Department of Energy & Climate Change

UNITED KINGDOM's NATIONAL REPORT ON COMPLIANCE WITH EUROPEAN COUNCIL DIRECTIVE (2009/71/EURATOM)

July 2014

Any enquiries regarding this publication should be sent to us at [insert contact for department].

Contents

Executive Summary

This report has been prepared by the United Kingdom (UK) to meet the requirement of Article 9.1 of the European Council Directive 2009/71/Euratom (Nuclear Safety Directive). ENSREG has produced guidance on the format of reports to demonstrate compliance, which is used as the basis for this report. As identified in the ENSREG guidance, the report explains how the UK complies with Articles 4 to 8 of the directive.

The UK already had measures in place to give effect to the provisions introduced by the 2009 Nuclear Safety Directive through national laws, regulations or conditions attached to the site licences. Where the UK regulatory system did not explicitly include measures that showed compliance with the 2009 directive, new measures were put in place. In particular, for Articles 6.4 on licensees' management systems and 6.5 on financial and human resources the UK's Regulator – the Office of Nuclear Regulation (ONR) – modified the standard licence conditions that are placed on all licensees to ensure compliance with these articles.

This report aims to demonstrate that the UK is compliant with all of the relevant articles in the Nuclear Safety Directive and, as importantly, is striving to ensure the spirit and intent of the directive is delivered through an approach that seeks to ensure continuous improvement to nuclear safety in the UK.

Introduction

1.1. Article 9.1 of Council Directive 2009/71/Euratom (Ref 1) of 25 June 2009 establishing a Community framework for the nuclear safety of nuclear installations (the 'Nuclear Safety Directive') requires that: *"Member States shall submit a report to the Commission on the implementation of this Directive for the first time by 22 July 2014, and every three years thereafter, taking advantage of the review and reporting cycles under the Convention on Nuclear Safety".* This is the first UK report to demonstrate that it meets that requirement and has been based on the guidelines for production of Member States' reports produced by ENSREG (Ref 2).

Nuclear power programmes in the UK

1.2. In the UK, nuclear power has been part of the energy mix since 1956, providing typically 15–20% of the country's electrical energy needs today. Currently, the UK has a fleet of operating gas-cooled reactors (AGR) and one operating pressurised water reactor (PWR). Many of these were designed and built over 30 years ago and they continue to command the focus of attention for the regulatory body, the Office for Nuclear Regulation (ONR), and the UK Government. In addition, the UK has other nuclear facilities that require continuing commitment to safety. These include several decommissioning reactors, nuclear fuel manufacture, fuel reprocessing facilities and radioactive waste storage facilities.

1.3. The UK Government has decided that nuclear power would be an integral part of the country's future energy strategy. A major programme of activity to assess the safety of new reactor designs concluded in December 2012 with issue of a design acceptance confirmation (DAC) by ONR for the EPR™ design at the culmination of the generic design assessment (GDA) process for this design. Provision of this DAC meant that ONR was satisfied with the safety and security aspects of the generic UK EPR™ reactor and that it was suitable for construction on licensed sites in the UK, subject to site specific assessment and licensing. In November 2012, ONR granted a site licence for Hinkley Point C, where EDF plans to build two EPR™ reactors. This was the issue of the first nuclear site licence for a nuclear power plant (NPP) in 25 years. ONR has also started a GDA on the Hitachi-GE Nuclear Energy Limited advanced boiling water reactor (ABWR) design.

1.4. The UK remains committed to nuclear safety. It has taken steps to ensure that safety is given a priority in the design and building of new reactors and continues to ensure that licensees regard safety as the priority for all operating reactors. Sound legislative and regulatory structures are in place and the UK participates fully in international programmes to enhance and promote nuclear safety.

Civil nuclear installations in the UK

1.5. Article 3.1 (a) of the Nuclear Safety Directive identifies the types of licensed nuclear installation that come under the directive as follows:

- enrichment plant;
- nuclear fuel fabrication plant;
- nuclear power plant;
- reprocessing plant;
- research reactor facility;
- spent fuel storage facilities;
- storage facilities for radioactive waste that are on the same site and are directly related to the nuclear installations above.

The UK has at least one installation of each type and details of the installations are provided in Annex 2 and summarised below.

1.6. There is a single fuel enrichment facility at Capenhurst. This produces enriched fuel for the civil nuclear industry using gas centrifuges. The site also stores UK stocks of depleted uranium.

1.7. Nuclear fuel fabrication is undertaken at Springfields. This facility produced the fuel for the Magnox and AGR programmes in the UK and also PWR fuel. The site last produced fuel for the Magnox programme some years ago and the plan for this site is currently decommissioning. Oxide fuel is still produced at the site. In addition to fuel production, the site also converts uranium to uranium hexafluoride for enrichment and back to oxide after enrichment.

1.8. The UK opened its first operational civil nuclear reactor in 1956 at Calder Hall, which was a Magnox reactor. It developed a programme of these reactors followed by a programme of AGRs and a single PWR. The principal features of these three reactor types are as follows:

- Magnox reactors use bars of natural uranium metal fuel clad in an alloy of magnesium and aluminium, known as Magnox. The reactor is built from graphite blocks with channels containing the fuel. The graphite acts as a moderator with the primary coolant being pressurised carbon dioxide. The earlier reactors had steel reactor pressure vessels (RPV) with heat exchangers external to the RPVs to generate steam to drive the turbines. The final two reactors (Oldbury and Wylfa) had pre-stressed concrete pressure vessels (PCPV), with heat exchangers within the PCPV. Each site had two reactors, with the exception of Calder Hall and Chapelcross sites, which had four reactors each. The Magnox reactors have reached the end of their lives and have been progressively closing since 1989. Wylfa Reactor 1 is the only remaining Magnox reactor operating. This is currently due to close in September 2014, although the licensee has requested that it should be allowed to continue up to the end of 2015. Three of the sites have permanently closed down and are currently defuelling the reactors (Calder Hall, Oldbury and Sizewell A) and the remaining seven have despatched all their fuel to

Sellafield and are currently decommissioning (Berkeley, Bradwell, Chapelcross, Dungeness A, Hinkley Point A, Hunterston A, and Trawsfynydd).

- There are seven sites with AGRs, with two reactors on each site, at Dungeness B, Hartlepool, Heysham 1, Heysham 2, Hinkley Point B, Hunterston B and Torness. These started operation between 1976 and 1988. Like the later Magnox sites, these have PCPVs, a graphite core, which acts as the moderator, pressurised carbon dioxide gas as a primary coolant and heat exchangers internal to the PCPV to raise steam to power the turbines. However, they use enriched uranium dioxide fuel in pellets within a stainless steel can to allow them to run at higher temperatures than the Magnox reactors. All 14 reactors are still operational. The licensee has planned closure for the reactors between 2018 and 2023, subject to being able to continue to demonstrate safe operation**.** It is considering extending the life of these plants, subject to commercial viability and meeting safety requirements. Fuel from the AGRs is despatched to Sellafield for reprocessing.
- The single PWR is located at Sizewell B. In common with all PWRs, this has enriched uranium dioxide fuel in a zircalloy can with pressurised water as a moderator and coolant contained within a steel RPV and a concrete containment. Sizewell B started operation in 1995 and is currently scheduled to close in 2035 again subject to being able to demonstrate safe operation.

1.9. The UK plant for reprocessing spent fuel is at Sellafield. It is an extensive site with a wide range of facilities and buildings of varying age. There are over 80 facilities that hold a significant amount of nuclear material. The site was originally established to support the UK nuclear deterrent and civil nuclear reactor programmes and subsequently developed to reprocess reactor fuel and store radioactive waste. The facilities range from very old (late 1940s) and degrading waste stores, built to the standards of that time, to more recent facilities. This is a major industrial complex which houses two principal reprocessing lines – one for oxide fuel and one for Magnox fuel. These lines require a significant number of other plants to prepare the fuel for reprocessing and to process and store the product from reprocessing and the waste streams. Sellafield has significant legacy plants and waste streams, which are outside the scope of the Nuclear Safety Directive. There are also four Magnox reactors on the Sellafield site at Calder Hall, which are permanently closed and being defuelled.

1.10. Dounreay was the UK's site for demonstrating liquid sodium cooled fast reactors. Two fast reactors were built on the site – the Prototype Fast Reactor (PFR) and the Demonstration Fast Reactor (DFR). Both are permanently shut down. PFR has been defuelled, although there is still fuel in its pond, whilst DFR is still defuelling. The Fuel Cycle Area (FCA) was used to reprocess fuel from the fast reactors on the site and is now permanently shut down and decommissioning. There is still some fuel in the FCA and the intent is to transfer this and fuel from the reactors to Sellafield.

1.11. The UK had two reactor research sites at Harwell and Winfrith, with research reactors at both sites. These have been closed for many years and some have been fully decommissioned. There are three reactors at Harwell and two at Winfrith that are currently being decommissioned.

1.12. The UK's last research reactor to operate, the CONSORT II reactor, operated by Imperial College, was a low power (100 kW thermal) research reactor. It first achieved criticality in 1965 and permanently shut down in 2007. Decommissioning plans for the

reactor are in an advanced state and defuelling of all fuel elements should be complete by 2015 and eventual delicensing of the site in 2023.

1.13. Spent fuel is stored at many of the sites described above, including the reactor sites. When fuel is removed from the reactor core at the operational reactor sites it is stored in ponds, with the exception of Wylfa, which has dry fuel store cells. Where fuel is to be reprocessed, there can be significant amounts of fuel stored on site, depending on shipment schedules and the need for cooling before transportation. On the Magnox sites that are permanently closed and being defuelled, the bulk of the spent fuel is stored in the reactor and the inventory in the cooling ponds at any time is minimised. Spent fuel is also stored at Sellafield prior to being reprocessed.

1.14. All nuclear installations have storage of radioactive waste. Waste at all sites other than Sellafield is either low level waste or medium level waste and is stored in appropriate facilities, depending on its characteristics. Low level waste is shipped to the existing UK Low Level Waste Repository for disposal. Medium level waste is stored on site for future treatment and immobilisation during decommissioning, which is underway on the decommissioning Magnox sites. Sellafield has a significant programme of medium level waste immobilisation. High level waste requires continuous cooling and Sellafield is the only site which generates and stores this type of waste, which is in liquid form. Sellafield has a programme for immobilisation of this waste stream.

Article 4 – Legislative, regulatory and organisational framework

Overall framework

Article 4

1. Member States shall establish and maintain a national legislative, regulatory and organisational framework (hereinafter referred to as the 'national framework') for nuclear safety of nuclear installations that allocates responsibilities and provides for coordination between relevant state bodies. The national framework shall establish responsibilities for:

(a) the adoption of national nuclear safety requirements. The determination on how they are adopted and through which instrument they are applied rests with the competence of the Member States;

(b) the provision of a system of licensing and prohibition of operation of nuclear

Role of Parliament

2.1. The Parliament of the United Kingdom of Great Britain and Northern Ireland is the supreme legislative body in the UK. It is located in Westminster, London. Parliament alone possesses legislative supremacy and, thereby, ultimate power over all other political bodies in the UK and its territories.

2.2. The Parliament has an upper house, the House of Lords, and a lower house, the House of Commons. The Queen is the third component of the legislature.

