and £314 million on Environment Protection. Income is derived chiefly from three sources:

(a) Income raised from charging for regulation.

(b) Flood defence levies.

(c) Government grants, which help to finance amongst other things, pollution prevention and control activities.

A6.49 The EA charges operators for its nuclear regulatory activities on the basis of a daily rate for inspectors. This rate is reviewed annually. The EA also recharges operators for monitoring it carries out. Annual charges for nuclear regulatory work and monitoring activities are approximately £6 million.

(iv) Human resources

A6.50 The EA has a total of over 13,000 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 45 technical staff, with additional administrative support. The other groups identified above involved with nuclear regulatory activities comprise approximately a further 20 technical staff.

(v) Inspectors' qualifications

A6.51 Nuclear regulatory staff recruited by the EA are required to have a good honours degree in science or engineering, and several years experience in a technical or management role in the nuclear industry.

(vi) Inspectors' training

A6.52 The EA 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.

A6.53 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.

A6.54 Developing the competences of staff is achieved by combination of structured training (for example on legal requirements) and developmental experience (for example on site inspection or issuing Enforcement Notices). The system adopted by the EA 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

A6.55 SEPA was set up by EA95 to provide environmental protection and improvement in Scotland. Powers under RSA 93[32] are a matter for the devolved administrations in the UK, including the Scottish Executive. SEPA is a 'non-departmental public body' whose main source of funding is from Grant in Aid provided by the Scottish Executive.

A6.56 Using its statutory powers, SEPA issues various permits, licences, consents and registrations, ranging from major industrial authorisations, such as a licence to abstract water from rivers, down to recreational ones such as fishing licences.

A6.57 SEPA's main aim is to provide an efficient and integrated environmental protection system for Scotland which will both improve the environment and contribute to the Scottish Ministers' goal of sustainable development.

A6.58 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.

A6.59 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.

A6.60 In Scotland, the Food Standards Agency and SEPA liaise closely together to ensure that the environmental monitoring programme for radioactivity is appropriate. Annual results from the environmental monitoring programme in the UK are published jointly by the environment agencies, the Food Standards Agency and the Environment and Heritage Service for Northern Ireland in a report entitled 'Radioactivity in Food and the Environment' (RIFE)[54]. The latest results published are from the 2005 environmental monitoring programme.

(ii) Structure

A6.61 Members of SEPA's Main Board are appointed by the Scottish Ministers, and comprise a Chairman, a Deputy Chairman and ten members, including the Chief Executive. The Board has ultimate responsibility for the organisation. It meets regularly and is specifically concerned with:

(a) Establishing the overall strategic direction of SEPA within the policy and resources framework agreed with the responsible Minister;

(b) Overseeing the delivery of planned results by monitoring performance against agreed objectives and targets;

(c) Ensuring that SEPA operates sound environmental policies in relation to its own operations; and

(d) Ensuring that high standards of corporate governance are observed at all times.

A6.62 SEPA also has three Regional Boards, reflecting its regional structure, each chaired by a member of the main Board. A Regional Board's general responsibilities include advising on the development of the business plans for the region, the generation and implementation of local initiatives for the environment, and advising on applications that have major effects on the local area.

A6.63 SEPA has two specialist teams dealing with the radioactive waste disposals from nuclear sites in Scotland. The Environmental Protection and Improvement Unit covers the day-to-day regulatory activities such as issuing authorisations, inspection, enforcement etc. The Policy Unit covers more strategic matters such as liaison with Government or other bodies, influencing the development of forthcoming policy or legislation. This Unit is also responsible for managing part of the UK Radioactive Incident Monitoring Network (RIMNET) in Scotland and leads on environmental monitoring such as the collection and assessment of samples. In all there are 25.5 technical staff dealing with radioactive substances, the majority of whom have some involvement in matters relating to nuclear sites.

(iii) Financial resources

A6.64 SEPA's income is derived chiefly from three sources:

(a) Income raised from charging for regulation.

(b) Government grant-in-aid, which helps to finance amongst other things, pollution prevention and control activities.

(c) Other sources (like Financial agreements with NDA for Nirex work).

A6.65 In the financial year 2005/06, SEPA's grant-in-aid from the Scottish Executive amounted to £34.1 million and the total budget is £61.1 million. 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 is updated annually by Retail Price Index. In the event that SEPA prices have to increase by more than RPI, 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 the Scottish Minister before SEPA can implement them.

(iv) Human resources

A6.66 SEPA has approximately 1200 staff, around 25 of whom are involved in nuclear site regulation.

(v) Inspectors' qualifications

A6.67 Nuclear regulatory staff recruited by the Agency are required to have a degree in a relevant discipline.

(vi) Inspectors' training

A6.68 SEPA 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.

A6.69 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 or move into a specialist area.

A6.70 Specialist staff regulating nuclear facilities, who are normally recruited from outside of SEPA, are required to have minimum of 3 years (Specialist 2 grade) technical or scientific professional experience upon appointment but the majority have at least 5 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.

Annex 7 - Extracts from HSE's 'Tolerability of Risk' (TOR)

A7.1 HSE's 'Tolerability of Risk' (TOR)[68] gives guidelines on the tolerable levels of individual and societal risks to workers and the public from nuclear installations for both normal and accident situations. It puts forward the concept that risk can be divided into three regions on the TOR diagram (Figure A7.1 below): an unacceptable region; the as low as reasonably practicable region (ALARP); and a broadly acceptable region.

In the **unacceptable risk region,** arguments of reasonably practicability cease to be acceptable. In essence, risks in this region cannot be justified except in extraordinary circumstances. The maximum tolerable risk to workers should not exceed 1 in 10^3 each year. The maximum tolerable risk to any member of the public from any large industrial plant should not exceed 1 in 10^4 each year, but with a benchmark figure for any new nuclear installation of 1 in 10^5 each year. For accidental risks, the risks for both normal operation and accidents taken together, then the risk for most people in the vicinity of a nuclear installation would be at or near 1 in 10^6 each year. For societal risk, the tolerable risk is linked to the number of persons affected and a figure of around 1 considerable accident per 10,000 years from any one of a programme of nuclear installations would be just tolerable, bearing in mind the complications of what constitutes the programme.

