TEXT OF UK PRESENTATION TO THE SECOND MEETING OF THE CONTRACTING PARTIES TO THE CONVENTION ON NUCLEAR SAFETY, VIENNA, APRIL 2002

By LG Williams, HM Chief Inspector of Nuclear Installations

INTRODUCTION

1. In the next hour or so, my intention is to take you through the key features of the UK national report covering in particular the main issues, the concerns of other contracting parties, actions from the 1999 CNS meeting and any significant developments since the publication of our report.

2. I will concentrate on:

- A brief description of the UK's nuclear installations;
- The legal framework for nuclear safety regulation;
- The regulatory body;
- How our report addresses the issues arising from the first meeting of the CNS in 1999;
- The key issues arising from the written questions we received.

3. The UK report, in line with the scope of the Convention, only considers nuclear power reactors. However, the same equivalent high level of safety covers UK's other nuclear Installations.

4. The UK report addresses all the relevant Articles i.e. Articles 6-19 and as such we consider that it fulfils all the obligations placed on the Contracting Parties and demonstrates how the UK meets the objectives set out in Article 1. No corrective actions were required to enable UK installations to comply with the Convention.

5. The Nuclear Safety Convention has three main objectives namely:

- To achieve and maintain a high level of nuclear safety world-wide through the enhancement of national measures and international cooperation including, where appropriate, safety related technical cooperation;
- To establish and maintain effective protection for individuals, society and the environment from harmful effects of ionising radiation from such installations; and
- To prevent accidents with radiological consequences and to mitigate such consequences should they occur.

6. The UK believes that these objectives are of immense value and we are fully supportive of the contribution the Convention makes to global nuclear safety. To realise this however, it is important for Member States to fully embrace the intent of the Convention and to report in an open and frank way. We have attempted to do this.

ARTICLE 6 – EXISTING NUCLEAR POWER INSTALLATIONS IN UK

The first reactors

7. The UK's nuclear power stations date back to 1953 when the decision was taken to replace the military piles at Windscale with closed circuit CO2 cooled reactors that would produce electric power for the national grid. The first of the eight reactors went critical in 1956 and all eight reactors at Calder Hall and Chapelcross are still operating. These reactors were the forerunners of the UK's Magnox Reactor programme.

8. The name Magnox came from the Magnesium alloy cladding of the metallic, natural uranium fuel rods. In this first generation programme, in addition to the 8 small (50 MW) reactors at Calder Hall and Chapelcross, the UK built another 14 steel pressure vessel reactors, starting in 1962 with the Berkeley and Bradwell Stations. The Magnox programme concluded with an additional 4 prestressed concrete pressure vessel reactors at Oldbury and Wylfa. Wylfa went critical in 1971. This gave a total of 26 Magnox reactors with a designed output of 5142 MW.

The Advanced Gas-Cooled Reactors (AGRs)

9. The Magnox reactors reached their limit of practicability with the Wylfa design and it was recognised that higher power reactors could only be achieved using enriched uranium fuel. The second generation gas cooled nuclear power stations, the Advanced Gas cooled reactors (AGR) were based on the design of a small prototype the UK had developed at Windscale, which used ceramic uranium dioxide fuel clad in stainless steel. The enriched fuel meant that the core was much smaller than the Magnox reactors. This, together with the use of pre-stressed concrete pressure vessels, enabled the achievement of higher coolant pressures and temperatures and hence power output.

10. Following on from the small-scale prototype at Windscale, which entered service in 1963, a programme of AGRs was ordered in the mid 1960's.

11. The first AGR power station started construction at Dungeness in 1965, but due to design and construction problems it did not go critical until 1983. Other AGR's at Hinkley Point and Hunterston in Scotland fared much better and went critical in 1976. The final and most advanced AGR's went into operation in 1988 at Heysham 2 and Torness. In total the UK built 14 AGR's on 7 power station sites with a design output of 8892 MW.

12. The initial design difficulties and poor construction record of the AGR's persuaded the UK to adopt PWR technology and in 1986 the government gave permission to construct the UK's first commercial PWR nuclear power station at Sizewell B. This first went critical in 1995 and remains our only PWR.

Prototype Reactors

13. Alongside it's Magnox, AGR and PWR programmes the UK developed a number of alternative power reactor designs. A third generation gas cooled reactor to achieve even higher thermal efficiency based upon ceramic fuel in the form of silicon carbide pebbles and with a helium coolant was designed in the late 1960's to build upon the DRAGON reactor experience at Winfrith. A commercial design for an HTR at Oldbury was available in 1971. The UK was also developing water reactor technology and a prototype Steam Generating Heavy Water Reactor was built at Winfirth with a power output of 100 Mwe. Commercial designs were produced but with the abundance of oil in the early 1970's the SGHWR and the HTR were never developed commercially. The UK also invested considerable R&D effort on fast breeder reactor development and two prototype reactors were built at Dounreay in Scotland. The larger reactor with an electrical output of almost 300 MW was finally shutdown in 1994.