2.3. The House of Commons is a democratically elected chamber with elections to it held at least every five years. The two houses meet in separate chambers in the Palace of Westminster (commonly known as the Houses of Parliament), in London. By constitutional convention, all Government Ministers, including the Prime Minister, are members of the House of Commons or, less often, the House of Lords, and are thereby accountable to the respective branches of the legislature.

2.4. Laws are made by Acts of the UK Parliament. Acts can apply to the whole of the United Kingdom, including Scotland. Due to Scotland having a separate legal system many Acts do not apply to Scotland and are either matched by equivalent Acts that apply to Scotland alone or, since 1999, by legislation made by the Scottish Parliament relating to devolved matters. Nuclear safety is not a devolved matter, and hence any legislation applies to the whole of the UK, although protection of the environment is and hence the Scottish Government has responsibility for this area.

2.5. Laws in draft form, known as bills, may be introduced by any member of either house, but usually a bill is introduced by a Minister of the Crown. The bill passes through many stages in both houses and may be amended many times during this process. When passed in identical form by both houses, it will be presented for the Sovereign's Assent. Theoretically, the Sovereign may either grant the Royal Assent (that is, make the bill a law) or withhold it (that is, veto the bill). Under modern conventions the Sovereign always gives Royal Assent.

Principal legislation for nuclear installations

2.6. The principal legislation for ensuring the safety of nuclear installations consists of the following Acts of Parliament, known as primary legislation:

- Health and Safety at Work etc Act 1974 (Ref 3)
- Energy Act 2013 (Ref 4)
- Nuclear Installations Act 1965 (Ref 5)

Under the UK system of legislation all of these Acts of Parliament have equal status and all must be complied with. The key features of each of them is summarised in the following three sections.

Health and Safety at Work, etc. Act 1974

2.7. Under the Health and Safety at Work, etc. Act 1974 (HSWA74), a general duty is placed on all employers and the self-employed to conduct their undertaking in such a way as to ensure, so far as is reasonably practicable (SFAIRP), the health and safety at work of their employees and also those affected by their work activities. This covers both nuclear and conventional health and safety.

Energy Act 2013

2.8. The Energy Act 2013 (TEA13) is the legislation that sets the framework for nuclear regulation in the UK. It establishes ONR as a public corporation and defines its purposes

and functions. It also allows ONR to appoint inspectors and defines their powers under TEA13.

Nuclear Installations Act 1965

2.9. Under the Nuclear Installations Act 1965 (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 ONR. Only a corporate body, such as a registered company or a public body can hold a licence and the licence is not transferable. Under TEA13, those parts of the NIA65 relevant to safety (sections 1, 3–6, 22 and 24A) became relevant statutory provisions of TEA13.

Role of Department of Energy and Climate Change

2.10. The Department of Energy and Climate Change (DECC) and its Secretary of State and Ministers are responsible to Parliament for nuclear safety matters. In addition, DECC has a number of policy roles in respect of the nuclear industry. These include responsibility for energy policy generally (including the role of nuclear power), international treaties and conventions, as well as the international nuclear liability regime. It also has Governmental responsibility for those parts of the UK civil nuclear industry still owned by the Government.

2.11. UK Government is a contracting party to:

- Convention on Nuclear Safety;
- Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management.

DECC is responsible for ensuring that the UK complies with these conventions and the EU Nuclear Safety Directive.

2.12. In carrying out its responsibilities, DECC will, where appropriate, seek information on nuclear safety-related matters from ONR.

Role of the Office for Nuclear Regulation

2.13. ONR was established as an independent public corporation by TEA13. Under the legislation, ONR has five designated purposes:

- nuclear safety;
- nuclear site health and safety;
- nuclear security;
- nuclear safeguards;
- transport.

In this report, the focus is on the first purpose – nuclear safety. This purpose is the protection of persons against the risk of harm from ionising radiation from UK nuclear sites. The second purpose – nuclear site health and safety – relates to all other potential risks to health and safety.

2.14. Under TEA13, ONR has been set up as a public corporation which is managed by its own management board. The ONR must do whatever it considers appropriate to ensure nuclear safety in the UK and, through provisions in the UK regulatory regime, are able to do so without any undue influence in its regulatory decision making. In particular, the role of the Chief Nuclear Inspector is enshrined in legislation.

Safety requirements

> *Article 4*
>
> *1. The national framework shall establish responsibilities for:*
>
> *(a) the adoption of national nuclear safety requirements. The determination on how they are adopted and through which instrument they are applied rests with the competence of the Member States;*

2.15. The primary legislation described in paras 2.7-2.9 sets very high-level, non-prescriptive goals, which are the top level requirements. More detailed safety requirements are set out in either the conditions attached to the site licence or regulations. These are described in the following two sections.

Regulations

2.16. Secondary legislation, in the form of regulations which, within the UK legislation system, are one type of 'relevant statutory provision', can be made by a Secretary of State if there is provision for them in primary legislation. Within the three principal Acts of Parliament that impact on nuclear safety (HSWA74, TEA13 and NIA65), described in paras 2.7–2.9, the relevant Secretary of State has the power to make regulations. The scope of these regulations is specified in the primary legislation. This legislation also includes who must be consulted during their drafting, which includes the relevant regulators.

2.17. Under the simplest parliamentary procedure 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 scrutiny by Parliamentary Committees as to the merits and drafting accuracy of the regulations.

2.18. The licence conditions (LC) specify the majority of the safety requirements on the licensees and hence in terms of nuclear safety there are very few regulations. However, there are a number of statutory provisions of HSWA74 that are relevant to nuclear installations, which relate to general safety management or other topics such as radiation safety. Examples of these are:

- Ionising Radiations Regulations 1999 (Ref 6)
- Radiation (Emergency Preparedness and Public Information) Regulations 2001 (Ref 7)
- Management of Health and Safety at Work Regulations 1999 (Ref 8)

2.19. Under TEA13, the Secretary of State for Energy and Climate Change has the power to make regulations for nuclear safety purposes, although this power has yet to be used.

Licence conditions

2.20. An important provision of NIA65, is that it allows ONR to attach such conditions to the licence as it considers necessary in the interests of safety and radioactive waste management. These powers, to grant a licence or not and to attach conditions, are delegated by the ONR Board to the post of the ONR Chief Nuclear Inspector.

2.21. ONR has developed 36 standard conditions (Ref 9) that together form a sound basis for good nuclear safety and radioactive waste management. These address, for example, issues such as operating rules (OR) and instructions, maintenance, safety justifications, periodic safety reviews (PSR), reporting and following-up on events, training and qualification of staff, modification to plant and procedures, independent nuclear safety committees, emergency arrangements, organisational structures and management systems. Several relate to the licensee having adequate arrangements to manage changes that may have safety implications.

2.22. The same LCs are attached to each site licence issued by ONR.

2.23. The LCs mainly set goals but do not prescribe how these goals are to be met. Therefore, each licensee can develop licence condition compliance arrangements that best suit its activities, whilst demonstrating that safety is being managed properly. Under the licence, the licensees have a legal duty to demonstrate adequacy of these arrangements. The arrangements may change as the facility progresses through its life from initial design to final decommissioning. Licensees' compliance with the conditions and with their own compliance arrangements is mandatory. Whilst the system gives flexibility to licensees, it secures high standards in a wide spectrum of nuclear facilities without being prescriptive or requiring detailed rule making by the regulatory body. The conditions allow for interventions by ONR, which can, for example, 'approve' arrangements or 'consent' to specific actions. Some conditions enable ONR to 'direct' a licensee to carry out a specific action, including shutting down a plant. Other conditions require the licensee to obtain ONR's permission before commencing an activity such as starting up a reactor after a periodic shutdown for maintenance.

Licensing

Article 4

1. The national framework shall establish responsibilities for:

(b) the provision of a system of licensing and prohibition of operation of nuclear installations without a licence;

2.24. TEA13 made ONR the nuclear licensing authority for nuclear sites under NIA65. NIA65 requires that an Nuclear Power Plant (NPP) is not installed or operated unless ONR has granted a site licence. The power to grant a licence or not is delegated to the ONR Chief Nuclear Inspector.

2.25. A nuclear site licence is issued on the basis of a satisfactory outcome of regulatory assessment of an applicant's case, including the financial and organisational capability of a proposed licensee. A licence is issued for all phases of the life of the site. The issue of a site licence brings an operating organisation, or potential operating organisation, into a more rigorous regulatory regime than would be achieved using conventional health and safety legislation. The granting of a site licence does not automatically give permission for a proposed plant to be built and operated. Regulatory control of activities on a licensed site is exercised using the site LCs. Routine regulatory inspection and assessment, and the PSR process, ensure that the licensing basis is maintained.

2.26. Under NIA65, the nuclear installation licensing system applies throughout the lifetime of a nuclear site, including installation, commissioning and operation to eventual decommissioning. NIA65 allows ONR to revoke a licence, or for it to be surrendered by the licensee. However, in either event, the licensee would remain responsible for the safety of activities on the site until another licence had been granted. This 'period of responsibility' can end only when a new licence has been granted for the site or ONR has given written notice that in its opinion there has ceased to be any danger from ionising radiations on the site.

2.27. ONR published a policy statement in August 2005 (Ref 10) that provides a basis for the considerations that need to be made in order to de-license the whole or part of a nuclear licensed site, licensed by ONR under NIA65. Its purpose is to achieve broad consistency with current scientific thinking, relevant guidance, legislation and other published material, including the Radioactive Substances Act 1993 (Ref 11) (and the exemption orders made under it), and Article 5 of the Basic Safety Standards Directive (Ref 12).

Nuclear safety supervision

Article 4

1. The national framework shall establish responsibilities for:

(c) the provision of a system of nuclear safety supervision;

2.28. TEA13 and HSWA74 enable ONR to appoint inspectors and give them regulatory powers of inspection and investigation.

2.29. ONR carries out its regulatory activities through consistent and proportionate regulation of nuclear safety by focusing on four core activities. These core activities reflect ONR's regulatory philosophy and are:

- securing sustained compliance;
- influencing improvements in safety;
- making balanced judgements;
- engaging with its stakeholders.

In order to achieve these core activities, ONR carries out interventions such as inspection, assessment and investigation to secure compliance or to permission certain activities. Further details of these are presented in this report when addressing Article 5 of the directive.

Enforcement Powers

> *Article 4*
>
> *1. The national framework shall establish responsibilities for:*
>
> *d) enforcement actions, including suspension of operation and modification or revocation of a licence.*

2.30. There are a range of enforcement powers available to the regulatory body. These arise from the primary laws, TEA13 and HSWA74, and the site LCs.

Enforcement powers under TEA13 and HSWA74

2.31. Both of these laws include enforcement powers, which can be used in response to breaches of legislation. The powers have the same titles in both laws and are essentially the same. The powers under HSWA74 can only be used for a breach of that law or its relevant statutory provisions and similarly for TEA13.

Improvement notice

2.32. If an inspector is of the opinion that a relevant statutory provision or a licence condition has been contravened, and that contravention will continue or be repeated, the inspector can serve a notice that requires the contravention to be remedied. ONR has chosen to put in place administrative arrangements which require a corporate decision before any such notice can be issued.

Prohibition notice

2.33. If an inspector is of the opinion that an activity is being or is likely to be carried out which risks causing serious personal injury, the inspector can serve a notice to prohibit the activity. In practice, this power is rarely used by ONR as there are more appropriate powers available under the LCs.