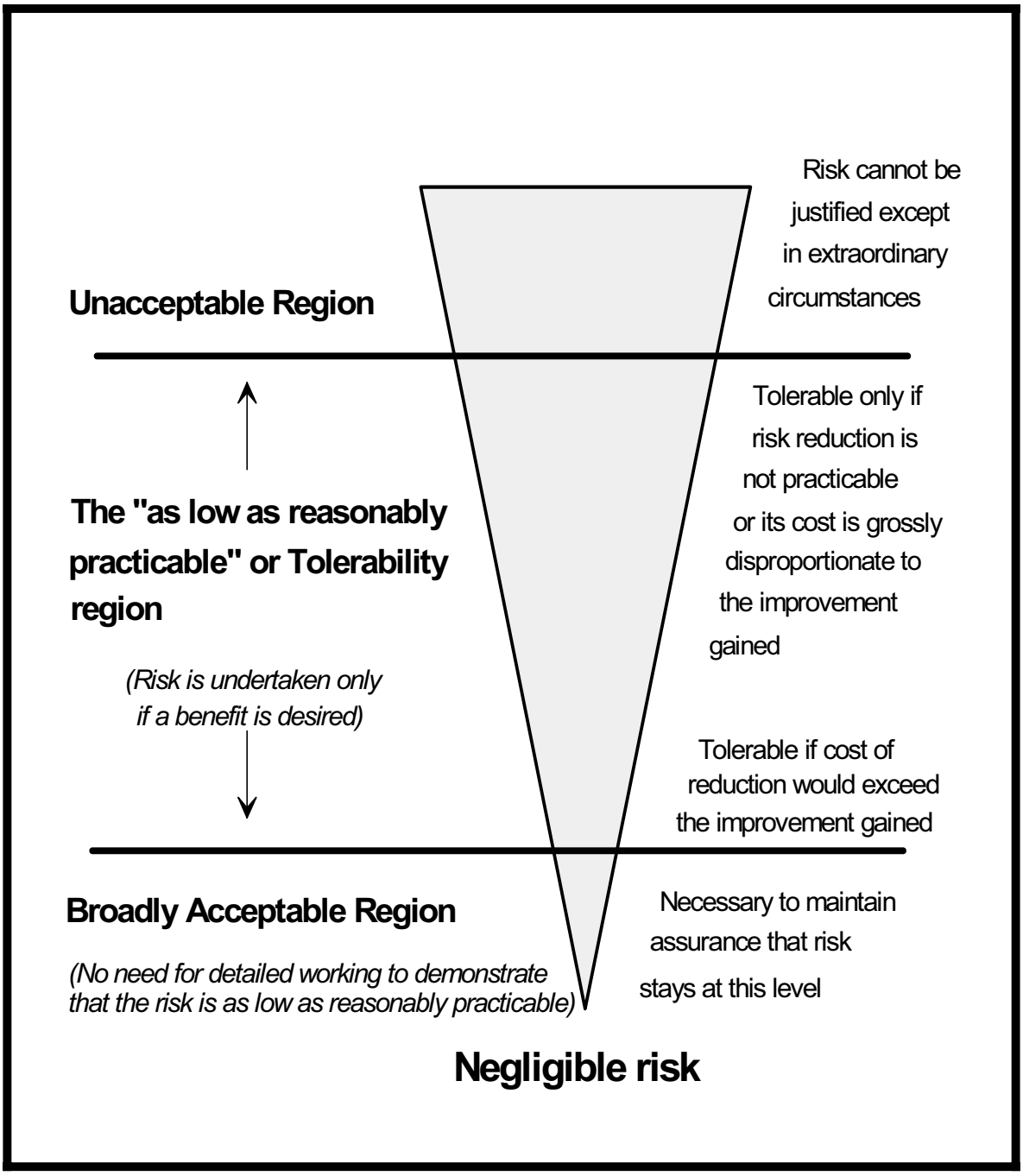
In the **ALARP (or tolerable) region,** licensees are required to do what they reasonably can to reduce risks, until the cost of doing so more than outweighs any benefit likely to be gained. The risks should be weighed against the costs of reducing them; measures must be taken to reduce or eliminate the risks, unless the cost of doing so would be obviously unreasonable compared to the risks.

In the **broadly acceptable region**, risks are low and are so insignificant that they need not claim attention. Although the legal duty of ALARP still applies, the regulator need not ask employers and licensees (in the case of nuclear licensed sites) to seek further improvement, provided that it is satisfied that the low levels of risk will be attained in practice, and maintained.

A7.2 Risks must always be balanced against the benefits arising from the activity.

A7.3 These concepts of 'unacceptable', 'tolerable' and 'broadly acceptable' levels of risk are embedded in the SAPs (see Annex 8). The SAPs are written as guidance for HSE's nuclear installation inspectors to use when carrying out assessment but they are also available to licensees and the public. Apart from the few that embody statutory limits, they do not place mandatory requirements on licensees. If a proposed plant design can be shown to satisfy the principles, licensing is quite straightforward. On the other hand, the non-mandatory nature of the SAPs gives the UK's licensing approach a flexibility which would enable the UK, for instance, to consider licensing nuclear installations built to non-UK standards, despite apparent differences in the wording of those standards and the HSE's SAPs.

Figure A7.1: Tolerability of Risk



Annex 8 - HSE's 'Safety Assessment Principles' (SAPs)

In this Annex, compliance with the Convention is demonstrated in a way that has substantially changed since the third UK report (i.e. in a way that has implications for the Convention obligations).

Background

A8.1 HSE inspectors use these Safety Assessment Principles (SAPs)[14], together with the supporting Technical Assessment Guides (TAGs)[47], to guide regulatory decision making in the nuclear permissioning process. Underpinning such decisions is the legal requirement on nuclear site licensees to reduce risks so far as is reasonably practicable, and the use of these SAPs should be seen in that context.

A8.2 The principles were first published in 1979 for nuclear power reactors. Corresponding principles for nuclear chemical plants followed in 1983. The principles were amended in 1988, following a recommendation by Sir Frank Layfield arising from the Sizewell B inquiry. He also recommended that HSE should publish for discussion its thinking on risk assessment. The HSE paper 'The tolerability of risk from nuclear power stations' (1988, revised in 1992) emerged in response[68]. It provides background on levels of risks that may be tolerable by comparing them with other risks that society chooses to bear in return for certain benefits.

A8.3 In 1992, the SAPs underwent a thorough revision with the objectives of:

a) consolidating the revisions made as a result of the recommendations of the Sizewell B inquiry;
b) implementing lessons learned since first publication;
c) ensuring greater consistency with international criteria (IAEA Safety Standards, Codes and Guides);
d) implementing suggestions made in HSE's 'The tolerability of risk from nuclear power stations' (TOR) paper (1988) and also in its 1992 revision; and
e) combining nuclear power reactor and nuclear chemical plant principles.

A8.4 Since that review, experience in their use and developments in the field of nuclear safety, both internationally and in the UK, have led to the need to undertake a further thorough revision of the principles.

A8.5 On the international front, the IAEA has restructured and has revised, or is revising, all of its safety standards. This has been occurring in parallel with greater European recognition that IAEA standards are an appropriate high standard to benchmark against. IAEA Requirements are explicit in requiring a Regulatory Body to keep its principles, regulations and guidance under review from time to time, taking account of internationally endorsed standards and recommendations. HSE agrees with this need for periodic review. This new edition of the SAPs, published in 2006, is the result of such a review and has included benchmarking against the IAEA standards, as they existed in 2004. The UK's goal-setting legal framework for health and safety does not apply IAEA requirements in a prescriptive manner, but they are reflected within the newly revised SAPs.

A8.6 HSE is a member of the Western European Nuclear Regulators' Association (WENRA), which is dedicated to ensuring that all European Union countries and candidate countries with civil nuclear power stations, as well as Switzerland have harmonised high levels of nuclear safety. To this end, WENRA is developing reference levels that represent good practices for civil nuclear power plants and for radioactive waste management and decommissioning. Harmonisation requires there to be no substantial differences from the safety point of view in generic, formally issued, national safety goals, and in their resulting implementation on nuclear power station licensed sites. In the UK, the reference levels will be secured using a combination of: national laws; health and safety regulations; conditions attached to

nuclear site licences; and the 2006 SAPs, TAGs and other forms of guidance used when granting nuclear site licences and in regulating licensees' activities.