14. Nuclear generation currently contributes just over 20% of UK capacity. The 8 Reactors at Calder Hall and Chapelcross continue to operate as do the 4 PCPV Magnox reactors, the 14 Advanced Gas-Cooled Reactors and the PWR at Sizewell B. Only 4 of original commercial programme 14 steel pressure vessel Magnox reactors are still operating. Bradwell closed at end of March thus Sizewell A & Dungeness A are only remaining operating Magnox with Steel RPVs

The Safety and Upgrading of Older reactors

15. The continued operation of all UK installations is dictated by many factors the overriding one being safety. All UK plants are licensed by HSE without time limit and the licence stays in place through the period of decommissioning. Licensed sites are subject to close regulatory scrutiny and if the licensees cannot provide an adequate operating safety case HSE has the powers to have a plant shut down, or to prevent start up. An example of this was the final closure of the Magnox power station at Trawsfynydd in Wales because the licensee had failed to make an acceptable safety case to justify the integrity of the RPV. In the end the Licensee judged it would have been too expensive to continue its efforts and decided to start decommissioning.

16. The licensee has prime responsibility for the safety. The nuclear power generation licensees have over many years built up a strong technical expertise, which has delivered a high standard of nuclear safety. This strength in depth has allowed the older installations to be upgraded and enabled the UK to build one of the most advanced PWRs in the world. This expertise coupled with tough regulation has fostered a strong safety culture in the nuclear industry. The licensees recognise the importance of safety and are continually learning from operational feedback using both national and international experience.

17. Periodic safety Reviews, (or their predecessors, the long Term Safety Reviews(LTSRs)) have been completed on all of the UK's Power Reactors except for the Sizewell B PWR. The first PSR for this unit is due in 2005.

18. PSRs confirm that plants are safe to continue to operate for a further 10 years, and that any reasonably practicable improvements have been made, including those arising from a comparison to modern standards. Any features likely to limit the life of the plant are examined and where necessary any monitoring programmes put in place. These are then monitored as part of routine regulatory process.

19. LTSRs /PSRs have resulted in programmes of improvement at all of the older reactors. For the Magnox units these were combined into a generic improvement programme, and some elements of this carried through into the PSRs for the early AGRs. In addition to publishing the LTSR / PSR results the results of the generic programme have also been published.

20. The reviews of the steel pressure vessel Magnox reactors has led to considerable scrutiny of the safety basis of these units, in particular on the codes and methodologies which underwrite the RPV structural integrity, the records and inspection data to support this, and on how data uncertainties are modelled. The remaining steel pressure vessel stations are subject to enhanced monitoring programmes.

21. The PSRs have confirmed that no overriding life limiting mechanisms exist for the PCPV stations, though clearly some technical issues continue to be monitored including relaxation of the post tension and fatigue life of some components. Licensees have been required to re-work their safety basis of critical components to current codes and methodologies.

22. To date 5 Magnox power stations, that is a total of 10 reactors, all with steel pressure vessels, have closed and are at some stage of defuelling and decommissioning. BNFL, who are the operator of the Magnox fleet have announced closure dates for the remainder through to 2011. Implications of the OSPAR convention will mean that Magnox reprocessing will have to be completed by 2020.

23. Predicted closure dates also exist for BE's AGR units, starting with Hinkley B and Hunterston B stations in 2012. However the licensee may decide to seek life extensions to these stations providing that it is economically viable and that a satisfactory safety case can be made to NII.

24. Environmental Impact Assessments will be required before defuelling / decommissioning programmes can be started. These are assessed by NII prior to Consent to start defuelling, which is also dependent on an acceptable safety case.

ARTICLE 7 LEGISLATIVE AND REGULATORY FRAMEWORK

Primary legislation

25. The overarching legislation in the UK for the safety of any industrial activity, including operation of nuclear installations is the HSW Act 1974. This legislation incorporates as a relevant statutory provision those parts of the

Nuclear Installations Act 1965 (As amended) which relate to licensing, inspection and enforcement. The HSW Act ensures that the prime responsibility for the safety of their workers and the public who may be affected by their activities rests with employers.

26. The licensing provisions of the Nuclear Installations Act (NIA) ensure that no person may construct or operate a prescribed nuclear installation without a nuclear site licence. HSE is the body with the power to grant such a licence. HSE has delegated the licensing function and regulatory oversight to the Director of its Nuclear Safety Directorate. The Nuclear Installations Inspectorate (NII) is part of the Nuclear Safety Directorate and its Director is Her Majesty's Chief Inspector of Nuclear Installations. The NIA empowers the Chief Inspector to attach any conditions to the licence as are necessary in the interests of safety.

27. The licensing regime is primarily focused on nuclear safety. Radiation protection legislation is provided by the Ionising Radiation Regulations (IRRs 1999). These regulations provide the UK's compliance with the EU's Basic Safety Standards Directive from ionising radiations, both on and off licensed nuclear sites.

28. The disposal of radioactive waste and the discharge of radioactive materials into the environment are regulated by the Environment Agency in England and Wales and the Scottish Environment Protection Agency in Scotland. The main piece of legislation is the Radioactive Substances Act.