Prosecution

2.34. In England and Wales, ONR and an inspector have the power to institute proceedings for an offence under TEA13, HSWA74 or any of the relevant statutory provisions, including appropriate parts of NIA65. In Scotland, an inspector can recommend to the Crown Office Procurator Fiscal's Service that a prosecution is initiated. Again, ONR's own administrative arrangements require a corporate decision to be made for the exercise of this power.

Powers under the site licence conditions

2.35. As well as placing requirements on the licensee, the standard 36 LCs (Ref 9) also include requirements for regulatory interactions between ONR and the licensees. These are used within specific LCs and provide ONR with the following powers.

Direction

2.36. A direction is issued by ONR when it requires the licensee to take a particular action. For example, LC31(1) gives ONR 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.

Specification

2.37. The standard LCs give ONR discretionary controls with regard to a licensee's arrangements and these are implemented through specifications. For example, in LC23(2), if ONR specifies, the licensee is required to refer operating rules to its nuclear safety committee for consideration.

Notification

2.38. The standard LCs give ONR 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 ONR, submit a safety case and shall not commence operation of the relevant plant or process without the consent of ONR.

Consent

2.39. 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 ONR that the proposed action is safe and that all procedures necessary for control are in place.

Approval

2.40. An approval is used to freeze a licensee's arrangements. Once approved, the procedures cannot be changed without a further approval from ONR, and the procedure itself must be carried out as defined; failure to do so would infringe the licence condition and would be an offence. For example, for nuclear power stations, ONR has approved operating rules important to safety in order to ensure that licensees cannot change these without seeking ONR’s approval of the change.

Agreement

2.41. An agreement issued by ONR 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 any modifications or experiment

carried out on any part of the existing plant or processes which may affect safety. Such arrangements require that modifications or experiments are classified according to their safety significance and are divided into stages where appropriate. Hence, the licensee submits a safety case justifying the modification and cannot proceed until ONR has written agreeing to this proposal.

Maintenance of the National Framework

Article 4

2. Member States shall ensure that the national framework is maintained and improved when appropriate, taking into account operating experience, insights gained from safety analyses for operating nuclear installations, development of technology and results of safety research, when available and relevant.

2.42. As noted in the discussion on safety requirements under Article 4.1(a), the requirements placed on the licensee through the licence and through health and safety legislation are high level and goal setting. A benefit of this is that it minimises the need to make legislative changes to the UK regime, as usually any changes can be accommodated through the licensee's arrangements for compliance with the safety requirements. This in turn allows for the UK regime to be responsive to changes in technology, international best practice / standards and lessons learned from international incidents. An example of this is the issue of new standards by the International Atomic Energy Agency (IAEA) or WENRA reference levels. These do not usually require a change to safety requirements, but the licensee is required to review its arrangements and make any necessary changes. New or revised nuclear safety standards can therefore be introduced quickly and without the need for legislative change.

2.43. In 2008, a Government review of nuclear regulation proposed a number of recommendations for improvement, which the Government accepted. As a result, the national framework has recently been revised by the introduction of TEA13, which has required the revision of HSWA74 and NIA65. The parts of TEA13 relating to nuclear regulation came into force on 1 April 2014.

2.44. The UK remains committed to learning from its experiences and the experience of others as part of our approach of seeking continuous improvements to nuclear safety. In particular, as a contracting party to the Convention on Nuclear Safety and the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, the UK periodically subjects its nuclear safety framework to international peer review to identify any shortcomings that need to be addressed. The UK continues to play an active role in the review meetings of these conventions so that any examples of best practice can be identified and, where appropriate, adopted in the UK. Additionally, the UK took a leading role at the 6th Review Meeting of the Convention on Nuclear Safety in seeking changes to the Convention's peer review processes so that they were strengthened to help ensure the continued robustness of international peer review.

2.45. As a member state of IAEA, the UK is and will continue to be subject to IAEA Integrated Regulatory Review Service (IRRS) missions. The UK has invited a series of modular missions in 2006, 2009 and 2013 and, as a matter of practice, the UK volunteers

for IRRS missions. These processes help to ensure that the UK regulatory regime continues to meet worldwide best practice. As an indication of the commitment of the UK to using these missions to improve its regulation, the 2013 mission determined that all ten recommendations, and 12 of 13 suggestions made by the 2009 IRRS mission, had been effectively addressed and therefore could be considered closed (Ref 13). The UK has invited IAEA to undertake a further mini-mission in 2014 to review progress made with the 25 findings as confirmed in the 2013 report. ONR sees this as an opportunity to further enhance stakeholder confidence and to demonstrate its commitment to continuous improvement. The UK is also in the process of agreeing an Operational Safety Review Team (OSART) mission to the UK to peer review the impact of the UK regulatory regime in practice at the operational level.

Article 5 – Competent regulatory authority

Article 5

1. Member States shall establish and maintain a competent regulatory authority in the field of nuclear safety of nuclear installations.

3.1. ONR was established under TEA13 on 1 April as the public corporation with the duty to enforce the law on nuclear safety, as well as a number of other purposes as listed in para 2.13. The ONR's role, responsibilities and powers are also set out in TEA13, as well as the make-up of the Board. In addition, the roles of the Chief Executive Officer and the Chief Nuclear Inspector have become statutory requirements under the legislation.

Developing and maintaining staff competences

3.2. ONR has had intensive recruitment campaigns since 2011, necessitating a radical revision of the training and assimilation of new inspectors. Recruitment in excess of 60 new inspectors meant that ONR could no longer rely solely on external training courses and ad hoc internal peer group assistance from experienced colleagues. Training and assimilation is resource intensive so it has to be structured, planned, properly resourced and continually evaluated to ensure it meets all needs. ONR therefore put in place a dedicated team of experienced inspectors, led by a training manager, to develop specialist and core regulatory training courses, thus increasing its capacity to meet all the training needs of an expanding organisation. ONR is further developing its training and knowledge management system to ensure an effective succession plan for its core resource capability. Each of these aspects is covered independently in the following paragraphs.

Warrants for new inspectors

3.3. All inspectors are formally appointed when ONR issues them with a warrant, which entitles them to exercise specified legal powers. For new inspectors, ONR recognised the need for managers to determine a period during which use of powers was administratively limited, the work of inspectors would be checked, and competence requirements would be established and completed. In order to improve the competency development of new ONR nuclear safety inspectors, and ensure consistency with established practices in other UK regulatory bodies, ONR introduced a Limited Warrant process. This requires all new inspectors to demonstrate an adequate level of competence by participating in a specific

training programme, focusing on core regulatory training, before being issued with a Full Warrant following an interview process.

3.4. The purpose of limiting the warrant is to restrict full powers until new inspectors have received appropriate training and assessment, whilst providing them with sufficient legal powers to fulfil their inspection duties in the early months after they join ONR. The powers excluded from the Limited Warrant are ones that are broadly associated with inspectors pursuing investigation and enforcement action, for which ONR mandates specific legal training.

Training of new inspectors

3.5. All inspectors joining ONR are required to have good academic qualifications and several years of experience in a relevant industry such that they can be regarded as being technical experts in their own discipline. The purpose of the training given to inspectors is to expand and build on this base rather than 'convert' them to acquire another knowledge base. To achieve this, inspectors receive training in two main areas:

- the mandatory core regulatory training (including refresher training);
- training to expand their technical expertise and to gain a working knowledge of other essential technical disciplines.

Training methods

3.6. In addition to the mandatory core regulatory training, a new inspector's training programme is developed on a personal basis after a training needs analysis. The delivery of the training relies extensively on an interactive tutorial approach as well as specific technical training courses. Training documentation provides signposts to where information can be found as well as providing detailed training material.

3.7. New recruits also undergo operational training (on-the-job training), where they carry out specific regulatory assignments under close supervision. The effectiveness of all training activities are evaluated initially and again after three months. This gives opportunities for trainees to evaluate training in the context of their job and gives better feedback to those developing the training courses.

Continued professional development

3.8. While considerable effort is spent on the training of new recruits, ONR also has a refresher training programme to ensure all staff maintain professional competencies. This applies to all inspectors within ONR, up to and including the Chief Nuclear Inspector. A wider review of inspectors' competencies is under consideration as part of ONR's move to a public corporation. ONR's current policy is that further training needs are a matter for discussion between individual inspectors and their managers, in consultation with the professional leads responsible for overseeing the application of regulatory standards in their particular specialism (e.g. structural integrity). That training would cover topics such as communication, influencing skills, change management and interpersonal skills, as well as the development of technical competencies.

3.9. In addition to regulatory and technical training, ONR has agreements in place for staff exchange schemes with other regulatory bodies. Such schemes provide development opportunities for individuals as well as facilitating the sharing and capture of best regulatory practices. Similar arrangements are in place for secondment of staff to licensee organisations which promote better understanding of working practices between the organisations.

ONR independence

> *Article 5*
>
> *2. Member States shall ensure that the competent regulatory authority is functionally separate from any other body or organisation concerned with the promotion, or utilisation of nuclear energy, including electricity production, in order to ensure effective independence from undue influence in its regulatory decision making.*

3.10. ONR's independence as a regulator is currently ensured under TEA13, where ONR is given direct responsibility for the enforcement of the nuclear safety regulatory system. ONR is designated as a public corporation with its own board to set the direction of the organisation and to ensure appropriate governance.

3.11. The Secretary of State for Energy and Climate Change is accountable to Parliament for nuclear safety in Great Britain. ONR therefore provides assurance through factual information and advice to this minister on nuclear safety matters, but operates its regulatory functions separately from Government and ministers. Government cannot direct ONR with respect to regulatory functions in a particular case – i.e. Government is unable to influence the individual regulatory decisions taken by inspectors – thereby ensuring that regulatory decisions are independent.

3.12. To ensure functional separation form DECC, ONR is sponsored by the Department of Work and Pensions (DWP). The relationship between ONR and DWP is codified in the ONR/DWP framework document (Ref 14).

3.13. A key component of the ONR/DWP framework document is that the DWP Permanent Secretary, as Principal Accounting Officer, has designated the Chief Executive of ONR as ONR's Accounting Officer. The ONR CEO, as Principal Accounting Officer, is therefore directly accountable to Parliament for an appropriate budget for ONR, and giving evidence, if summoned before the Public Accounts Committee, on ONR's stewardship of public funds.

3.14. The ONR Board is responsible for ensuring that any statutory or administrative requirements for the use of public funds are complied with, and that the ONR Board operates within the limits of its statutory authority and any delegated authority agreed with DWP. ONR must publish an annual report of its activities together with its audited accounts after the end of each financial year. The annual report and accounts must be laid in Parliament and made available on ONR's website.

ONR resources

Article 5

3. Member States shall ensure that the competent regulatory authority is given the legal powers and human and financial resources necessary to fulfil its obligations in connection with the national framework described in Article 4(1) with due priority to safety. This includes the powers and resources to:

(a) require the licence holder to comply with national nuclear safety requirements and the terms of the relevant licence;

(b) require demonstration of this compliance, including the requirements under paragraphs 2 to 5 of Article 6;

ONR financial resources

3.15. ONR is funded through a combination of a start-up loan from DWP (section 16 ONR/DWP Framework Document) (Ref 13) and cost-recovery from dutyholders.

3.16. ONR recovers some 98% of its costs from the licensees it regulates. ONR is able to do this as section 24A of NIA65 enables ONR to charge fees to nuclear licensees to recover the expenses incurred through its regulation of the nuclear site licensing regime. In addition, further expenses are recovered from licensees in respect of safety research programmes agreed between ONR and the industry. Further fees regulations made under HSWA74 allow ONR to charge for other safety regulation carried out on licensed nuclear sites, including the GDA process.