A8.7 In addition, a significant proportion of assessment work is directed towards the periodic safety review (PSR) of older facilities, decommissioning and radioactive waste management. The 1992 SAPs, with their focus on design, were not readily suited to these applications and complementary guidance had to be created. This new revision of the SAPs, while remaining applicable to new nuclear facilities, makes greater provision for decommissioning and radioactive waste management, and is also clearer in its application to safety cases related to existing facilities.

A8.8 In 2001 HSE built upon its work on 'The tolerability of risks from nuclear power stations' with its publication 'Reducing risk, protecting people: HSE's decision making process' (known as R2P2)[69]. This further explains HSE's decision making process, and has been supported by guidance on the principle that risks should be As Low as Reasonably Practicable (ALARP). There were, however, aspects of societal concerns specific to the nuclear context that R2P2 did not tackle and HSE has further developed its thinking in this area.

A8.9 Since the previous edition of the SAPs in 1992, HSE has been developing assessment guidance for its inspectors in the TAGs, which give further interpretation of the principles and guidance in their application. These have been written to help interpret the 1992 SAPs and in some cases have addressed gaps in them. The current 2006 edition of the SAPs covers these gaps, and the TAGs will be subject to review in the light of the revised principles. The SAPs and the TAGs will become a more integrated suite of guidance.

A8.10 In summary, therefore, this edition of the SAPs has been:

a) benchmarked against the IAEA Safety Standards, as they existed in 2004, that represent good practice;
b) expanded to address emergency arrangements, remediation and decommissioning;
c) reviewed for application to defence nuclear activities covered by the Defence Nuclear Safety Regulator (DNSR);
d) clarified for the assessment of safety cases, and now includes safety management systems; and
e) updated to be consistent with HSE's thinking on societal risk.

A8.11 In reviewing and revising these principles, we have taken into account the technical interests and views of others through inviting comment on specific technical topic areas, and wider issues. However, the final decision on the content has been ours.

Introduction

The purpose of the Safety Assessment Principles (SAPs)

A8.12 The SAPs apply to the assessment of safety cases for nuclear facilities that may be operated by potential licensees, existing licensees, or other duty holders. The term 'safety case' is used throughout the document to encompass the totality of a licensee's (or duty holder's) documentation to demonstrate high standards of nuclear safety and radioactive waste management, and any sub-set of this documentation that is submitted to HSE.

A8.13 The principles presented in the SAPs relate only to nuclear safety and radioactive waste management. Other conventional hazards are excluded, except where they have a direct effect on nuclear safety or radioactive waste management. The use of the word 'safety' within the document should therefore be interpreted accordingly.

A8.14 The SAPs provide HSE inspectors with a framework for making consistent regulatory judgements on nuclear safety cases. The principles are supported by Technical Assessment Guides (TAGs), and other guidance, to further assist decision making by the nuclear safety regulatory process[47]. The SAPs also provide nuclear site duty holders with information on the regulatory principles against which their safety provisions will be judged. However, they are not intended or sufficient to be used as design or operational standards, reflecting the non-prescriptive nature of the UK's nuclear regulatory system. In most cases the SAPs are guidance to inspectors, but where guidance refers to legal requirements they can be mandatory depending on the circumstances.

SFAIRP, ALARP and ALARA

A8.15 The SAPs are consistent with R2P2, which provides an overall framework for decision making to aid consistency and coherence across the full range of risks falling within the scope of the HSWA74. This extended the framework in TOR. R2P2 discusses the meaning of risk and hazard and explains the distinction HSE makes between the terms. Hazard is the potential for harm from an intrinsic property or disposition of something that can cause detriment, and risk is the chance that someone or something is adversely affected in a particular manner by the hazard. The SAPs use these definitions. HSE regards anything that presents the possibility of danger as a 'hazard'. The relative importance of likelihood and consequence in determining control measures may vary. In some circumstances, particularly where the consequences are very serious or knowledge of the likelihood is very uncertain, HSE may choose to concentrate solely on the consequences, that is, concerned only with the hazard.

A8.16 R2P2 describes risks that are unacceptably high and the associated activities would be ruled out unless there are exceptional reasons, and risks that are so low that they may be considered broadly acceptable and no further regulatory pressure to reduce risks further need be applied. However, the legal duty to reduce risk so far as is reasonably practicable (SFAIRP) applies at all levels of risk and extends below the broadly acceptable level. Both R2P2 and TOR set out indicative numerical risk levels, but the requirement to meet relevant good practice in engineering and operational safety management is of prime importance.

A8.17 In applying the TOR framework, the term 'as low as reasonably practicable' (ALARP) has been introduced: for assessment purposes, the terms ALARP and SFAIRP are interchangeable and require the same tests to be applied. ALARP is also equivalent to the phrase 'as low as reasonably achievable' (ALARA) used by other bodies nationally and internationally.

A8.18 The SAPs assist inspectors in the judgement of whether, in their opinion, the duty holder's safety case has satisfactorily demonstrated that the requirements of the law have been met. The guidance associated with each principle gives further interpretation on their application.

A8.19 The basis for demonstrably adequate safety is that the normal requirements of good practice in engineering, operation and safety management are met. This is a fundamental requirement for safety cases. In addition, this is expected to be supported by a demonstration of how risk assessments have been used to identify any weaknesses in the proposed facility design and operation, showing where improvements were considered and to demonstrate that safety is not unduly reliant on a small set of particular safety features. A number of numerical targets are included in the SAPs, and some of these embody specific statutory limits that must be met.

A8.20 The principles are used in judging whether ALARP is achieved, and that is why they are written using 'should' or similar language. Priority should be given to achieving an overall balance of safety, rather than satisfying each principle or making

an ALARP judgement against each principle. The principles themselves should be applied in a reasonably practicable manner. The judgement using the principles in the SAPs is always subject to consideration of ALARP. This has not been stated in each case to avoid repetition. HSE inspectors need to apply judgement on the adequacy of a safety case in accordance with HSE guidance on ALARP[70].

A8.21 In many instances, it will be possible to demonstrate that the magnitude of the radiological hazard will result in doses that will be low, in relation to the legal limits, so that considerations of off-site effects or detailed worker risks will be unnecessary.

A8.22 The development of standards defining relevant good practice often includes ALARP considerations, so in many cases meeting these standards is sufficient to demonstrate that the legal requirement has been satisfied. In other cases, for example where standards and relevant good practice are less evident or not fully applicable or the demonstration of safety is complex, the onus is on the duty holder to implement measures to the point where it can demonstrate to HSE inspectors that the costs of any further measures would be grossly disproportionate to the risks their adoption would reduce.

A8.23 The application of ALARP should be carried out comprehensively and balance the risks. This requires all applicable principles to be considered as a combined set. When judging whether risks have been reduced ALARP, it may be necessary to take account of conventional risks in addition to nuclear risks.