Licensing of Nuclear Power Plant

29. The HSW Act, NI Act, IRRs and the RSA provide the regulatory framework for nuclear safety in the UK. As well as the general legal duties that operators have under the HSW Act, the licensing powers derived from the NI Act enables HSE to put more detailed safety requirements on operators. Under the NI Act no site can be used for installing or operating a nuclear installation unless a licence has been granted by HSE. A licence can only be granted a Corporate Body. The site licence has no set time period but applies throughout the life cycle of the plant i.e. from siting through to decommissioning. Conditions can be attached to the licence in the interests of safety and radioactive waste management and the power to do this is delegated to HM Chief Inspector of Nuclear Installations. The same 36 conditions are currently attached to all site licences

31. These conditions are not prescriptive in terms of detailed safety requirements but are goal setting in that they focus on the issues that are important to the management of safety. They generally require the licensee to "make and implement adequate arrangements" to deliver key safety activities such as the control of modifications. This gives the licensees flexibility in the way they can meet the goals. The details of the LCs are annexed to the UK report. The site licence and the attached conditions provide HSE with a very powerful tool to monitor and, when necessary, control the activities of the licensees.

32. This goal setting regulatory regime calls for, on one hand, extensive technical expertise and resources from the licensees in order that they can achieve and demonstrate high levels of safety and on the other, competent and experienced staff within NII to make sound regulatory judgements.

33. HM Inspectors of Nuclear Installations are empowered to enter and inspect licensed installations to enforce the HSW and NI Acts. The main objective of regulatory inspection is to monitor the licensee's compliance with the requirements of the nuclear site licence and other regulations to ensure safety is being managed properly, and to investigate incidents.

34. Inspectors have a programme to check that the controls imposed by these conditions are adequate to properly control the task in hand, and that they ensure that risks are being minimised. Thus there is a live mechanism to ensure that the highest standards are being applied and that these are kept under continuous review.

35. The nuclear site licence requires the licensee to produce safety cases to demonstrate the safety of a nuclear power plant through all its phases including design, construction, commissioning, operation (including modifications) and decommissioning. NII's licensing and enforcement decisions depend upon the adequacy of these safety cases and such adequacy is determined through the assessment process. Twenty-two of the Licence Conditions require the licensees to make and implement adequate arrangements to fulfil the goal of a particular condition. Arrangements must be in writing and thus can be scrutinised by the NII

36. Assessment of safety cases and arrangements for the management of safety related business is carried out by specialist Nuclear Inspectors. The inspectors who carry out this work are all engineers and scientists educated to first and in many cases second degree level and who have on average at least 10 years industrial experience prior to joining HSE. Through specific support contracts funded from within its budgets NII can contract the support of other specialist assistance from Universities, consultancies and national organisations.

37. The basis of NII's scrutiny of the adequacy of these cases is contained in two documents. The HSE publication "Tolerability of Risks from Nuclear Power Stations (TOR) is referenced in the UK report report. A more recent HSE document, Reducing Risks, Protecting people, builds on TOR as a basis for HSE's regulation of other industrial risks. TOR remains the foundation framework for nuclear safety.

38. The TOR document was published in 1988 as a result of the Sizewell B public inquiry and discusses the levels of risk from nuclear power plants in the context of other industrial and societal risks. TOR places risks into three regions: Unacceptable region (where risks cannot be justified), a broadly acceptable region, and a region between these two where risk is undertaken on if benefit is desired (referred to as the ALARP region). These three regions are embedded in NII's Safety Assessment Principles (SAPs). As well as

providing guidance on sound engineering practise, the SAPs define (probabilistically) basic safety objectives (BSOs) and Basic safety limits (BSLs). The SAPS provide the framework used by NII's assessors for judging whether licensee's safety cases demonstrate adequate safety levels. Again SAPs are publicly available and are referenced in our national report.

39. NII Inspectors also take into account other relevant standards, including those set out by IAEA

40. There are several enforcement tools at the disposal of NII inspectors. These range from verbal or written requests to the licensee to make improvements, through to directions to cease operations. In between these two extremes NII adopts a graded approach depending upon the particular circumstances. Licence instruments are also used to enforce the control of safety related activities such as modifications or freeze arrangements to ensure that the licensee cannot change them without the agreement or consent of the NII. In addition to the licensing powers deriving from the NIA, NII inspectors can use formal written notices (Prohibition and Improvement) that derive from the HSW Act. Failure to comply with the conditions attached to the site licence, or to instruments made under it or other legislation is itself a criminal offence. In the case of a significant breach of the law NII will initiate criminal proceedings and seek prosecution of the licensees in the courts.

41. Other relevant legislation includes the Radiation (Emergency Preparedness) Public Information regulations that were enacted in 2000 to implement the relevant parts of EC Directive 96/29. These require the preparation of emergency plans as well as the provision of relevant information.

42. New legislation is to be brought forward in the near future to put the management of historic radioactive waste liabilities on a formal footing. While most of these relate to nuclear fuel cycle facilities the arrangements will also deal with funding for the decommissioning of the first generation Magnox reactors

ARTICLE 8 – REGULATORY BODY

43. In the UK the regulatory Body for safety from all forms of industrial activity, including nuclear safety is the Health and Safety Executive. The aim of HSE is to implement the policies of the Health and Safety Commission (HSC) for maintaining and improving the health, safety and welfare of persons at work and for protecting the public from the risks associated with work activities. HSE is a body of some 4,000 or so Civil Servants, of whom 162 technical staff work directly on nuclear safety.