3.17. As mentioned above, ONR will recover relevant costs from the licensees in line with the relevant statutory provisions. Should ONR's income be significantly reduced for any reason the Government, via ONR's sponsor department DWP, will ensure that ONR has sufficient resources to discharge its functions, thereby also making certain that the Government complies with its international duties to make sure that the regulator is adequately resourced.

3.18. ONR uses a work recording system to identify the effort and expenses of its staff attributable to each licensee.

Human resources

3.19. Since the establishment of ONR as a public corporation in April 2014, it is free to recruit staff without the constraints it had as a Government agency.

3.20. ONR has successfully recruited in excess of 60 specialists in recent years, with this expected to reach around 80 by completion of the current campaign, against an existing complement of about 240 nuclear safety specialists. In 2013/14, ONR opened its external recruitment at more senior levels to attract high levels of skills and experience. ONR is also developing proposals for graduate recruitment and has already introduced an 'equivalence' route that enables those with sound technical knowledge but limited high-

hazard or nuclear experience to undergo a development and training programme to obtain the knowledge, experience and competence required to reach inspector standard.

3.21. Although there have been recent successes in recruitment, maintaining staff levels and assimilating and training new recruits will remain a challenge. ONR is implementing knowledge management processes to ensure a managed succession plan for all core capability skills and is investing significantly in the development of staff through bespoke management programmes. ONR is also looking to work more strategically with the supply chain to have better access to scarce technical skills and resource for limited periods to meet exceptional demands.

External support to the regulatory body

3.22. The nuclear safety regulator in the UK does not use technical support organisations in the way many other regulators do. Most of the expertise to regulate nuclear safety is available to ONR through its own staff. To maintain this situation, ONR 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 resources are needed to respond to a high workload, or the specialism is not available in ONR. To accommodate this, ONR has an extramural support budget and framework agreements with some outside bodies known to be independent, to enable contracts to be placed quickly. The work done under these contracts is to produce technical assessments to a specification prepared by ONR. ONR uses the outcome of the technical assessments to inform its regulatory assessment and its staff make any necessary regulatory decisions.

3.23. Currently, ONR obtains technical support through three main routes:

- the Health and Safety Laboratory, an agency of the Health and Safety Executive (HSE) provides technical support on a wide range of safety issues that are not specifically related to nuclear installations, e.g. ventilation or protective equipment;
- purchasing consultancy advice through an ONR framework agreement with pre-tendered suppliers;
- purchasing, through normal procurement routes, a range of one-off consultancy contracts from a range of suppliers.

The framework agreement was set up in order to secure access to independent technical expertise at a time when the needs of the nuclear industry are increasing and in response to a recommendation of the IAEA's IRRS in 2006, which stated that ONR should have access to scientific and technical support in the same way it is available to many other nuclear regulators in other countries. The support framework, which was set up with 31 contractors from the UK and overseas, operated successfully for 15 months. Approximately half of contracted technical support was commissioned through the framework. It is envisaged that this will increase in future years as work on assessment of new reactor designs begins.

Regulatory powers to ensure compliance with safety requirements

> *Article 5*
>
> 3. *This includes the powers and resources to:*
>
> *(a) require the licence holder to comply with national nuclear safety requirements and the terms of the relevant licence;*

3.24. The top level safety requirements for a nuclear site can be summarised as follows:

- The dutyholder must ensure SFAIRP the health and safety at work of their employees and others affected by their work activities (para 2.7).
- No site can be used for a nuclear installation unless a nuclear site licence is in force, granted by ONR (para 2.9).
- Licensees must comply with the conditions attached to the site licence (paras 2.20–0).
- Other requirements may be specified in regulations (paras 2.16–0).

Failure to comply with these requirements is specified as an offence in the appropriate legislation.

3.25. TEA13 and HSWA74 give ONR general powers of enforcement to issue improvement and prohibition notices (paras 2.32–2.33).

3.26. The LCs themselves also assign specific ONR powers to ensure compliance in relation to each of the separate conditions, as described in paras 2.36–2.41. These powers are direction, specification, notification, consent, approval and agreement.

3.27. ONR also has the power to prosecute the licensee (para 2.34) in the event of a significant breach of legislation.

Regulator powers to require demonstration of compliance with safety requirements

> *Article 5*
>
> 3. *This includes the powers and resources to:*
>
> *(b) require demonstration of this compliance, including the requirements under paragraphs 2 to 5 of Article 6;*

3.28. The powers to require the licensee to demonstrate compliance with the nuclear safety requirements come from the site LCs.

3.29. LC14 requires the licensee to produce safety cases consisting of documentation to justify safety during the design, construction, operation and decommissioning phases of the installation. A safety case provides a written demonstration that relevant standards have been met and that risks have been reduced SFAIRP.

3.30. LC23 requires the licensee to produce an adequate safety case for any operation and to identify the conditions and limits that are necessary in the interests of safety, which are known as operating rules. To ensure that the plant remains within the boundaries of the safety case the licensee must remain within the conditions and limits defined by the operating rules. Compliance with the operating rules is a key element of ensuring safety on the plant.

3.31. To ensure continuing safety in the light of changes to the plant there are two key LCs:

- LC22 requires the licensee to make and implement adequate arrangements to control any modifications to the plant. Modifications mean alterations to buildings, plants, operations, processes or safety cases. As well as intentional modifications, these include changes in the licensee's knowledge of the plant which may result from events on the site or elsewhere. The licence condition requires the licensee to revise the safety case and implement any revised conditions and limits resulting from modifications.
- LC15 requires the licensee to carry out PSRs to demonstrate that the safety case continues to be adequate and is being complied with and to update the safety case and any conditions and limits if necessary.

3.32. Under LC6, the licensee is required to make adequate records to demonstrate compliance with all LCs. The licensee must make adequate arrangements for keeping records or documents which relate to the licence requirements. This includes the LCs mentioned above and hence is part of the arrangements for the licensee to demonstrate compliance with the safety requirements.

Regulator powers to verify compliance

Article 5

3. *This includes the powers and resources to:*

(c) verify this compliance through regulatory assessments and inspections; and

Powers to allow inspection and assessment

3.33. To allow ONR to be able to inspect and assess, it needs the powers to gain access to the site and information. The powers to do this come from primary legislation (TEA13 and HSWA74) and the site licence.

3.34. The powers in TEA13 and HSWA74 are essentially the same, but are quoted in both laws. When undertaking an inspection or assessment using the powers, the inspector must consider under which legislation it is being performed. Typically for a licence condition inspection it will be under TEA13, but if an inspection is against a relevant statutory provision of HSWA74, which includes, for example, the Ionising Radiations Regulations 1999 (IRR99, Ref 6) it will be under that legislation. If the inspector has to formally use the powers, they must be from the correct law. The powers include all those necessary for inspection and assessment, and also for investigations. There are a broad range of powers, but those that are key for inspection and assessment are the powers to:

- enter a premises;
- carry out any examination or investigation;
- inspect and take copies of any document.

3.35. The powers within the site LCs related to inspection and assessment are those that require the licensee to provide ONR with documents. A number of the LCs require the licensee to furnish copies of documents to ONR if it specifies that it should do so. Documentation that the licensee must furnish to ONR when specified, includes:

- any document, record, authority or certificate – LC6(5);
- any safety case documentation – LC14(4);
- any copies of records or documents made in connection with quality management systems – LC17(5);
- extracts of operational records – LC25(4).

Assessment and verification by the nuclear regulator

3.36. Through a programme of planned and reactive inspections and technical assessments, ONR inspectors check that appropriate standards are developed, achieved and maintained by the licensees. ONR also:

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

3.37. In the course of its nuclear regulatory work, ONR scrutinises the activities of licensees both at their licensed nuclear sites and through assessment of the licensees' written safety submissions. This section describes the assessment and verification activities carried out by ONR. Special emphasis is put on describing how ONR uses its Safety Assessment Principles (SAPs, Ref 15) during assessment to judge the adequacy of safety case submissions.

3.38. It is the duty of licensees to meet all statutory limits, and to reduce the risk to 'so far as is reasonably practicable'. 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 'as low as reasonably practicable' (ALARP) and 'as low as reasonably achievable'

(ALARA) concepts, more familiar to international safety experts. Assessment of the safety of nuclear plants is therefore based on assessing the licensee's safety case that it has used to demonstrate that the risk from the plant is ALARP.

Granting permission for activities following regulatory assessment of safety submissions

3.39. Licensees submit requests for permission to carry out activities supported by safety submissions. ONR sets safety standards in broad terms for the reviews and assessments using the legal requirements of the LCs, and guidance set out in SAPs, which are based on the philosophy described in HSE's *Reducing risks, protecting people* (R2P2, Ref 16). ONR publishes guidance to its inspectors on purpose, scope and contents of the safety cases (Ref 17).

3.40. ONR's SAPs and Technical Assessment Guides (TAG) form a framework that is used as a reference for technical judgements on the adequacy of licensees' safety cases. They also assist ONR in applying a consistent and proportionate approach to its assessment process. In carrying out an assessment, the ONR inspectors 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.

3.41. 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 whether the licensee has made a case to demonstrate that risks are reduced ALARP. They represent ONR's view of good nuclear engineering practice. They point to the design features that in ONR's view would lead to a safe plant.

3.42. The SAPs also contain probabilistic targets, some of which (radiation doses to people) embody specific statutory limits. However, ONR inspectors will primarily use the engineering principles and use the Probabilistic Safety Assessment (PSA) as a check to inform regulatory judgements and decisions. PSA is used to produce numerical estimates of the risk from the plant and thus provides an input to judgement of the adequacy of the plant safety case. It acts as a crosscheck on the level of safety provision, so that the PSA and deterministic SAPs are complementary. The numerical analysis informs, but does not in itself provide the basis for, a decision.

3.43. The SAPs are aimed at the safety assessment of both proposed (new) nuclear facilities, and existing facilities. 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 ONR 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.

3.44. A revision of the SAPs is in preparation with an anticipated publishing date of the end of 2014. Most of the revisions arise naturally because of the time interval since the last update in 2006. A review of the SAPs against the lessons learned from the Fukushima accident showed the SAPs to be fundamentally sound but some limited changes were prompted.

3.45. The UK's goal-setting legal framework for health and safety does not apply IAEA requirements in a prescriptive manner, but they are reflected in the revised SAPs so that the SAPs benchmark status is retained. For example, the text of the revised SAPs was reviewed for consistency against the individual requirements of IAEA SSR-2/1 'Safety of Nuclear Power Plants: Design' and SSR-2/2 'Safety of Nuclear Power Plants: Commissioning and Operation'.

3.46. Assessment of licensees' safety cases is undertaken by first understanding and then sampling the key aspects of a safety case using ONR's SAPs, and other national and international standards when appropriate. The technical expertise of ONR staff is used to select the issues to be pursued in depth. Guidance is provided to inspectors in the form of TAGs for a range of technical topics, e.g. a number of TAGs are relevant to the assessment of digital instrumentation and control.