Application of the SAPs

General

A8.24 The SAPs contain principles and guidance. The principles form the underlying basis for regulatory judgements made by HSE inspectors, and the guidance associated with the principles provides either further explanation of a principle, or their interpretation in actual applications and the measures against which judgements can be made.

A8.25 Not all of the principles in the SAPs apply to all assessments or every facility; clearly, principles specific to reactors do not apply to fuel-cycle facilities. Less obviously, not all of the reactor principles apply to all reactors: research reactors have significant differences from power reactors. Additionally, the assessment of a modification to a facility will only require the relevant principles to be applied. In short, the principles are a reference set from which the inspector needs to choose those to be used for the particular nuclear safety situation.

Proportionality

A8.26 The Management Regulations and its Approved Code of Practice (ACoP)[71] define three levels of risk assessment: low, intermediate and high. Nuclear installations are in the high category, which should use ‘the most developed and sophisticated techniques’. However, there are a wide range of hazards associated with different facilities and activities on nuclear licensed sites. So, within the high category of assessment, the depth and rigour of the analysis required for nuclear facilities will vary considerably. This is consistent with HSC’s Enforcement Policy Statement[72] that the requirements of safety should be applied in a manner that is commensurate with the magnitude of the hazard. Therefore, the extent and detail of assessments undertaken by duty holders as part of a safety case, including their independent assessment and verification, need to be commensurate with the magnitude of the hazards. Similarly, subject to other legal duties or public policy requirements, regulatory attention should also be commensurate with the magnitude of the hazard, although issues such as novelty and uncertainty will also be factors.

A8.27 Safety cases, and the analyses and assessments contained within them, must be fit for purpose and in accordance with the nuclear site licence condition requirements, and with Regulation 3 of the Management Regulations. They must,

among other things, be suitable and sufficient for the purpose of identifying all measures to control the risk.

A8.28 Inspectors must be proportionate in what they require from duty holders. The higher the hazard, the more rigorous and comprehensive the analysis, which would be expected to lead to greater defence in depth to protect people. Therefore a low hazard facility may need a much more limited analysis to ensure adequacy. This might be expected to result in fewer or less extensive safety provisions.

A8.29 In some cases, the magnitude of the potential radiological hazard may be uncertain. In these cases, a precautionary approach should be applied by erring on the side of safety. Where the absence of a radiological hazard cannot be shown, an assumption must be made of an appropriate radiological hazard and its magnitude.

Life-cycle

A8.30 The SAPs are for regulatory assessment throughout the life-cycle of an activity on a nuclear licenced site. Specific sections of the SAPs are devoted to siting and decommissioning. However, not every principle in the other sections will apply to all the other life-cycle stages, and as always, the principles are a reference set from which the inspector chooses those to be used for the particular stage in the life-cycle. The sections of the SAPs on Leadership and management for safety and the Regulatory assessment of safety cases include life-cycle issues. The Engineering principles are relevant to design, construction, manufacture and installation, but will also apply to later operational stages. Commissioning is a key stage in providing the necessary assurance of safety, and a number of the principles include aspects of commissioning. Decommissioning also needs to be considered at all life-cycle stages. IAEA Safety Standard NS-G-1.24 provides more detailed guidance for the assessment aspects to be considered at the main life-cycle stages.

New facilities

A8.31 One of the aims of the SAPs is the safety assessment of new (proposed) nuclear facilities. They represent HSE's view of good practice and we would expect modern facilities to have no difficulty in satisfying their overall intent.

Facilities built to earlier standards

A8.32 Inspectors will assess safety cases against the relevant SAPs when judging if a duty holder has demonstrated whether risks have been controlled to be ALARP. The extent to which the principles have been satisfied must also take into account the age of the facility or plant. For facilities that were designed and constructed to standards that are different from current standards, the issue of whether sufficient measures are available to satisfy ALARP considerations will be judged case by case.

A8.33 A common situation when the SAPs are applied to facilities built to earlier standards is in the assessment of a Periodic Safety Review (PSR) as required by LC15. PSRs are a thorough and comprehensive review of the safety case at regular intervals throughout a nuclear facility's life. The reviews are more wide ranging than a restatement of the safety case (see IAEA Safety Standard NS-G-1.24 and NS-G-2.105).

A8.34 For certain activities, such as decommissioning, it is recognised that some principles may not be met transiently, and this is allowable provided the result is to achieve a safer end-state. However, during this period, the requirement to reduce risks ALARP remains.

Ageing

A8.35 As a facility ages, plant safety margins may be eroded and a duty holder may argue that it is not worthwhile to make improvements. Remaining lifetime may be invoked in making the ALARP demonstration, but this factor should not be used to make a case for a facility to operate outside legal requirements. A minimum period

of ten years, or the minimum future life of the facility if longer, should be used in ALARP demonstrations. Remaining lifetimes of less than ten years will be subject to regulatory action to ensure that the declared lifetime is not extended beyond that assumed without further justification.

Multi-facility sites

A8.36 When considering the radiological hazards and risks posed by a nuclear site, all the facilities, services and activities on it need to be considered. In most cases, the SAPs are considered in relation to single facilities, and so the control of risks is also generally considered on a facility basis. However, there is a need to consider the totality of control of risks from a site. Two different situations arise: where all the facilities and services are under the control of a single licensee, covered by a single nuclear site licence, and where some of the facilities and services are on neighbouring sites, under the control of different duty holders. Many of the issues are similar.

A8.37 Sites that have multiple facilities often produce a set of individual safety cases for each facility. Shared services are also generally dealt with by separate cases. The division of the site in this way requires the definition of boundaries and interfaces between facilities, facilities and services, and services. It also requires an appropriate combination of the individual analyses to develop the site safety case. This is necessary to account for the interactions and interdependencies between facilities and services.

A8.38 Determining whether risks have been controlled and reduced ALARP therefore requires an overall consideration of the site and, in determining if good practices have been met, all risks need to be assessed. On a complex site there will be many different radiological hazards and risks that, in determining the necessary safety measures for the site, may need to be balanced in demonstrating that the overall risks are ALARP.

Alternative approaches

A8.39 The principles are written bearing in mind the content of safety cases likely to be submitted to HSE. However, duty holders may wish to put forward a safety case that differs from this expectation and, as in the past, the inspector will consider such an approach. In these cases the duty holder is advised to discuss the method of demonstration with HSE beforehand. Such cases will need to demonstrate equivalence to the outcomes associated with the use of the principles in the SAPs, and such a demonstration may need to be examined in greater depth to gain such an assurance. An example of such a situation is the greater use of passive safe concepts.

Structure of the principles

A8.40 The SAPs are structured in separate sections, as follows:

- Fundamental principles. These principles are founded in UK health and safety law and international good practice, and underpin all those activities that contribute to sustained high standards of nuclear safety.
- Leadership and management for safety. This section sets out principles that form the foundation for the leadership and management for safety in the nuclear environment.
- The regulatory assessment of safety cases. This section sets out the principles applicable to the assessment of the production and nature of safety cases.
- The regulatory assessment of siting. This section provides principles applied in the assessment of a site, since the nature of a site can have a bearing on accident consequences.