44. HSE is independent of the bodies responsible for promotion or utilisation of nuclear energy. HSE is responsible for regulating all industrial health and safety in the UK and it embraces a number of Directorates and Divisions.

45. The principle group relevant here is HSE's Nuclear Safety Directorate which comprises (as at end March 2002) 162 technical staff supported by a further 90 administrative staff. However, it has been recognised that this is insufficient to deal with current licensing demands and authorisation has been given to recruit additional staff. Current plans see the number of nuclear inspectors increasing to around 180 this year but we expect to need more resources soon to deal with the additional work of liabilities management outlined earlier.

46. HSE's Safety Policy Directorate includes a further 3 technical staff and 3 administrators on nuclear related work There are allocated lead staff in HSE's Legal and Press offices who also support nuclear work.

47. The organisation of the Directorate is now aligned to reflect it's key licensees, with each of the three operating divisions having it's own inspection and assessment staff who are expert on the issues facing their specific plant. This operational part of NSD is known collectively as the Nuclear Installations Inspectorate (NII).

48. NSD is funded directly from HSE's funds that are provided by Government. However, it recovers most of its costs by charging the licensees for operating the licensing system and these receipts are returned to the Treasury.

49. A key aspect of the UK's nuclear regulatory system is the role performed by a series of advisory committees. These organisations have a membership drawn principally from the academic world, from employee organisations and from relevant national organisations. Advisory committees have specific individual remits, but in general they are charged with providing an authoritative source of advice separate to the relevant regulatory body. The Nuclear Safety Advisory Committee (NuSAC) and the Ionising Radiation advisory Committee (IRAC are structured to offer such advice to HSC and to government. NuSAC's remit includes advice on design, siting, operation, maintenance, decommissioning, nuclear safety research and emergency preparedness. NuSAC is not directly involved in regulatory matters. On certain topics NuSAC can take evidence from both HSE/NII and licensees. IRAC advises HSC on all matters concerning protection against ionising radiations that are relevant to HSE's remit.

ARTICLE 9 – RESPONSIBILITY OF THE LICENCE HOLDER

50. In the UK legislation makes it quite clear that the holder of the nuclear site licence is responsible for the safety of the nuclear installation and also for the safety of its employees and the public who may be affected by the installation's operations.

51. While the licensee will meet this responsibility by complying with all legal requirements, nuclear safety is ensured by compliance with the following obligations of the site licence: -

- Licensee to produce a safety case for safety related activities;
- Licensee to operate in accordance with safety case;
- Licensee to operate in accordance with its safety management arrangements.

ARTICLE 10 – PRIORITY TO SAFETY

52. The UK believes that the safety of its nuclear installations is of paramount importance. This is reflected through legislation and in particular the stringent requirements of the Nuclear Installations Act with its strict licensing regime, and through the attitude of the licensees who have the day-to-day responsibility for safety. The licensees with responsibility for the UK's nuclear power plants make it quite clear that they regard safety as their top priority and this is reflected in their Safety Policies.

53. They also have clear management accountability. NII requires that Corporate Boards also carry out their own independent monitoring and audit to confirm that their priorities and policies for safety are being met.

ARTICLE 11 –FINANCIAL AND HUMAN RESOURCES

54. The nuclear operators in the UK must demonstrate to the satisfaction of HSE that they have in place adequate resources to discharge their day to day and long term obligations and liabilities connected with their nuclear operations. We keep this requirement under review and currently NII is satisfied with the current provision for dealing with safety improvements and decommissioning liabilities. Our national report contains financial details about these matters.

55. Under the requirements of the nuclear site licence the licensee must ensure that any person carrying out a safety related activity must be suitably qualified and experienced for that task. In addition the licensee must have adequate arrangements for training all its personnel who carry out safety related tasks. This requirement is also applicable to designers of new installations and contractors carrying out safety duties.

56. We believe that currently there are adequate human resources available in the nuclear industry. However, NII keeps this under close regulatory scrutiny and we are closely monitoring the impact of the privatisation of the nuclear power industry that has led to a drive to reduce staffing. We are also looking at the provision of nuclear engineers and scientists to service not only the nuclear industry but also the nuclear regulators in the future. In 1999 we introduced a new licence condition to ensure licensees have adequate controls in place to manage change. The Licence Condition includes a power for NII to Direct a licensee to not implement a proposed change that it considers could prejudice safety. This power has been used.

ARTICLE 12 – HUMAN FACTORS

57. The UK licensees and regulators recognise the importance of the human dimension in ensuring safety. This coupled with strong management of safety systems can provide the basis for continual improvement in operational safety. The HSE has developed and published guidance on the successful management of health and safety for both general application and for nuclear installations that build upon the principles of the ISO 9000 series but expands more on the human and cultural aspects. NII is increasingly using Human Factors specialists in its assessment work and is currently trying to increase its cadre in this area.

ARTICLE 13 – QUALITY ASSURANCE

58. UK has been amongst the leaders in the development of QA standards. The ISO 9000 series has its roots in BS 5750. The UK has also made a significant contribution to the development of the IAEA safety standards in this area. In addition nuclear site licenses have a condition attached to them that require the licensee to have adequate QA arrangements for all matters that affect safety.