3.47. The output of the assessment by an inspector from a particular technical discipline is an assessment report (AR). ONR project or site inspectors bring together and integrate the findings from ARs covering each of the relevant technical areas and provide an overall conclusion regarding the adequacy and acceptability of the assessed safety case, leading to a recommendation as to whether permission should be granted for the requested activity. This is formally documented in Project Assessment Reports (PAR). To ensure openness and transparency of regulatory decisions, PARs are now published on the ONR website (Ref 18).

3.48. Extensive discussion between the different specialist inspectors and the project and site inspectors, together with face-to-face discussions and written exchanges with the technical experts of the licensee, are 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 inspectors make recommendations, if appropriate, on where safety can be improved. These recommendations are discussed with the licensee and a programme to implement improvements is agreed. ONR monitors progress with implementation of these recommendations and other issues that may be raised requiring regulatory follow-up. ONR utilises a system for recording and monitoring progress made by the licensee in addressing regulatory issues and recommendations. Appropriate enforcement action is taken if the issues remain unresolved or inadequate progress is made.

3.49. The contents of safety cases may vary due to differences in design between different nuclear installations, but ONR'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?
- Has enough been done to demonstrate ALARP?

3.50. In answering the above questions, ONR's 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.

3.51. If a safety issue is judged to be of sufficient importance, ONR 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, ONR may use external recognised independent experts in the appropriate technical field to help to inform its regulatory judgement. Such external resources, however, do not make regulatory judgements but provide expert authoritative advice to ONR inspectors.

3.52. As part of an overall project agreed with the licensee, the ONR project inspector may consider it necessary to carry out inspections, prior to granting permission (readiness inspections). The purpose of such inspections is to verify that safety case claims are supported by factual evidence or that the licensee has arrangements in place to meet the intent of the safety case.

3.53. Requests for permission to carry out activities (e.g. modifications) that have comparatively low nuclear safety significance are not sent to ONR for review and a decision. However, for such activities the licensee prepares sufficient information to allow ONR to decide whether the decision was justified, should ONR decide to undertake a check. Some of these activities will be examined as part of ONR's routine inspections.

Inspection of nuclear sites

3.54. ONR carries out planned inspections of nuclear licensed sites to monitor licensees' compliance with the LCs and the requirements of HSWA74 and other regulations. An inspector (or team of inspectors) 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, ONR inspectors often visit the site and key manufacturers' works to monitor the construction of components important to safety and witness quality assurance procedures.

3.55. The allocation of inspectors to site takes into account the risk associated with the site and the number of plants. For operational reactor sites, there is a single site inspector and for decommissioning reactors a site inspector may cover two sites. Sellafield has a large number of plants on the site and therefore has significantly more site inspectors. The actual number depends on the regulatory strategy for the site and may vary from year to year. The nuclear site inspectors spend about 30% of their working time on their site(s), when they ensure that the licensee is complying with the LCs and the arrangements made under them. The remainder of the site inspector's time is spent on preparing for inspections, following up on inspections, assessing a licensee's documentation and co-ordinating other ONR activities on the site.

3.56. Individual site intervention plans are produced according to generic templates based on a matrix that includes both the LCs and relevant legislation, the important critical systems (derived from the safety case) and recent operational experience feedback (OEF). Before the start of each year, the plan is modified, as necessary, to take into account OEF, 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 ONR inspectors who carry out specialist assessments or inspections as necessary. The Integrated Intervention Strategy (IIS) developed by ONR embraces the site and corporate inspection processes, together with the assessment processes, to help provide a consistent and integrated framework for all regulatory activities. ONR's organisational change and the implementation of programme working has brought about further consistency in regulating similar sites and enables ONR to have better oversight of regulatory issues within the operating fleet, defuelling and decommissioning plants, and hence more effective targeting of its regulatory efforts.

3.57. Site intervention plans are produced, monitored and reviewed within an IIS whose purpose is to ensure both that ONR focuses its resources where they are most needed and that the planning process is transparent to stakeholders. The IIS takes 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 inspections will be focused on systems or structures and processes required for nuclear safety as identified in the safety case. These are factors that contribute most to the licensee's safety management performance, and the prevention of significant nuclear events. In order to bring further consistency to disciplined delivery of these inspections, ONR inspects these factors against LC12 (Suitably qualified and experienced staff), LC23 (Operating rules), LC24 (Operating instructions), LC27 (Safety mechanisms), LC28 (Examination, maintenance and testing) and LC34 (Leakage and escape of radioactive material and radioactive waste).

3.58. These inspections provide information on whether safety case requirements are met. The site intervention plan is enhanced to include other factors that ONR considers important to the overall safety of the site. These include:

- any site-related work arising from progressing outstanding PSR requirements or other reviews of the safety case;
- emergency arrangements;
- strategic themes important for safety such as organisational resilience and supply chain;
- operational experience and organisational learning;

- leadership and management for safety.

These elements will be subject to regular inspection visits against the appropriate licence condition by the 'nominated site inspector'. Further inspections may be planned as part of the site intervention plan to verify compliance with other LCs. Inspections by site inspectors provide regular updates of current site performance and operational issues, obtained through activities such as examination of event and operational records.

3.59. Reactive inspections are undertaken in response to specific events; those operational matters that may affect safety. Further investigation may be undertaken by ONR inspectors, and appropriate regulatory action taken, in line with the enforcement policy statement and the regulatory strategy for the site.

3.60. 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.

3.61. Following inspections by the ONR inspector, the findings of the inspection are discussed with the licensee and, where appropriate, the corrective actions required from the licensee are agreed. Subsequently, the inspector prepares an intervention report that records appropriate details of the objectives of the visit, matters considered, conclusions drawn and any follow-up actions identified. Significant issues are recorded in a database so that their resolution can be monitored. Executive summaries of all intervention reports for operating reactors are published on the ONR website.

Regulatory enforcement actions

Article 5

3. *This includes the powers and resources to:*

(d) carry out regulatory enforcement actions, including suspending the operation of nuclear

3.62. There are a range of enforcement powers available to the regulatory body. These arise from both the primary laws (TEA13 and HSWA74), which apply to health and safety inspectors of all industries and the LCs, which only apply to the nuclear industry. They are described in paras 0–2.41.

3.63. As noted in para 2.31 the enforcement powers in TEA13 and HSWA74 are essentially the same, and both consist of improvement notices, prohibition notices and prosecution. They are included in both laws. When undertaking an enforcement action, the inspector must consider which legislation is applicable. Typically, for a licence condition inspection it will be under TEA13, but if an inspection is against a relevant statutory provision of HSWA74, which includes, for example, IRR99 it will be under that legislation. If the inspector has to use enforcement action, the correct law must be quoted.

3.64. Regulatory actions to suspend operation of a nuclear installation are rarely used, but would be implemented using the LCs.

3.65. As described in para 2.36, LC31(1) gives ONR the power to direct a licensee to shut down any plant, operation or process on the site within such period as ONR may specify. Furthermore, it cannot be restarted without ONR's consent (LC31(2)). In addition, other LCs also give ONR the power to direct the licensee to halt other activities on the site, such as:

- LC19 – construction or installation of a new plant;
- LC22 – modification or experiment on an existing plant;
- LC25 – decommissioning of a plant.

Again, once a direction has been issued the licensee cannot restart the activity without ONR's consent.

3.66. A prohibition notice could be used to suspend operation. However, this requires an inspector to make the judgement that an activity risks causing serious personal injury, which is unlikely to be the case for situations that require suspension of operation. Also, for a prohibition notice, the licensee can make its own judgement when the situation has been remedied and operation can be restarted without ONR involvement. Hence, a direction can be used in a wider range of circumstances and gives ONR, as the regulator, greater control than a notice.

3.67. In taking regulatory action, ONR follows its Enforcement Policy (Ref 19), which sets out the purpose of enforcement and the principles that should be applied. Inspectors are guided by an Enforcement Management Model (Ref 20) to help determine which enforcement measure is the most appropriate in a given situation.

3.68. The discussion on enforcement actions above and in paras 3.24–0 deals only with the most significant issues. Inspectors can use less formal enforcement actions such as verbal warnings or letters to secure compliance. These are the most frequent actions used in response to a licensee's shortfalls against safety requirements and also to secure continuous improvement on plants. They are particularly useful to deal with shortfalls in a licensee's arrangements that have not resulted in direct challenges to safety, but do need to be remedied to ensure that safety is maintained.

Article 6 – Licence holders

Article 6

1. Member States shall ensure that the prime responsibility for nuclear safety of a nuclear installation rests with the licence holder. This responsibility cannot be delegated.

4.1. The responsibility for safety is embodied in HSWA74, which applies to all industries not just nuclear. Paragraph 2.1 of the Act states:

> "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."

With respect to persons not employed on site, paragraph 3.1 states:

> "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 thereby exposed to risks to their health or safety."

4.2. For nuclear installations, the responsibility is further refined by NIA65 as follows:

- Section 1(1) prohibits operation of a nuclear installation without a licence and section 1(3) makes breach of this prohibition a criminal offence.
- Under section 4(6) contravention of any conditions attached to the licence is also a criminal offence, and the licensee is liable for such contravention regardless of whether it was committed by the licensee or by another person.
- Section 3(1) states that a nuclear site licence shall not be granted to any person other than a body corporate and shall not be transferrable. This ensures that the licensee cannot delegate any of its obligations set out in the licence.

4.3. 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 those employees and members of the public that may be affected by the installation's operations.

4.4. The non-prescriptive licensing regime in the UK ensures that the licensees recognise and accept their responsibilities, while allowing them to determine their own methods for complying with the law, subject to the regulator being satisfied that they meet requirements. The way in which this responsibility is carried out is monitored and, if necessary, safety improvements are enforced by ONR.

Licensee's responsibility to regularly assess, verify and improve nuclear safety

Article 6

2. Member States shall ensure that the national framework in place requires licence holders, under the supervision of the competent regulatory authority, to regularly assess and verify, and continuously improve, as far as reasonably achievable, the nuclear safety of their nuclear installations in a systematic and verifiable manner.

Legal requirements for safety documentation

4.5. ONR's standard site LCs 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 ONR the power to require reviews of safety documentation. PSRs are the output from this process.
- LC16 (Site plans, designs and specifications) requires that the licensee provides ONR 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 identifies safe limits and conditions for operation, known as operating rules.
- LC24 (Operating instructions) requires the licensee to carry out all operations that may affect safety in accordance with written instructions.
- LC27 (Safety mechanisms, devices and circuits) requires the licensee to 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.
- 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.
- LC36 (Organisational capability) requires the licensee to make and implement adequate arrangements to control any change to its organisational structure or resources which may affect safety.

4.6. The licensee must also have adequate arrangements for compliance with relevant statutory provisions of HSWA74, for example IRR99, as well as other appropriate legislation.

4.7. Regulation 3 of the Management of Health and Safety at Work Regulations 1999 contains a general requirement for licensees to carry out a health and safety risk assessment (including for the purpose of complying with licensing requirements) and to review and amend such assessment as necessary.

4.8. All licensees have arrangements to ensure that requirements are complied with in a manner that is most appropriate to the specific installation, the licensee's activities on the site and its management systems.

Safety assessment by the licensee

4.9. Safety justifications to demonstrate compliance with legal requirements ('safety cases') are required prior to the start of construction, before commissioning, before first

operation, after steady reliable operation has been achieved, before plant modification and prior to decommissioning. During the operational and decommissioning phases, the safety case is updated as necessary to reflect changes to plant or procedures, new safety analysis techniques, research findings and the outcome of PSRs.