- Engineering principles. This section comprises the major part of this document and covers many aspects of the design and operation of nuclear facilities.
- Radiation protection. This section provides a link with IRR99.
- Fault analysis.
- Numerical targets and legal limits. This section sets out the targets to assist in making ALARP judgements.
- Accident management and emergency preparedness. This section provides the links to assessing compliance with licence conditions and REPPIR.
- Radioactive waste management.
- Decommissioning.
- Control and remediation of radioactively contaminated land.

Annex 9 - Emergency Arrangements

In this Annex, compliance with the Convention is demonstrated in a way that has not substantially changed since the third UK report (i.e. in a way that has implications for the Convention obligations).

A9.1 The Nuclear Emergency Planning Liaison Group (NEPLG), see under Article 16, has issued consolidated guidance[58] to all organisations that may be involved in planning for a civil 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 which have been adapted for an emergency in the nuclear industry by NEPLG and its constituent organisations. The following paragraphs summarise the structure of the document and the scope of the information that it provides.

Emergency plans

A9.2 This chapter gives guidance on the formulation of emergency plans. It covers the scope and objectives of planning and identifies the key elements that should be included.

Roles and responsibilities of responding organisations

A9.3 This chapter identifies the all organisations that will need to play some part in responding to an emergency. It addresses the roles and responsibilities of each participating organisation and identifies other organisation with which it must interface. Where necessary, the legal obligations, with respect to emergency response, of participating organisations are identified. The organisations include:

- Police
- Fire and Rescue Service
- Local Authorities
- Health Service
- Ambulance Service
- Nuclear Site Licensees
- Department for Business, Enterprise and Regulatory Reform (formally DTI)
- HSE (Nuclear Installations Inspectorate)
- Food Standards Agency
- Department of the Environment, Food and Rural Affairs
- Department of Health
- Department for Transport
- Environment Agency
- Scottish Environment Protection Agency
- Cabinet Office
- Foreign and Commonwealth Office
- Health Protection Agency
- Meteorological Office
- Nuclear Decommissioning Authority

The testing of off- site preparedness

A9.4 This chapter describes a process for testing off-site preparedness at civil nuclear sites. It covers the programming, planning, scope, conducting, debriefing and reporting on off-site emergency exercises. The arrangements for testing off-site

preparedness are well established and involve the simulation of a range of accidents which may involve the release of radioactivity and off-site consequences. The exercise or modules undertaken should provide a thorough test of the off-site plan and show that the arrangements are in a state of readiness should an emergency occur appropriate to the hazard.

Exercise assessment

A9.5 Every year the nuclear industry undertakes many exercises. These range from onsite facility exercises to off-site exercises. Exercises are the main vehicle whereby areas for improvement are identified as such it is important that there is an effective assessment process. This chapter of the NEPLG document provides guidance on how to develop an assessment process for an off-site emergency exercise. Developing appropriate and relevant assessment criteria allows areas for improvement to be defined and good points to be clearly identified to assist the learning process for emergency response.

Off-site facilities

A9.6 Following the Three Mile Island accident in 1979, it was recognised that, in the event of an emergency, a facility would need to be established to bring together organisations with a role in the off-site response. Such facilities, generically known as off-site facilities, have been an important feature of civil nuclear emergency response arrangements since that time. This chapter outlines principles agreed by NEPLG which should apply to the operation of off-site facilities. The choice and location of off-site facilities should take into account local circumstances and, where relevant, existing emergency provisions and should be agreed by local organisations with executive responsibility in the event of a nuclear emergency.

Early countermeasures within the detailed emergency planning zone

A9.7 This chapter describes the principles that need to be applied in considering early countermeasures within the detailed emergency planning zone in the event of an emergency at a civil nuclear site. It addresses sheltering, evacuation and the issue of potassium iodate tablets. This chapter also notes the need for regular communication with affected population.

Extendibility

A9.8 This chapter concerns circumstances where it is necessary to extend countermeasures for emergencies with effects extending beyond the detailed emergency planning zone. The aim is to provide emergency planners, particularly those from county or regional local authorities, health authorities and the police, with information which would assist them in deciding upon the extent of extendibility planning they deem necessary, and what this should involve.

A9.9 It is a long standing guiding principle of civil nuclear emergency planning that detailed plans covering the area defined by the detailed emergency planning zone should be drawn up on the basis of the reasonably foreseeable accident (i.e. the design basis accident or reference accident), which is now required through the Radiation (Emergency Preparedness and Public Information) Regulations 2001 (REPPIR). These plans must be capable of being extended using general contingency plans to deal with a larger, even less likely accident. The improbability of a larger accident means that the absence of a detailed plan would not significantly increase the risk to the public.

The Government Technical Advisor (GTA)

A9.10 Following the Three Mile Island accident in 1979 the Government reviewed UK civil nuclear emergency response arrangements. That review identified a need for somebody to provide authoritative and independent statements to the press and

broadcast media in the event of a civil nuclear emergency, and to advise the emergency services on actions to protect the public. The review also concluded that the most suitably qualified person to undertake the role would be a senior member of HM Nuclear Installations Inspectorate (NII). As a result, the arrangements for appointing a Government Technical Adviser were put into effect.

A9.11 This Chapter of the NEPLG guidance covers in detail the terms of reference and the duties of the GTA. The following chapter provides guidance on how the GTA will interface with the Health Advisor. Feedback from exercises has identified that both are key participants who need to work closely together.

Food Standards Agency (FSA) – advice and interface

A9.12 Experience of exercises has pointed to the need for guidance on the arrangements for provision of precautionary advice and the making of food restriction orders by the FSA, and on the interface and liaison arrangements between the FSA and other organisations located at the off-site facility. This chapter provides guidance on how this might be done within the overall planning framework.

Media briefing centres

A9.13 The guidance set out in this chapter is based on best practice developed and refined by NEPLG since 1991 when the principles relating to the organisation and operation of media briefing centres was agreed. These were developed as a result of lessons learned following the Three Mile Island accident in 1979 which identified the need for media briefing centres in the event of an accident at a civil nuclear site.

A9.14 The purpose of this chapter is to describe:

(a) the principles to be applied and arrangements agreed, for briefing the media in a nuclear emergency

(b) the information that should be set out in the Off-Site Emergency Plan detailing who is responsible for delivering public information.

A9.15 The subsequent chapter sets out in detail the media roles of respective organisations and the interaction between these organisations.

Radiation monitoring coordination

A9.16 Extensive resources and equipment are available to undertake environmental and personal radiation monitoring following an accident at a civil nuclear site. These belong to the various organisations and agencies forming NEPLG, and are part of their well established emergency plans. Hence, the arrangements are regularly tested and maintained in a state of readiness. This chapter concentrates on the principles that need to be applied to, and the practical arrangements involved in, the co-ordination of radiation monitoring following an accident at a civil nuclear site.

Recovery phase

A9.17 The procedures for recovery planning following a civil nuclear accident became prominent following the experience of the Chernobyl accident. The guidance in this chapter is based on the lessons of UK consideration and wider experience, with contributions from all the main responding organisations. Subsequent chapters of the guidance document addresses planning for recovery, procedures for recovery.