ARTICLE 14 – ASSESSMENT AND VERIFICATION

59. The UK believes it complies fully with the requirements of this Article. The licensing system ensures that before any nuclear installation can be constructed, commissioned, operated, modified or decommissioned the licensee must produce a safety case to demonstrate the safety of the proposed activities. The safety case represents a detailed analysis of the plant proposals and shows how safety will be delivered. The licensee is also required to have procedures to independently assess its own proposals depending upon safety significance. In addition NII carries out assessment of the licensee's proposals as part of regulatory function. Again our report details the steps taken to ensure adequate assessment and verification of safety at nuclear power installations.

60. Earlier in my presentation under Article 7 on regulatory framework I set out our use of Tolerability of Risk and Safety Assessment Principles (SAPs) to judge safety cases. In Article 9, I discussed the requirements for the production of safety cases. Here in Article 14 on Assessment and Verification I want to draw out again how fundamental the concept of the safety case is to the UK regulatory approach. Safety cases are required by licence conditions that cover construction, commissioning, operation and decommissioning.

61. Safety cases are based on good engineering practise, cross-checked by probabilistic techniques. They are required to be formally reviewed both periodically and as part of the consideration of modifications. Quality Management requirements on safety cases are imposed under LC14 and the continuing validity is ensured as part of start up controls and the powers to require immediate shutdown.

62. The continued validity of margins identified and claimed within safety cases are confirmed by programmes required under the Maintenance condition. Proper arrangements under this condition will include Planned Maintenance, In-service inspection (ISI) and Aging Monitoring Programmes.

ARTICLE 15 – RADIATION PROTECTION

63. In the UK, radiation protection of the people who work at nuclear power stations and the public who may be affected by the power station's operations is assured by the Ionising Radiation Regulations (IRR's) 1999. These regulations implement the provisions of the EURATOM Basic Safety Standards Directive and are consistent with the recommendations of the International Commission on Radiation Protection (ICRP).

64. There are two significant threads to the regulation of routine exposure to radiation. Direct exposure is regulated by HSE, and for licensed nuclear sites this is done by NII as part of its overall regulation of these sites. This covers both exposure to workers, and that of any members of the public who receive direct exposure from licensed sites.

65. Exposure to Ionising Radiation, principally to the public, can and does also arise as a result of discharges to the environment. These discharges are within the regulatory remit of Environmental Agency (EA) for England and Wales, and Scottish Environmental Protection Agency (SEPA) for sites located in Scotland. Discharges are regulated by means of specific Discharge Authorisations that are legally enforceable instruments that detail the amounts of each radionuclide that can be discharged. A programme of environmental surveillance is conducted independently around nuclear sites to provide assurance that the radiological effects o discharges are within predictions.

ARTICLE 16 – EMERGENCY PREPAREDNESS

66. The safety standards used in the design, construction, operation and maintenance of nuclear installations in the UK ensure that the risk of accidents that could have consequences for the public is reduced to very low levels. Nonetheless, the UK recognise that it is prudent to have emergency arrangements to mitigate the consequences of such an accident should it occur. Condition 11 attached to the nuclear site licence requires the licensee to:

- Have adequate emergency arrangements
- Consult with other relevant bodies
- Rehearse their arrangements at regular intervals; and
- Train all staff in what to do in an emergency.

67. The licensee's arrangements are supported by national nuclear emergency arrangements that are co-ordinated by the Department of Trade and Industry. Our national report gives extensive details of these

arrangements that are designed to accommodate the various government structures and accountabilities, which exist in various parts of the UK.

68. Even though there may not be any reasonably foreseeable accident relevant at reactor built to a modern criteria, a detailed emergency planning zone is retained as a basis for extending the arrangements to accommodate severe accidents.

69. As I briefly mentioned earlier in the presentation, UK has recently introduced Radiation (Emergency Preparedness) Public Information Regulations REPPIR to replace the earlier regulations. These require local organisations to prepare necessary emergency plans and require operators to make available information to base these plans on. REPPIR also enables local organisations to recover additional costs for this work from licensees. REPPIR meets the requirements of EC Directive 96/29.

ARTICLE 17 – SITING

70. The UK has extensive planning laws to control the siting of nuclear installations. Dovetailing with these planning laws are nuclear siting policies both for the initial characterisation of the site and the maintenance of its suitability. The siting policy takes account of the hazards associated with the site both natural and man-made, emergency arrangements, topography and the control of developments in the vicinity of the site.

71. These policies are implemented through the procedures for licensing the site on which a new facility will be constructed. The UK report gives further details of the siting arrangements that demonstrate that we have effective measures to comply with this article of the convention.

ARTICLE 18 – DESIGN AND CONSTRUCTION

72. The UK regulatory system ensures that there are considerable controls over the design and construction of nuclear power plants. These are described in detail in our report. The licensees' are required to have comprehensive and up to date design standards, and NII's Inspectors use their Safety Assessment Principles to ensure that licensee's designs are comprehensive and demonstrate that risks will be ALARP.