4.10. The licensees also have processes for recording and investigating events on site. More significant issues are raised as 'incidents' through reporting arrangements in place between licensees and ONR in line with the requirements of LC7 (Incidents on the site). The condition requires the licensees to make adequate arrangements for the notification, recording, investigation and reporting of incidents on site. If appropriate, for example as a result of an investigation into an incident, the safety case would be adjusted to reflect the findings.

4.11. The licensee is responsible for the preparation and maintenance of the safety case, which it must fully understand and make use of at all stages of the site's life. Licensees' management systems, required under LC17 (Management systems), 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.

4.12. The safety case is the totality of the documented information and arguments that substantiate the safety of the plant, activities, operations and modifications. ONR does not prescribe the format of safety cases but ONR's SAPs, which provide guidance to ONR inspectors, set out what a safety case must demonstrate (paras 0–0). The safety case demonstrates in writing that the plant, its processes, activities and any modifications:

- meet the design safety requirements and criteria;
- conform to good nuclear engineering practice and to appropriate standards and codes of practice, or other relevant good practice (e.g. use of the concepts of 'defence-in-depth' and 'adequate safety margins');
- 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;
- have a defined and acceptable operating envelope, with defined limits and conditions, and the means to keep within the envelope (safety management).

4.13. The major licensees have developed their own Nuclear Safety Principles that set down the deterministic and probabilistic acceptance criteria against which they judge each safety case. Some UK NPPs have recently undertaken major projects that significantly enhance the visibility, traceability and user-friendliness of their safety cases.

4.14. For the majority of the UK's operational nuclear installations that are already in the latter stages of their operating lives, or are undergoing defuelling and decommissioning, the current emphasis is on the PSRs and on pre-decommissioning work such as environmental impact studies.

4.15. All but one of the Magnox sites has ceased generation. To date, at each change of phase, the licensee has produced a new safety case, which reflects the changed hazard after permanent shutdown, final removal of fuel etc. These have been produced

independently of the PSR cycle. Magnox Ltd is now moving to align these, so that in addition to a new safety case it is also ensuring that it completes a PSR at the same time, thus setting a completely new baseline for the plant.

4.16. New guidance on the licensing process has been published to inform potential licensees preparing to embark on a programme of constructing new NPPs (Ref 21). The broad principle of pre-construction and pre-operation reports was retained, but the amended process recognised the international nature of possible vendors and potential licensees, and a generic approach to early assessment of the design. For the first time it allowed the granting of a nuclear site licence, but not permission to start construction, prior to supply of a pre-construction safety report (PCSR).

4.17. Under the new guidance, the initial assessment and verification of the safety of a nuclear installation starts before construction commences. An outline NPP design, described in a generic PCSR, is prepared concentrating on the 'nuclear island', that portion of the NPP design that is independent of the choice of NPP geographical location. Site-specific information detailing how the generic design has been applied given the specifics of the site is added to this generic PCSR to create a site-specific PCSR. ONR carries out a GDA of the generic PCSR and a site-specific assessment of the site-specific PCSR.

Periodic reviews of the safety case

4.18. Major PSRs are carried out by licensees, no later than every ten years (or when subject to a review following a major event on the site or elsewhere). ONR's TAG50 (Ref 22) sets out what ONR expects to see in the PSR.

4.19. The UK has been undertaking safety reviews of its 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 ten years.

4.20. The rationale for selecting ten years as the review period was chosen 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', SSG-25. The legal basis for PSRs in the UK is embodied in LC15 (para 4.5).

4.21. Also, 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.

4.22. 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. Throughout this time, the safety

case must remain valid and, before any significant changes occur, it must be updated and revalidated. Additional to this ongoing process, the PSR is designed to ensure that there is a thorough and comprehensive review of the safety case at regular intervals throughout a nuclear installation'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 and assessment of the impact of proposed changes, which are 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.

4.23. The objectives of the PSRs are to:

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

4.24. In reviewing the totality of its existing 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;
- various engineering improvements introduced during the operational lifetime which have enhanced safety;
- numerous safety assessments undertaken during the plant's life.

4.25. 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, taking the expected future life of the plant into account.

4.26. Another essential element of the review is for all structures, systems, or components susceptible to ageing or degradation to be reviewed, 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.

4.27. The PSR must also demonstrate that the safety case is not limited to design basis events, but should also consider the resilience of the plant, staff and processes to events beyond the design basis.

4.28. 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 ONR. 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 on the continuing validity of the safety case, this would require the licensee to resolve the matter to ONR's satisfaction.

4.29. The results of the PSRs have produced, and continue to produce, worthwhile improvements to safety. So far, for the current operating fleet the PSR process has not revealed any factors seriously prejudicial to the continued operation in the foreseeable future of any operating nuclear installation. However, the first reviews 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 a vital part of ONR's monitoring of an operator's performance, and an essential input to any agreement by ONR to the continued operation of any nuclear installation. In some cases, the licensees decided not to continue with operation in the light of PSR findings.

4.30. As well as the PSRs, major reviews are undertaken every two or three years for generating sites and some other sites coincident with periodic shutdowns, carried out in accordance with LC30 (Periodic shutdown) for the purpose of enabling examination, inspection, maintenance and testing. The review findings are used to update the safety case and provide a justification for a further period of operation (usually 1.5, 2 or 3 years until the next periodic shutdown). The focus is on plant inspection results and any modifications completed during the outage, to demonstrate that adequate safety margins will continue to exist throughout the subsequent operating period. Permission from ONR for start-up is required at the end of each periodic shutdown.

4.31. In addition to the programme of inspections that ONR undertakes throughout the year, a meeting is held between ONR and the licensee at the nuclear licensed site. This is termed an annual review of safety. The purpose of the meeting is to review the plant and safety case status to maintain an overview of the position.

Prevention of accidents and mitigation of consequences

Article 6

3. The assessments referred to in paragraph 2 shall include verification that measures are in place for prevention of accidents and mitigation of consequences of accidents, including verification of the physical barriers and licence holder's administrative procedures of protection that would have to fail before workers and the general public would be significantly affected by ionizing radiations.

Safety analysis methodology

4.32. The licensees' analyses of normal operating conditions show that resultant radiation doses due to ionising radiations, both to members of the workforce and the public, are, and will continue to be, below regulatory limits and, furthermore, are ALARP.

4.33. 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 for design basis faults of deterministic and probabilistic assessment. 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. The deterministic approach is used in the analysis of design basis accidents to demonstrate the capability of the safety systems. As part of this approach, the licensees are expected to ensure that a small change in design basis parameters does not lead to a disproportionate increase in radiological consequences. Analyses are also undertaken of more severe faults outside the design basis, which could lead to large releases of radioactivity. These severe accident analyses include study 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.

4.34. The PSA provides a comprehensive, systematic numerical analysis of the risk from the plant to demonstrate its acceptability, by analysing the consequences and the frequency of a large number of potential fault sequences. Currently, Sizewell B and the AGRs have established 'Living PSA programmes'". UK regulation is not prescriptive; however, there is a requirement that licensees will follow good international practice when developing their safety documentation and their processes. In this regard, the living PSA programmes established by operational reactor licensees have been developed based on IAEA-TECDOC-1106.

4.35. The discussions above reflect the approach used on the reactor sites. For other sites, similar approaches are used, but through techniques, methodologies and depth of assessment appropriate to the different plant and reflecting the different nature of the hazards.

4.36. Safety documentation also provides the basis for the management for 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 controls and limits determined by the safety analysis within the safety case.

4.37. 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 development. The licensees put systems in place to manage the changes to the safety cases properly 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 management systems required by LC17, and any changes to the safety case are regulated as modifications under LC22.

4.38. 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 is developed mainly by a design team that eventually hands over responsibility to the operator. Management systems define how information is transferred, demonstrate that there are mechanisms in place to ensure that responsibilities are clear, and make sure that the case is fully adopted and implemented.

4.39. In order to meet the LCs, 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.

4.40. All licensees categorise the safety significance of safety documentation and proposals to modify the safety cases. This is to ensure that the degree of assessment and verification and the choice of clearance route 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 in terms of its category and content through an independent nuclear safety assessment (INSA) 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;
- formally agreed by ONR.

4.41. At the lowest level of safety significance, the station director, in the case of NPPs, or suitably authorised personnel in other installations, may authorise and implement the proposal, but sufficient documentary evidence must be prepared to justify the category allocated, and ensure this evidence is available for auditing if needed.

4.42. Licensees in the UK also make extensive use of external international peer reviews through the World Association of Nuclear Operators (WANO). The UK is also in the process of inviting an IAEA OSART mission to the UK.

Main elements of on-site emergency arrangements

4.43. LC11 requires the licensee to make and implement adequate arrangements for dealing with any accident or emergency arising on the site and their effects. The licensees have therefore produced an emergency plan for each site, which includes:

- a description of the organisation that is set up on the site to manage the emergency;
- responsibilities of personnel in the emergency organisation;
- training requirements for personnel;
- equipment for use in an emergency;
- arrangements for liaison with emergency services on the site;
- radiological monitoring of the environment on and around the site;
- communications with organisations off the site.

4.44. LC11 also requires rehearsal of the arrangements to ensure their effectiveness. This is achieved by the licensee holding training exercises and ONR agreeing to a programme of demonstration emergency exercises during which inspectors from ONR formally observe and judge the licensee's performance. ONR can specify that exercises cover all or part of the arrangements. This power would be used if ONR was not satisfied with an aspect of the licensee's performance and the licensee did not agree or volunteer to improve and repeat the exercise.

4.45. ONR's consent is normally required to bring nuclear fuel onto a site for the first time. As part of the assurances that ONR require prior to granting this consent, appropriate emergency and evacuation arrangements must be demonstrated, and an on-site Emergency Plan that is in the public domain must be approved. This plan cannot then then be changed without the further approval of ONR. Relevant considerations for providing the consent include sufficient trained personnel and suitable available equipment to deal with the risks from hazards on the site. Similarly, ONR's consent may be required at stages specified by ONR relating to key increases in hazard on the site during the active commissioning process, for example in which reactor plant is brought from initial criticality up to its full reactor power rating. At any of these stages, ONR may require a demonstration of enhanced emergency arrangements prior to the granting of Consent to proceed to the next stage. This may be through an examination of the training records for all staff affected, or by means of a demonstration exercise that staff from ONR formally observe. Throughout the life of the nuclear installation, the emergency arrangements are subject to review and, with ONR's approval as described above, revised as appropriate.

Licensee's management systems

Article 6

4. Member States shall ensure that the national framework in place requires licence holders to establish and implement management systems which give due priority to nuclear safety and are regularly verified by the competent regulatory authority.

4.46. In July 2011, ONR varied its standard LC17 (Management systems) in order to transpose the obligation in this article into UK law. The principal change is that a duty is now placed on licensees to establish and implement management systems which give due priority to safety. In recognition of this change, LC17 is now titled 'Management systems' rather than 'Quality assurance'. In addition, LC17(2) 'Quality assurance arrangements' now refers to 'Quality management arrangements' to reflect modern terminology. In response to the change in emphasis in LC17, ONR revised its internal guidance to inspectors.

4.47. ONR requires that a licensee's quality management arrangements are based on current national or international quality management system standards and that the arrangements adequately address all matters which may affect safety. The licensee may choose to use an integrated management system. This approach is a requirement of GS-R-3 and is encouraged by ONR as it ensures safety is considered in all the licensee's activities and is not confined to the quality / safety management systems.