Annex 10 - IAEA Integrated Regulatory Review Service (IRRS) UK mission 2006

This Annex is a new addition since the third UK report.

A10.1 In January 2006, following the announcement of a review of energy policy, DTI asked the Health and Safety Executive (HSE) to contribute an expert report on some specific health and safety risks arising from recent and potential energy developments and on the HSE's approach to ensure that risks arising from these are sensibly managed by industry. The report was to include a review of HSE's approach to regulating potential new nuclear build, especially the potential role of pre-licensing assessments of candidate designs.

A10.2 In this context, an IAEA Integrated Regulatory Review Service team (IRRS) was invited to conduct a review to assess how HSE intends to go about the appraisal of reactor designs. The review took place between 26 March - 03 April 2006, and focused on the following IRRS topics: Organisation; Authorisation; and Review and Assessment. Three further IRRS topics were reviewed to ensure that the team had an appreciation of the UK's legal system and its approach to nuclear safety regulation. These topics were: Legislative and Governmental Responsibilities; Authority, Responsibilities and Functions of the Regulatory Body; and Regulations and Guides.

A10.3 The final report of the IAEA mission[12] is based on the combined expertise of the team, with reference to the relevant IAEA standards.

The findings of the review and HSE / ND's response

A10.4 The review team identified 13 good practices, which will be promulgated world-wide by IAEA for the benefit of their Member States. The team also made 13 recommendations and 14 suggestions.

A10.5 The report of the mission also contains four proposals in which the team provides their expert opinion on how ND might adapt its approach to deal with new build activities. These will be considered by ND, along with other inputs into Energy Review.

A10.6 HSE/ND's initial response to each of the mission findings have been collated into a table[13].

In summary

- seven of the findings need to be addressed as part of HSE's work associated with the review of energy policy;
- four of these, and a further two findings, need to be addressed urgently if HSE is requested to undertake further work associated with new build of nuclear power stations; and
- the remaining eighteen findings will be addressed as part of ND's continuous improvement programme.

ND management welcomes the results of this independent review and the chance to interact with world experts as part of its efforts to strive for better regulation of the UK nuclear industry. More detail is available on the HSE website[73].

Progress since the review

A10.7 In order to assess the progress of ND's response to the IRRS findings an external consultant was engaged to carry out an independent review. The preliminary results of this review, in August 2007, has noted variable progress against each of the Recommendations and Suggestions, and each issue has been ascribed an 'index of progress' with the work being identifies as either 'completed', 'being delivered', 'initiated' or 'not started'.

A10.8 Of the 27 issues, one Recommendation and four Suggestions are completed (5), five Recommendations and six Suggestions are being delivered (11), four Recommendations and two Suggestions are initiated (6), and three Recommendations and two Suggestions are not yet started (5).

A10.9 All of the issues associated with potential new build are either completed or being delivered (as shown in Table A10.1 below). In particular, each issue has been completed sufficiently to allow the work on potential new build to progress as described in Annex 11.

A10.10 A significant proportion of the issues being delivered are considered to be capable of early resolution if resources permit.

A10.11 The issues not yet started have all been submitted for internal consideration and, in competition with other high priority work, have been placed under regular review for progression when resources permit.

A10.12 An overall conclusion of the independent review is that, although there is progress in many areas in setting up frameworks or processes, 'delivery' on a number of issues is being delayed by the resource burden represented by the implementation stage, as the process is rolled-out.

A10.13 This relates directly to one of the issues raised by the IRRS (Suggestion 5) which, in the wider context of the their Report, has been accepted that resource needs should be subject to adequate analysis on the basis of work requirements, rather than work being dictated by resource available.

A10.14 Notwithstanding the resource constraints, HSE is confident that substantial progress in responding to the majority of issues raised by the IRRS mission will be able to be reported at the Convention Review Meeting in April 2008.

Table A10.1 – Progress against IRRS Recommendations and Suggestions related to potential new build

IAEA Recommendations (R) & Suggestions (S)		HSE / ND Initial Response Identified as needing to be addressed urgently	HSE / ND Progress
A - Legislative and governmental responsibilities			
S1	HSE should make arrangements to charge fees for pre-licence application work.	We are currently seeking legal advice on the options available and will make recommendations as part of our response to the DTI Energy Review.	The Health and Safety (Fees) (Amendment) Regulations 2007[41] came in to force on 2 July 2007 (see under Article 7) **Completed**
S2	HSE should initiate actions to establish and document the role of the public in the regulatory process.	We will consider extending the consultation required in NIA S3(3) for the granting of a nuclear site licence and include it in our open documentation.	HSE has made commitments on public involvement in the regulatory process if new nuclear build occurs. This is described in Annex 11. The process will be documented this year. For regulatory decisions, other than to provide information, there is not planned to be any public involvement. This position is unchanged but needs to be document. **Being Delivered**
B - Authority, responsibilities and functions of the regulatory body			
R2	Processes should be developed and documented that describe the steps to be followed for the issuance or amendment of a licence, including the activities, responsibilities, inputs and outputs.	We recognise the changing environment where new licensees may in future become responsible for activities on existing sites. We will provide appropriate documentation and guidance to these new licensees on their roles, responsibilities and our expectations of abilities and competencies. The need for further guidance will be covered in our submission to DTI's Energy Review.	HSE has published 'The licensing of nuclear installations'[74]. Further information is in Annex 11. HSE has published on its website the steps necessary for generic design assessment, but has not yet provided guidance beyond that stage. The process has been used and is understood but needs to be codified and published. **Being Delivered**

IAEA Recommendations (R) & Suggestions (S)		HSE / ND Initial Response Identified as needing to be addressed urgently	HSE / ND Progress
C - Organisation of the regulatory body			
S5	NSD resources necessary to accomplish new build activities need to be established and included into budget planning.	We will do this in advance of any new build applications – and include outline information in the response to DTI for the Energy Review.	A new Division has been established in ND for new build (see Annex 6). Resources have been transferred from other Divisions and from the wider HSE sufficient for the early steps of new build. ND is recruiting to attract the necessary resources for subsequent stages. **Being Delivered**
D - Authorization process			
R6	Processes should be developed and documented for potential new build nuclear power plants that describe the steps to be followed by an applicant for the issuance of a site licence, including pre-licensing phase. Respectively, formal guidance should be developed on the content and format of required safety submissions, to improve efficiency and effectiveness of the entire licensing process (see also suggestion 1.1.1/S1 on financing the regulatory work in pre-licensing phase, and more detailed proposals given in separate Appendix for the authorization of potential new builds).	We have raised this issue in our discussion document as part of the Energy Review and we are seeking comment from stakeholders. The need for this will form part of our submission to DTI's Energy Review.	The HSE guidance now available, published on the HSE website and described in detail in Annex 11, fulfils R6 for the 'pre-licensing' phase. The development of further guidance awaits the outcome of the Government consultation on new nuclear power plant, as described in Section 2 of this document. **Being Delivered**

IAEA Recommendations (R) & Suggestions (S)		HSE / ND Initial Response Identified as needing to be addressed urgently	HSE / ND Progress
E - Review and assessment			
R9	NSD should identify expertise and technical support available inside UK or abroad to support it in its review and assessment work. This should include the possibilities to perform independent analysis and validation of codes in areas such as PSA, Thermal Hydraulics, Severe Accident Analyses. Appropriate arrangements should be made to assure that for all safety relevant topics high qualified expertise can be identified by NSD.	We will put in place a more formal structure to ensure that validated technical support and expertise is available from UK or abroad. We will do this for the current needs and consider options for any new build	Potential sources for expertise and technical support have been identified and initial discussions have taken place with potential contractors. A contract has been signed with the IAEA to evaluate the four candidate designs for potential new build in the UK against the IAEA Safety Standards. This work will be taken into account in any subsequent regulatory decisions that are made. **Being Delivered**

Annex 11 - Regulating Potential New Build

This Annex is a new addition since the third UK report.