73. At present there are no new nuclear power stations being built in the UK. However, from time to time plants undergo major modification to upgrade safety or replace obsolete equipment. This requires comprehensive design work in a range of safety functions. This ensures that designers are familiar with reactor safety requirements and the licensing system ensures that design and construction work takes full account of the safety requirements mentioned in the Convention.

74. The UK recognises that in any case new plants would be based on proprietary designs and would be constructed by specialist contractors.

However it would still be necessary for the prospective operator, as applicant for the site licence, to convince NII that they understood the design and had ensured that the design met their own criteria and the UK legal requirements of ALARP. This will require a significant amount of in-house intelligence and design / analysis capability. In UK this is known as the licensee acting as an intelligent customer for the work carried out by others. It is now being recognised as a key part of licensee's capability throughout the life cycle of nuclear facilities in the UK and was one of the drivers behind the introduction of LC36 mentioned earlier.

ARTICLE 19 – OPERATION

75. The licensing system in the UK provides comprehensive regulatory controls over the complete life of a nuclear power station. This system ensures that all the requirements of this article of the Convention are met as follows:

- Initial Authorisation to operate – Licence is required before construction can commence – consent from HSE is required before operation can commence.
- Licence requires operational limits and conditions to be derived from the safety case and implemented in the operator's arrangements and control documentation.
- Licence requires operator to have adequate arrangements for the maintenance, inspection and testing of all safety related plant and equipment
- Licence requires operator to have procedures for operators to respond to incidents and accidents including emergencies and any lesser off normal events.
- Licence require a safety case to support operations, and for this to be periodically reviewed. Period is set as every 10 years. Operational control documentation should be derived from the safety case. Licence also requires that only suitably qualified and experienced persons can carry out safety related tasks.
- Licence requires operators to record and report incidents
- Licence requires operators to have arrangements to investigate and report operational matters that may have an effect on safety. Licensees have extensive operational experience feedback systems in operation.
- Licence requires operators to minimise radioactive waste arising and it requires operators to manage the handling treatment and storage of radioactive waste pending disposal.

MATTERS ARISING FROM FIRST REVIEW MEETING

76. At this point I would like to introduce the key additions to the UK report that address the request for additional information raised at the first review meeting in 1999. These are covered in the report, but I will highlight the key topics here.

The UK Electricity Supply Industry

77. Deregulation of the Electricity supply industry. This has been in progress in the UK for over 10 years and some of the UK's NPS have been in the ownership of publicly quoted utilities since the mid 1990's. A combination of pressures, both the need to demonstrate sound financial performance, and the need to accommodate the revised market arrangements have led to a reduction in manpower and the greater use of contractors.

78. There are also New Electricity Trading Arrangements that are intended to increase the degree of supply side competition in the market. One feature is that it encourages generators to be flexible in their supply of electricity

Maintaining Competence

79. A combination of an aging workforce within the industry, and the thinning out of the technical base which resulted from the market pressures being placed on licensees means that some technical disciplines are becoming scarce within the UK employment marketplace. Government has been persuaded to examine the sustainability of the nuclear skills base in the country and as a first step is conducting a survey to determine the current skills base.

80. Though not directly related to the above changes within the industry, NII has been increasing its cadre of inspectors. Total complement is now around 160 and recruitment is in progress to increase this by 12.5%. However it is likely that additional commitments to a programme to deal with legacy radioactive waste will increase this further.

Legislative and Regulatory Changes

81. There have been no substantive changes to key legislation.

82. The Nuclear installations Act gives NII Chief Inspector the power to attach Conditions to the Licence, in the interests of safety and some time ago NII had introduced standardised licences with 35 conditions. After the 1998 Dounreay Audit, we re-examined the need for a new condition to control changes to the corporate structure of licensees. We formed a project group to take our activities forward and the output was licence condition 36 about which I have already spoken.

83. I gave notices to licensees in 1999 that Licence condition 36 would operate from 1 April 2000, but that clause 5, which gave NII powers to halt changes, would come into force immediately. Licensees were given the intervening time to set up their arrangements for the control of change. The arrangements are important to ensure that change is managed consistently and transparently, and the LC gives NII the power to intervene, to challenge and if necessary to stop a change which it's inspectors consider to have been badly conceived to executed.

Periodic Safety Review Progress

84. The programme of Periodic Safety Reviews has continued to plan PSRs have been completed on all UK's Nuclear Power Reactors except Sizewell B

and this is due 2005. The PSRs have produced worthwhile safety improvements and confirmed that plants are safe to operate for a further 10 years subject to the satisfactory outcomes of the routine regulatory process. HSE publishes its findings of each PSR.