4.48. ONR requires quality assurance arrangements for procurement to be included in LC17 and therefore inspectors are advised as part of the internal guidance to consider what arrangements the licensee has to guard against poor quality goods / services or counterfeit material relating to safety-significant items. ONR has developed guidance on procurement, TAG077 (Ref 23), to provide further guidance to inspectors addressing this area.

General requirements

4.49. A licensee's management system is developed as part of the arrangements to meet LC17 'Management systems' and is normally derived from the requirements of national and international quality management Codes and Standards such as GS-R-3 and ISO9001 (Ref 24). Furthermore, any significant changes to the licensee's organisational structures or resources are controlled by arrangements made to meet the requirements of LC36 'Organisational capability'.

4.50. 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 competence, the management, control and verification of work and the audit and review of performance. GS-R-3 requires an integrated approach to achieving objectives to ensure that safety is properly taken into account in all the activities.

Safety culture

4.51. Licensees use the management system to promote a strong safety culture. They achieve this by encouraging:

- clear safety leadership from management;
- the ability to question the effective delivery of relevant safety principles and practices, and to report in a timely manner on safety issues;
- training in error prevention methods;
- the development of methods to enhance learning;

- the improvement of safety culture through learning from experience and benchmarking
- monitoring safety performance.

Graded application of management system requirements

4.52. The application of management system requirements is graded by 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 scrutiny, supervision, inspection, monitoring, documentation, training and audit and surveillance are applied according to the safety significance of the plant. It also minimises the potential for error leading to the possibility of severe consequences associated with ill-conceived or inadequately executed activities or equipment failures. Licensees use a well-established process that specifies the control measures to be applied to the activity according requirements in the safety case.

Documentation of the management system

4.53. Licensees typically describe the documentation of the management system in a hierarchical structure. The top tier includes policies, organisational structure, and the mission or principal objectives. The second tier contains processes and procedures and job or post profiles. The third tier normally contains working level instructions and training material

Licensee's resources

Article 6

5. Member States shall ensure that the national framework in place requires licence holders to provide for and maintain adequate financial and human resources to fulfil their obligations with respect to nuclear safety of a nuclear installation, laid down in paragraphs

Financial resources

4.54. Under UK company 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 must also be audited and made available to the public.

4.55. The assets and liabilities of all the Magnox reactors, reprocessing and fuel cycle sites including Sellafield and Dounreay, and nuclear research sites transferred to the Nuclear Decommissioning Authority (NDA) in April 2005. NDA was established as a new non-departmental public body which came into being in April 2005. Each site is operated by a licensee, which NDA refers to as a Site Licence Company (SLC). Work on the site is funded by the UK Government through NDA, which has a contract with the licensee on each site. Finance is therefore provided by the UK Government.

4.56. The AGR stations and the PWR station at Sizewell B are owned by EDF NGL, who must comply with UK company law as described above.

4.57. 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 a nuclear installation's decommissioning costs. In particular, EDF NGL's decommissioning costs are to be met from the Nuclear Liabilities Fund (NLF) established for this purpose when the company was restructured in 2005.

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

4.59. When issuing a licence to an organisation for the first time, ONR seeks advice from DECC that the prospective licensee has the resources to be a nuclear site licensee for the activities envisaged. NIA65 permits only a corporate body to be a nuclear site licence holder. This provides some assurance of continuity of commitment even if that company is taken over by, or merges with, another one.

4.60. In July 2011, ONR modified the standard set of conditions attached to the nuclear site licence for all licensed sites to require licensees to provide and maintain adequate financial and human resources to fulfil their obligations in respect of nuclear safety. This requirement was introduced to ensure that the Nuclear Safety Directive was fully implemented in Great Britain. LC36 (Organisational capability) was amended to include the requirement as LC36(1). ONR has issued guidance on how this requirement should be interpreted by its inspectors (Ref 25). The essence of this guidance is that ONR gains confidence that licensees provide and maintain adequate financial resources to fulfil their obligations in respect of safety by demonstrably understanding and managing the hazards and risks associated with their undertakings. This means that they are reducing risk SFAIRP and implementing improvements in a timely manner; maintaining an adequate human resource capability; assessing what financial resources are necessary to continue to meet those needs; and assigning those resources accordingly. Although it has not yet happened, if a safety issue could not be resolved to the satisfaction of the inspector, and financial resource issues were identified as a possible factor, ONR would seek appropriate external advice on the issue.

Financing safety improvements during operational life

4.61. 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. The principal elements of operating costs comprise:

- maintaining and enhancing safety;
- 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);
- depreciation (representing the proportion of the fixed assets written off in relation to the accounting life).

4.62. As with any other expenditure, the licensee's internal financial control processes determine the authority required before commitments are made to make safety or any other improvements. These processes examine the impact on the licensee's 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 commercial activities.

Provision of resources

4.63. LC36 was introduced specifically to guard against any downward drift in a licensee's resources as a consequence of ill-considered cost-cutting. The licensee determines the resources necessary to carry out its activities during the planning of its management systems and the planning of any operation or work activity. The minimum level of competent personnel for activities that may affect safety is included in a baseline statement.

4.64. The required competence for personnel, particularly for those whose work may affect safety, is determined and documented in a post profile. Training is provided using a structured and systematic approach and is assessed to ensure that required standards are achieved. Continuing competence is assessed through supervision and appraisal and, for critical work, refresher training is provided. Increasingly, use is made of external resources, such as contractors to undertake specific projects, but it remains the licensees' responsibility to ensure the competence of contractors.

Article 7 – Expertise and skills in nuclear safety

Article 7

Member States shall ensure that the national framework in place requires arrangements for education and training to be made by all parties for their staff having responsibilities relating to the nuclear safety of nuclear installation in order to maintain and to further develop expertise and skills in nuclear safety.

Regulatory background

5.1. HSWA74 places responsibility for safety on every employer on the licensed site. 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 (Ref 8), in particular Regulation 13 on capabilities and training.

5.2. In addition, several licence conditions set goals on training and the management of human resources. LC10 (Training) requires the licensee to make and implement adequate arrangements for suitable training of all persons on site who have responsibility for any operations which may affect safety. LC12 (Duly authorised and other suitably qualified and experienced persons) 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 operations.

5.3. The licensees' arrangements made under other licence conditions such as LC22 (Modification or experiment on existing plant), LC11 (Emergency arrangements) and LC36 (Organisational capability) also require that the licensee should address human resource and training issues.

5.4. ONR's role is to inspect the adequacy of, and compliance with, the arrangements made under the LCs. Under normal circumstances, ONR 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 authorised person.

5.5. Training and human resource issues are addressed by nuclear inspectors when they are reviewing safety documentation against ONR's SAPs (Ref 15), ensuring 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.

5.6. In order to comply with regulatory requirements, a licensee must demonstrate to ONR'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;
- 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 arrangements to satisfy the requirements of the relevant LCs.

Licensees' training programmes

Qualifications, experience and training

5.7. For all tasks undertaken on site, licensees' and contractors' staff must be shown to be competent in their duties and understand the safety implications of the work. The licensee for a site ensures that, for each role with a responsibility for safety, the duties, responsibilities and competencies for the role are identified and that the training needs of an individual to fulfil that role are met.

5.8. The assessed competence requirements for a specific role are achieved by a combination of:

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

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

5.9. LC12 (Duly authorised and other suitably qualified and experienced persons) 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 (SQEP).

5.10. LC12 further provides for the appointment of duly authorised persons (DAP). DAPs are identified as individuals who are in direct control or supervision of operations or activities that impact on the safety envelope of the facility. Their appointments are therefore subject to additional management controls covering areas such as appointment and assessment. However, the general principle that persons whose activities may impact upon nuclear safety should be appropriately trained, and their competence adequately assured, is similar for SQEPs and DAPs.

5.11. ONR does not assess the competence of licensee staff directly, or authorise, (e.g. reactor desk engineers) as is the case in some regulatory regimes. ONR's approach is to seek confidence that the licensee has put in place, and is implementing, effective arrangements for training and competence assurance for all personnel whose activities may impact upon plant safety. This should cover both licensee employees and others such as contractors whose actions could impact upon nuclear safety.

5.12. Computer-based simulators are available for all operating reactors and form part of the training of plant operators. The simulators are capable of simulating a range of accident conditions.

Training of external personnel

5.13. 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.

5.14. When safety analysis work and/or inspection work (e.g. non-destructive testing and examination) is contracted to organisations external to the licensee, ONR requires the 'intelligent customer' approach. This means that the licensee should have sufficient in-

house expertise to specify, set up contracts, manage and, if necessary, challenge the work of contractors.

5.15. In the UK, licensees are responsible for ensuring the safety on the licensed site and are required under LC17 (Management systems) to establish and implement management systems that give due priority to safety. Licensees are therefore responsible for ensuring, amongst other things, that their contractors are suitable for the work that they do. ONR 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 require licensees to have appropriate quality management systems in place and ONR inspectors carry out inspections to ensure that these arrangements are to satisfactory standards. For critical components, such inspections may also involve examination of the quality management arrangements of suppliers or contractors. However, it is always the licensees' responsibility to ensure that these arrangements are adequate.

Periodic review

5.16. The performance of a licensee's employees is assessed regularly by their line managers as part of the performance management processes. This requires periodic formal performance reviews, which are recorded. These reviews will identify any corrective or development actions. Although the performance review process itself is not a requirement of LC10 (Training), these actions will then be fed into the overall training plan for sites as required by LC10.

Training programme development

5.17. 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 arrangements for compliance with LC22 (Modification or experiment on existing plant), 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 ONR, 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 to improve training

5.18. LC7 requires the licensees to develop adequate arrangements for the notification, investigation and reporting of incidents on site. The licensee's arrangements for investigations include determining whether deficiencies are part of the cause and identifying any necessary actions to correct them.

5.19. 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 licensees' staff and also routine and team inspections by ONR inspectors.

Competence of instructors

5.20. Training instructors are 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 on how to present training materials to best effect. Arrangements are in place for line managers to assess the performance of instructors, and feedback is also provided by the staff receiving instruction.

Technical support resources

5.21. Licensees' engineering and technical capability comprises staff at operating NPPs and at central HQ locations. These staff provide the in-house resource available to respond to requirements for technical analyses and informed action. 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 each licensee's operating locations. In these areas, there may be technical support from, and collaboration with, other licensees.

5.22. Each licensed nuclear site has engineering and technical support staff that 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 site director, for ensuring that nuclear safety cases are prepared at the location, in the central organisation, or externally. They are also responsible for the preparation, review and development of the written instructions for operational staff.

5.23. For the major licensees, and most of the others, a central engineering and technical organisation provides technical support to all the licensees' locations. This includes providing specialists in key technical and safety areas which are specific to a licensee's plants. These staff understand the design of the plants 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.

5.24. Each 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.

Maintaining and enhancing the national nuclear skill base

5.25. The nuclear sector currently employs around 44,000 people in the UK. Existing operations, decommissioning and clean-up, together with a potential programme of new nuclear build, means the nuclear industry has a sustained recruitment demand and continued requirement for skills training and refreshment of the workforce.

5.26. Skill gaps are projected for the nuclear industry. Research led by Cogent, which is an industry-led skills council for a number of industries, including nuclear, analysed the

workforce requirements for new nuclear power station build and operation. This research indicated that 1000 new apprentices and 1000 new graduates with a science, technology, engineering or mathematics qualification are required each year to support existing operations and new build activity throughout the industry and supply chain.