Generic design assessment

A11.1 The HSE website[8] explains the generic design assessment process developed by the UK nuclear regulators. All documents referred to below can be found through this address.

A11.2 On 23 May 2007, the Government published its Energy White Paper 'Meeting the Energy Challenge', which covered a range of energy issues including nuclear power. At the same time, the Government also published a consultation document 'The Future of Nuclear power', on the Government's preliminary view that it is in the public interest to give private energy companies the option to invest in nuclear power stations.

A11.3 The consultation document (CD) refers to the generic design assessment system devised by the nuclear regulators (HSE, EA and SEPA) for potential new nuclear power stations. The CD invites applications from vendors of nuclear reactors interested in having their designs assessed, and set down criteria that these needed to meet to be eligible for the first stage of the assessment process. Since June 2007, SEPA has withdrawn from the GDA process.

A11.4 On 5 July the Government announced that four applications had been made which met these criteria (which included having the support of a 'credible' nuclear power operator. These designs are:

- The Atomic Energy of Canada Ltd – ACR 1000
- EDF/Areva – EPR
- GE-Hitachi – GE ESBWR
- Toshiba – Westinghouse – AP 1000

A11.5 HSE and EA have now started the first stage of the assessment process (the initial design assessment) for all four designs. This stage should be completed by early 2008.

A11.6 The Government's consultation exercise will run until mid-October 2007 and its final policy conclusions on nuclear power are likely to be announced towards the end of 2007. All nuclear related work (including generic design assessment) is progressing on a contingency basis and would be stopped if, following the consultation, the Government concludes that it will not support the building of new nuclear power stations.

Guidance on generic design assessment

A11.7 Since July 2006, the nuclear regulators have worked closely to develop proposals, and on 11 January 2007 the following suite of guidance material on the generic design assessment of new nuclear power station designs was published.

- 'Guide to regulatory Processes for Generic Design Assessment of New Nuclear Power Stations' - Guidance on the overall assessment process issued by the nuclear regulators jointly.
- 'Nuclear Power Station Generic Design Assessment - Guidance to Requesting Parties' - Guidance from HSE on how it will assess the safety of new nuclear power station designs.
- 'OCNS guidance document for generic design assessment activities'
- 'OCNS Management of sensitive nuclear information during the generic design assessment of nuclear technologies'

- ‘Process and Information Document for Generic Assessment of Candidate Nuclear Power Plants’ - Guidance from the Environment Agency setting out how they will assess environmental issues.

This guidance is aimed primarily towards those companies that may wish to offer their designs for potential construction and operation in the UK.

A11.8 The above suite of guidance documents sets out a coordinated design assessment process which has a number of advantages:

- The process allows the regulators to become involved at the earliest stage in a project, long before a site-specific proposal is made. This allows better focusing of regulatory resource at a stage when greater influence can be brought to bear on the safety standards and features adopted in any proposed design.
- The new process allows the work of the principal regulators to be much more closely coordinated. For example, a Joint Programme Office is being established to administer the process on behalf of all the regulators.
- By ensuring the process is open and transparent, and by encouraging public participation at key stages, public confidence in the regulatory process should be increased.
- Separating design issues from site and operator issues will improve the efficiency of the regulatory process, reduce the risks for operators during the later licensing phase, and increase levels of certainty in the investment process

HSE's approach to generic design assessment

A11.9 HSE has prepared guidance on how the licensing of new nuclear power plants could be dealt with, and in particular, how generic design assessment could be introduced, to allow design issues to be dealt with in advance of site-specific matters.

A11.10 This envisages a four step process for design assessment:

- Design and safety case submission.
- Fundamental Safety Overview of the reactor design (a short review of the acceptability of the proposed reactor design).
- Overall design safety review (a more in-depth HSE safety assessment of the case submitted).
- Detailed assessment leading to potential design acceptance (examining all relevant aspects of the submission, including inspection of an applicant’s procedures and records and some verification analysis).

A11.11 This process is likely to take around three and a half years to complete, but could take longer if a number of applications were being considered by HSE simultaneously.

A11.12 To ensure that the GDA is carried out in an open and transparent manner, and to allow public participation in the process, arrangements will be made to give the public access to the safety cases prepared for the design proposed by each applicant, without compromising commercial and security considerations. An opportunity will then be given for the public to comment to applicants on that information, who will be asked to respond to the issues raised.

A11.13 The regulators will oversee this process. At key stages in the process the regulators will publish their views on the main issues raised and responded to in the public involvement process.

A11.14 At the end of this process, HSE would seek to issue a short statement on the acceptability, in principle, of a licence application based on the generic design assessed.

A11.15 This could then be followed by a formal site licence application, which would be considered by HSE following the completion of the generic design assessment

process. This would centre on site-specific issues and those relating to the organisation of the potential operator. Elements of the design considered in depth during generic design assessment would be regarded as 'frozen' and not re examined unless significant modifications were proposed.

A11.16 It should be noted that, although preferred, generic design assessment will not be mandatory, and potential licensees will not be precluded from applying for a nuclear licence without going through design assessment.

Roles of the regulators

A11.17 While all the nuclear regulators have independent responsibilities (as described under Article 8 and in Annex 6), they all recognise the benefits of building upon their existing close working arrangements to align their processes and regulatory positions wherever possible. To achieve this, a Joint Programme Coordination Team has been set up by the regulators to ensure that they work together closely and effectively.

A11.18 In addition, a Joint Programme Office has been set up to administer the generic design assessment process on behalf of all the nuclear regulators.

Stakeholder engagement

A11.19 The regulators will be publishing more information on the proposed public involvement process in due course. They will also be announcing a range of other activities to engage with stakeholders – including the establishment of an e-bulletin network to provide information on the generic design assessment process, to which individuals and organisations will be able to subscribe.

Next Steps

A11.20 Regulators will continue their discussions with vendors and potential operators of nuclear power stations over the next few months.

A11.21 Until the Government announce its final policy on nuclear power (expected towards the end of 2007), the regulators will undertake an initial design assessment - a limited assessment intended to determine the 'broad licensability' of each design. This work will be undertaken on a contingent basis alongside the Government's nuclear consultation.

A11.22 FSA will be carrying out independent pre-licensing checks as they will need to satisfy themselves that a proposed design is safe for the food chain.