"De Jure et De Facto"

85. NII independence from Government is ensured by the Health and Safety at Work Act and Health and Safety Commission and Executive. (HSC/E). Organisation charts can be found in the National reports. NII funded as part of HSC/E budget but recovers costs from licensees. NII has technical and regulatory competence in pursuit of its own regulatory judgement but can access additional expertise if required

Regulatory Improvement

86. NII pursuing Regulatory Excellence using the EFQM Excellence Model. A group called the "Continuous Improvement Programme Board" has been set up to initiate and monitor improvement. Intention is to capture and document existing processes. We operate processes and procedures to achieve transparency, accountability and probity with the minimum bureaucracy commensurate with business needs. We continually strive to lighten the load, welcoming challenge to the need for bureaucracy and to be responsive to suggestions to reduce it

International Cooperation

87. NII devotes up to 5% of total time to a range of international activities. We have bi-lateral arrangements with 16 countries and actively support international organisations such as IAEA, OECD/NEA, INRA, WENRA, We also participate in projects that support the regulatory authorities in Eastern Europe and the Former Soviet Union

KEY ISSUES ARISING FROM QUESTIONS FROM OTHER COUNTRIES

88. The UK received about 80 questions from 14 countries. Written answers are available. Clearly I will not have time to answer each question – so I will try to address some of the key areas raised by the questioners.

89. The questions are similar scope to those at the first CNS review meeting in 1999 although on this occasion these were significantly fewer detailed technical questions. I have identified seven areas that may need further clarification: -

Restructuring of the nuclear Industry

90. Regarding the restructuring of the Industry, questions tended to focus on the licensees' use of contractors for safety related work. Some questions broadened this into the issue of the authorisation or licensing of contractors and suppliers of equipment and services to the industry. The role of the regulator in this process was the focus of some attention. The related topic of maintaining of the necessary skill base was the focus of some questions. Several countries asked about the impact of commercial activity on safety.

91. It is now some ten years since parts of the industry were privatised and other parts started to operate as if they were privatised. In UK we now have considerable experience of this process of change. I have already spoken about the reasons for the introduction of licence condition 36. This is the main piece of legislation by which the safety regulator controls changes to the corporate structure of the nuclear industry. The new licence condition LC 36, on Control of organisational change, requires licensee to make and implement adequate arrangements to control organisational changes that may affect safety. One feature of LC 36 is that it endeavours to ensure the maintenance of skills within a licensee's organisation. Even though much of the work may be contracted out, the licensee must retain sufficient competence to be an "intelligent customer".

92. In the UK, licensees are responsible for ensuring the safety on the licensed site and are required under licence condition 17 to have quality assurance arrangements for all matters that might affect safety. Licensees are therefore responsible for ensuring, amongst other things, that its contractors are fitted for the work that they do. HSE has guidance for its Inspectors on judging whether licensees and contractors meet their safety responsibilities, and this guidance is available to licensees. NII does not specifically prescribe the qualification, quality systems or performance of contractors but it does carry out inspections on quality assurance arrangements.

93. Regarding the maintenance of safety commitments, licensees have to develop ways of protecting their safety culture and monitoring for any loss of morale or staff. NII's Inspectors seek evidence of this and make their conclusions on whether there has been any degradation

Operation of plant built to earlier standards

94. Regarding plant built to earlier standards, questions focussed mainly on the upgrading process – in particular the fact that after some upgrading old plant may not fully meet current requirements. A related issue concerned the criteria for final plant closure. Other questions asked about problems with obsolete equipment and the availability of sufficient knowledge and skills to maintain the plant.

95. I have already spoken about the process of periodic safety reviews that has been carried out in UK, and the programme of plant upgrading that resulted from these reviews. The key question is the decision making process regarding the extent to which a plant should be upgraded to move towards current standards. Again I have spoken about the HSE document that introduces the concept of Acceptable and Tolerable risk. This is developed in the NII safety Assessment principles into the concept of Basic safety limits (BSL) and basic safety objectives (BSO). When assessing a new design we, the regulator, would expect the design to approach the basic safety objective. For an existing plant the BSL would be regarded as a cut-off and we would endeavour to make improvements to move towards the BSO. This some degree of cost benefit analysis. The use of BSO and BSL are of course based on a probabilistic analysis. The NII assessment principles also set out

deterministic criteria. This is clearly more difficult to interpret in terms of BSOs and BSLs but judicious use of both probabilistic and deterministic criteria enable judgements to be made. If a plant fails to meet the basic safety standards then it must be closed down. In most cases the decision to close will be taken by the licensees themselves on economic grounds when confronted by expensive safety upgrading requirements. Regarding the issues of obsolescence or the availability of technical support, this is an issue that our inspectors monitor routinely.

Legal and Regulatory Issues

96. Regarding legal and regulatory issues, several questions have asked about what guidance of standards or other documents are issued by NII. This was asked with respect to the authorisation of contractors (that I have already spoken about), maintenance and testing requirements, licensee's financial arrangements, content of safety analysis reports, and emergency arrangements. One question also related to the assessment resource of NII.

97. In the main part of my presentations I noted that the licensing regime set safety goals. It is the licensees' responsibility to determine how these goals are met. They do this by developing written arrangements to demonstrate how they intend to comply with the licence conditions. Once made the licensee is legally bound to comply with its own arrangements This offers a flexible approach to regulation enabling the licensee to use its resources effectively, and very importantly, give the licensee ownership of safety. However if NII is not satisfied with a licensee's arrangements it can enforce improvements. (It has a veto if necessary!) Guidance exists for NII inspectors regarding the content of arrangements but these are not legally binding. It is therefore incumbent on the licensee to develop for example maintenance arrangements and the content of safety analysis report. It is the NII's role to ensure that these arrangements are adequate.