5.27. Government is working closely with Cogent, the National Skills Academy for Nuclear (NSA Nuclear) (Ref 26), and the industry to ensure that the UK has a clear, shared understanding of the key skills priorities for the nuclear sector, and how skills demand can be met. NSA Nuclear was set up in January 2008 specifically to develop the capacity and capability of the UK nuclear workforce. By working with existing training providers across the UK, it provides more than 1000 apprenticeships and 150 foundation degrees in the sector. Cogent and NSA Nuclear have been working on developing training standards that are applicable to the whole industry. NSA Nuclear has also developed a Nuclear Skills Passport which will provide all employees and contractors in the nuclear sector with a physical record of their industry-specific training and qualifications, assisting both employers and employees.

5.28. In addition, the NDA has a statutory duty as set out in the Energy Act of 2004 to take appropriate action to ensure that adequate skills are available for it to carry out its duties and has budget allocated annually to develop the skills needed to deliver its objectives through a Skills and Capability Strategy.

5.29. The National Nuclear Laboratory, based in Cumbria, demonstrates the Government's commitment to protect and grow the UK's national nuclear technology capability and skills base. The National Nuclear Laboratory holds a significant breadth of technology expertise. Some 500 staff at the £250-million purpose-built facility run a wide range of radioactive and non-radioactive experimental programmes, as well as offering a wide range of analytical services.

5.30. At university level there has been a very positive response to the shortage of graduates entering the industry. A number of new postgraduate nuclear courses have been set up, 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 in many years there will be the chance to obtain a degree in nuclear engineering. Also, the number of students undertaking postgraduate research is increasing. Finally, the University of Manchester has set up a Nuclear Centre which offers a range of courses and research on nuclear topics.

Training of regulatory personnel

5.31. Training of regulatory personnel is not covered by this article and has already been described under Article 5.1 (paras 3.1–0).

Article 8 – Information to the public

Article 8

Member States shall ensure that information in relation to the regulation of nuclear safety is made available to the workers and the general public. This obligation includes ensuring that the competent regulatory authority informs the public in the fields of its competence. Information shall be made available to the public in accordance with national legislation and international obligations, provided that this does not jeopardise other interests such as, inter alia, security, recognised in national legislation or international obligations.

Freedom of Information Act 2000

6.1. The Freedom of Information (FOI) Act 2000 (Ref 27) establishes a general right of access to all types of recorded information held by all Government organisations, including ONR. It places a duty on ONR to say whether it holds the information and, if it does, to provide it to the applicant unless an exemption applies. This process must be completed within 20 working days. The Act is retrospective and therefore applies to historical documentation as well as that generated more recently. The rights to ONR information conferred by the Act apply to everyone, anywhere in the world. The Act is 'reason blind', which means that information can be requested for any purpose.

Openness and transparency of the regulatory body

6.2. For ONR, openness and transparency means proactively adopting a presumption of disclosure of information on its own activities. As part of its wider Change Programme, ONR established a dedicated project to develop ideas and implement these in order to enhance openness and transparency in all its activities.

6.3. One of the key outputs of this project was introduction of a process to publish all ONR's major regulatory decisions. These are now published on ONR's website, with details underpinning each decision.

6.4. ONR demonstrated its commitment to openness and transparency during the GDA of the new reactor design, both throughout the process and by publication of the final assessment reports of its findings and regulatory decisions on the UK EPR™. *The good practices on openness and transparency identified during the GDA process have been captured and transferred to the rest of ONR's programmes, where appropriate.*

6.5. In June 2012, as part of its contribution to a cross-nuclear industry forum, ONR shared its strategic themes and regulatory priorities with the industry and identified a number of licensee / dutyholder issues on which it is seeking progress.

6.6. ONR is currently piloting the publication of its intervention reports. These reports provide details of ONR's findings whilst carrying out its inspection and other regulatory activities.

6.7. Every three months, ONR produces a report for each licensed site which summarises its regulatory activities associated with the site. As well as being published

on ONR's website, the report for a site is forwarded to the members of the local community group for that site and is usually presented at the three-monthly meeting of the group.

6.8. TEA13 requires ONR to produce and publish three key documents:

- a strategy for carrying out its functions;
- an annual plan for carrying out its functions;
- a report to the Secretary of State on the performance of the ONR's functions.

The latest versions of these documents are available on ONR's website (Refs 28–30).

6.9. Furthermore, In common with all other Government departments, ONR must comply with the FOI Act 2000 (Ref 27) and Environmental Information Regulations 2004 (Ref 30). ONR has a dedicated team to handle requests for these two items of legislation. As a public body, the ONR is required to issue its own publication scheme, setting out the categories of information it publishes and how the public can access that information.

6.10. ONR also participates in international initiatives from the Organisation for Economic Cooperation and Development Nuclear Energy Agency (OECD-NEA) and WENRA to promote openness and transparency.

Openness and transparency of the licensees

6.11. Licensees adopt a policy of openness and transparency and place importance on assuring the public that they can be trusted to act to the highest professional standards. It is recognised that further work needs to be done in this area. As an example, EDF NGL has a series of workstreams to further improve this area.

6.12. The openness and transparency policy requires site or station directors to write to local stakeholder groups regularly, providing updates on safety and operational performance as well as details of specific events reported through the recording processes.

6.13. Regular local community meetings are held at all nuclear licensed sites to give updates on developments, with regulators in attendance to present their reports. In addition, monthly newsletters are circulated to the community and local media and also published on the company website for all to see.

6.14. Visitor centres have recently opened at all seven EDF NGL sites.

6.15. In addition, the UK nuclear industry openly shares information with other nuclear operators across the globe through international organisations such as WANO). Such arrangements enable the operators to learn from the experience of others. They also regularly 'peer review' other plants and operations internationally. This information is passed freely and frequently to promote behaviours throughout the organisation that support safe and reliable operation.

Annex 1 – Glossary and abbreviations

AGR	Advanced gas-cooled reactor
ALARA	As low as reasonably achievable
ALARP	As low as reasonably practicable
AR	Assessment report
DAP	Duly authorised person
DBA	Design basis assessment
DECC	Department of Energy and Climate Change
HSWA74	Health and Safety at Work etc. Act 1974 (Ref 3)
INSA	Independent nuclear safety assessment
IRR99	Ionising Radiations Regulations 1999 (Ref 6)
LC	Licence condition
NDA	Nuclear Decommissioning Authority
NIA65	Nuclear Installations Act 1965, (Ref 5)
OEF	Operating experience feedback
ONR	Office for Nuclear Regulation
PAR	Project assessment report
PCPV	Pre-stressed concrete pressure vessel
PSA	Probabilistic safety assessment
PSR	Periodic safety review
PWR	Pressurised water reactor
RPV	Reactor pressure vessel
R2P2	Reducing risks, protecting people (Ref 16)
SAP	Safety assessment principles
SFAIRP	So far as is reasonably practicable
SQEP	Suitably qualified and experienced person
TAG	Technical assessment guide
TEA13	Energy Act 2013 (Ref 4)

Annex 2 – Civil nuclear installations in UK

Site	Plants	Status	Spent fuel storage	Comments
Enrichment plants				
Capenhurst	Fuel enrichment plant	Operating	None	
Nuclear fuel fabrication plants				
Springfields	Magnox fuel production plant	Decommissioning	None	
	Oxide fuel production plant	Operating	None	
Nuclear power plants – pressurised water reactors (PWR)				
Sizewell B	1250 MWe PWR	Operating	1 pond	
Hinkley Point C	2x EPR™	Planned	1 pond	
Nuclear power plants – advanced gas-cooled reactors (AGR)				
Dungeness B	2x615 MWe AGR	Operating	1 pond	
Hartlepool	2x655 MWe AGR	Operating	1 pond	
Heysham 1	2x625 MWe AGR	Operating	1 pond	
Heysham 2	2x680 MWe AGR	Operating	1 pond	
Hinkley Point B	2x655 MWe AGR	Operating	1 pond	

Site	Plants	Status	Spent fuel storage	Comments
Hunterston B	2x644 MWe AGR	Operating	1 pond	
Torness	2x682 MWe AGR	Operating	1 pond	
Nuclear power plants – Magnox reactors				
Berkeley	2 x Magnox	Decommissioning	None	
Bradwell	2 x Magnox	Decommissioning	None	
Calder Hall	4 x Magnox	Defuelling	None	Fuel is transferred from the reactor to flasks to transfer to Sellafield
Chapelcross	2 x Magnox	Decommissioning	None	
Dungeness A	2 x Magnox	Decommissioning	None	
Hinkley Point A	2 x Magnox	Decommissioning	None	
Hunterston A	2 x Magnox	Decommissioning	None	
Oldbury	2 x Magnox	Defuelling		
Sizewell A	2 x Magnox	Defuelling	None	
Trawsfynydd	2 x Magnox	Decommissioning	None	
Wylfa	Reactor 1 – 500 MWe	Operating	3 dry storage cells	
	Reactor 2	Permanently shut down		

Site	Plants	Status	Spent fuel storage	Comments
Reprocessing plants				
Sellafield	Magnox fuel reprocessing plant	Operating	See footnote [1]	
	Oxide fuel reprocessing plant	Operating		
Dounreay	Prototype Fast Reactor (PFR)	Defuelled	Some fuel stored in pond	
	Demonstration Fast Reactor (DFR)	Defuelling	In reactor only	Fuel pond has been emptied
	Fuel Cycle Area (FCA) – fast reactor fuel	Decommissioning	Some fuel stored in a cave	

[1] The original Windscale reactor pond built between 1948 and 1952 was subsequently modified to handle Magnox fuel from the Calder Hall reactors, which it did until 1960.

A second pond operated from 1960 until 1986 as a receipt, storage and de-canning facility for Magnox fuel. An adjacent pond has operated since 1965 for the storage of oxide fuel, comprising receipt facilities, services and storage pond with bays built between 1965 and 1982. It also stores empty high-integrity, multi-element bottles that have been used in LWR fuel transport and storage, prior to their disposal.

A further separate pond has operated since 1982 for the storage of AGR fuel received directly from the power stations or from FHP. Fuel is stored prior to processing, after which dismantled fuel is dispatched to THORP Receipt and Storage ponds in internal transit flasks.

The FHP pond opened in 1984 comprising three bays, two of which are currently used for Magnox fuel storage and one for AGR fuel. Magnox fuel is typically stored for six months to allow radioactive decay of short-lived isotopes. AGR fuel is stored for some years before being sent to THORP for reprocessing. Storage arrangements are carefully designed to eliminate the potential for criticality events.

The THORP Receipt and Storage Ponds opened in 1988 and act as a temporary store for AGR fuel and LWR fuel en route to reprocessing.

Site	Plants	Status	Spent fuel storage	Comments
	reprocessing plant			
Nuclear research facilities				
Harwell	BEPO research reactor	Care and maintenance	Small amount of research reactor fuel	All reactors have been decommissioned to a state where they can be left for radioactive nuclides to decay before final decommissioning.
	PLUTO research reactor	Care and maintenance		
	DIDO research reactor	Care and maintenance		
Winfrith	Steam-generating heavy water reactor (SGHWR)	Decommissioning	None	
	DRAGON research reactor	Decommissioning		
Research reactors				
Imperial College	CONSORT II research reactor	Defuelling	None	

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