Supporting Guidance

A11.23 In March 2007, HSE published 'The licensing of nuclear installations'[74] to replace the earlier HSE publication 'Nuclear Site Licences under the Nuclear Installations Act 1965 (as amended) - Notes for Applicants' [HSG120], issued in 1994. This replacement document will be reviewed and updated periodically. The document addresses:

- The law and the regulatory regime.
- The nuclear licensing process.
- Delicensing.

It provides basic regulatory information and links to other reference documents that potential licensees need to be aware of.

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Glossary and Abbreviations

ACoP	Approved Code of Practice
ADS	Approved Dosimetry Service
AECL	Atomic Energy of Canada Ltd.
AGR	Advanced Gas-cooled Reactor
ALARA	As low as reasonably achievable
ALARP	As low as reasonably practicable - the ALARP principle is fundamental to the regulation of health and safety in the UK. It requires that risks should be weighed against the costs of reducing them. Measures must then be taken to reduce or eliminate the risks unless the cost of doing so is obviously unreasonable compared with the risk.
BEGL	British Energy Generation Ltd.
BERR	Department for Business, Energy and Regulatory Reform (established in June 2007 to replace the Department of Trade and Industry)
BMS	Business Management System
BNFL	British Nuclear Fuels plc
BNGSL	British Nuclear Group (Sellafield Limited)
BPEO	Best Practicable Environmental Option
BSL	Basic Safety Limit
BSO	Basic Safety Objective
CCF	Common Cause Failure
CDRM	Control Rod Drive Mechanism
CEO	Chief Executive Officer
CIDI	Central Index of Dose Information
CNO	Chief Nuclear Officer (BEGL)
CNOO	Chief Nuclear Operations Officer (MEL)
COMAH	Control of Major Hazards Regulations 1999
Convention	Convention on Nuclear Safety
CoRWM	Committee on Radioactive Waste Management
DBA	Design Base Accident
Defra	Department for Environment, Food and Rural Affairs
DEPZ	Detailed emergency planning zone
DNSR	Defence Nuclear Safety Regulator - Under NIA65, nuclear activities under the control of the Crown are exempted from civil nuclear licensing requirements, although they are subject to regulation by HSE under HSWA74. DNSR is a department within the Ministry of Defence which exercises an internal regime for assessing the safety of defence-related nuclear activities, wherever possible using equivalent standards to those used by HSE for the regulation of licensed civil nuclear activities.
DoH	Department of Health
DTI	Department of Trade and Industry (replaced in June 2007 by BERR)
DWP	Department for Work and Pensions

EA	Environment Agency for England and Wales
ECW	Emergency Cooling Water
EH&S	Environment, Health and Safety
EIADR99	Nuclear Reactors (Environmental Impact Assessment for Decommissioning) Regulation 1999
ERL	Emergency Reference Level
FEPA85	Food and Environment Protection Act 1985
FSA	Food Standards Agency
GDA	Generic Design Assessment
GEMA	Gas and Electricity Markets Authority
Government	The UK Government and/or the Devolved Administration, as appropriate
GRP	Glass Reinforced Plastic
GTA	Government Technical Adviser
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 makes substantial use of independent advisory committees (see NuSAC) who advise the Commission directly.
HSE	Health and Safety Executive - a distinct statutory body with day-to-day responsibility for making arrangements for the enforcement of safety legislation. HSE is the statutory licensing authority for nuclear installations. This function is delegated to senior officials within the HSE's Nuclear Directorate.
HLW	High Level Waste
HSWA74	Health and Safety at Work etc. Act 1974
IAEA	International Atomic Energy Agency
ICRP	International Commission on Radiological Protection
IIS	Integrated Intervention Strategy
ILW	Intermediate Level Waste
INES	International Nuclear Event Scale
INPO	Institute of Nuclear Power Operators
INRA	International Nuclear Regulators Association
IRAC	Ionising Radiations Advisory Committee
IRR99	Ionising Radiations Regulations 1999
IRRS	IAEA Integrated Regulatory Review Service
IRS	Incident Reporting System
ISRS	International Safety Rating System
Joint Convention	Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management
KPI	Key Performance Indicators
LC	Licence Condition

LLW	Low Level Waste
MEL	Magnox Electric Ltd.
Met. Office	Meteorological Office
MoU	Memorandum of Understanding
MRWS	Managing Radioactive Waste Safely
mSv	milliSieverts
ND	HSE's Nuclear Directorate, senior officers of which have delegated regulatory and enforcement powers relating to nuclear site licensing under the NIA65 (see HSE above)
NDA	Nuclear Decommissioning Authority
NDT	Non Destructive Testing
NEAF	Nuclear Emergency Arrangements Forum
NEBR	Nuclear Emergency Briefing Room
NEPLG	Nuclear Emergency Planning Liaison Group
NETA	New Electricity Trading Arrangements
NIA65	Nuclear Installations Act 1965 (as amended)
NII	Nuclear Installations Inspectorate - a part of the HSE's Nuclear Directorate
NLF	Nuclear Liabilities Fund
NLFA	Nuclear Liabilities Fund Agreement
NPP	Nuclear Power Plant
NRPB	National Radiological Protection Board
NuSAC	Nuclear Safety Advisory Committee - independent advisors on nuclear safety matters to HSC. Prior to mid 1997 NuSAC was known as the Advisory Committee on the Safety of Nuclear Installations
OCNS	Office for Civil Nuclear Security
OECD-NEA	Organisation for Economic Cooperation and Development - Nuclear Energy Agency
OEF	Operational Experience Feedback
OR	Operating Rule
OSART	Operational Safety Review Team
PCSR	Pre-construction Safety Report
PINS	Planning Inspectorate
POSR	Pre-operational Safety Report
PSA	Probabilistic Safety Assessment
PSR	Periodic Safety Review
PWR	Pressurised Water Reactor
QA	Quality Assurance
REPPIR	Radiation (Emergency Preparedness and Public Information) Regulations 2001
RIFE	Radioactivity in Food and the Environment

RIMNET	Radiation Incident Monitoring Network
RPA	Radiological Protection Adviser
RPD	Radiation Protection Division (of HPA)
RPS	Radiological Protection Supervisor
RPV	Reactor Pressure Vessel
RSA93	Radioactive Substances Act 1993
SAPs	HSE's Safety Assessment Principles
SCART	Safety Culture Assessment and Rating Tool
SCC	Strategic Coordination Centre
SE	Scottish Executive
SEER	Scottish Executive Emergency Room
SEPA	Scottish Environment Protection Agency
SGLR	Senior Government Liaison Representative
SLC	Site Licensee Company
SPD	HSE's Safety Policy Directorate
SPI	Safety Performance Indicator
SSR	Station Safety Report
TCP	Town and Country Planning Act 1990
TOR	Tolerability of Risk
TSO	Technical Support Organisation
UK	United Kingdom of Great Britain and Northern Ireland
User Interface	The medium through which personnel obtain information about the plant and perform actions which impact upon plant behaviour
WAG	Welsh Assembly Government
WANO	World Association of Nuclear Organisations
WENRA	Western European Regulators Association

End of Fourth UK Report to the Convention on Nuclear Safety