98. Regarding NII's assessment resource, we do not use a Technical Support Organisation. HSE/NII is essentially the regulatory body and the TSO. NII has sufficient a range of expertise to carry out most necessary safety assessments. The majority of NII's staff is employed in assessment duties. On occasions, it is necessary to seek outside support – for example if the volume of work exceeds available resources or very specialist expertise and advice is needed. When this happens, it is the responsibility of the individual NII assessor to contract extra resource from where he/she sees appropriate. A budget is available for this purpose. We do not use a single supplier and, of course, we need to take care regarding independence or any other vested interest.

Emergency Arrangements

99. Several questions queried the logic of the 3Km detailed emergency planning zones (DEPZ), the relationship of these to design base accidents and the extendibility of the plans for sever accidents. Questions were also asked regarding the scope of the analysis of severe accidents.

100. The detailed emergency planning zone is an area around the nuclear installation where arrangements to protect the public are planned in detail.

This is based on the release of radiation from an accident, which can be reasonably foreseen taking account of the most significant design basis accident derived from the safety case for each site. This is derived using safety analysis techniques to identify a spectrum of accidents; the one which gives rise to the most significant off site consequences is used for planning purposes. This information, taken together with the countermeasures guidance provided by NRPB on sheltering, taking of stable iodine tablets and evacuation, which are described in section 16.9 of the UK CNS Report, provides the basis of the DEPZ. Detailed actions are not predefined for beyond design basis accident either within or without the DEPZ because it is not practicable to make detailed plans against very uncertain and improbable events. Instead, existing plans are capable of being extended to deal with a larger than foreseen accident, based on civil emergency contingency arrangements. This approach was endorsed by the reports of the independent Inspectors for the Sizewell B and Hinkley Point C Public enquiries into the planning applications for these two plants.

101. A whole range of faults is considered in the safety case ranging from frequent faults to infrequent beyond design basis faults. The main contribution to risk to the surrounding population results from core melt that is considered in the risk assessment. Measures are in place to assist operators to try to avoid a reactor fault developing into a severe accident, if the fault develops outside Emergency Operating Instructions. These are known as System Based Emergency Response Guidelines. If the fault progresses to fuel melt there is guidance on each plant to assist the management of a severe fault. These are known as Severe Accident Guidelines and include advice as to what material should be used to shutdown and hold down the core reactivity and what materials could be considered to limit offsite releases.

<u>Future of Nuclear Power in UK</u>

102. This is a topic that is occupying the mind of the nuclear industry on a worldwide basis. The UK government has recently carried out an energy review and questions have asked about the outcome of this review. Other questions have asked about any current work in progress regarding assessing new designs and, whether there are any intentions to change the licensing basis for any new NPP.

104. The review looked at the range of energy supply options including nuclear. It recommends that the policy focus should be establishing new sources of low cost/low carbon energy; keeping options open is essential to avoid technology lock-in; innovation is important in a broad range of energy technologies; a step change in energy efficiency is needed and an expanded role for renewables; and that there are good grounds for keeping the nuclear option open.

105. Nuclear power (from AGR, PWR and Magnox stations) currently provides about a quarter of the UK's electricity supplies as well as playing a role in limiting the UK's greenhouse gas emissions and helping the UK meet its Kyoto targets. It also contributes to the security and diversity of supply in the UK. Existing nuclear stations will continue to contribute to UK energy

requirements provided they do so to the high safety and environmental standards currently observed. As with other forms of electricity generation, it is for the market to bring forward proposals for new plant. British Energy and BNFL, the UK nuclear generating companies, have said they have no current plans to do so. However each have expressed some interest in new designs.

Safety performance indicators

106. Questions referred to the availability of performance indicators and how the regulator uses them.

107. The important issue is that indicators give indication of weaknesses and enable remedial action to be taken before there are any adverse safety implications. This is one of the fundamental principles of a licensing regime, i.e. that action is taken before any possible accident and not afterwards!

108. NII is currently working with licensees to establish an agreed set of performance indicators that will be routinely reported to NII as an indication of safety performance. At the same time NII is actively developing its own internal systems for rating individual licensees performance in respect of regulatory compliance.

109. The UK continues to be involved in International activities on developing appropriate indicators for measuring licensees' safety performance and regulatory effectiveness. This work is being fed into the discussions with licensees on developing a comprehensive suite of safety indicators.

110. Together with the results of inspections, audits, assessments and reviews of incidents and events these can provide early identification of safety problems.

Human Factors/Safety Culture

111. Several questions related to various aspects of safety culture and human factors. Often these related directly to matters associated with the restructuring of the Industry. The licensees' request to change from 8hour to 12 hour shift patterns is a good example of this. The problems of measuring safety culture were also apparent from the questions.

112. As the change in shift patterns at Hinkley Point B (from an 8 hour shift to a 12 hour shift) might well have proved harmful for the execution of safety related tasks, this particular proposed change was "called in" by NII under the licensee's Licence Condition 36 arrangements for detailed review and assessment. A trial was conducted against a wide range of indicators and a detailed study has been completed and assessed. It was concluded that the particular arrangements that were introduced during the trial period, together with the clear and tightly controlled operating constraints and monitoring arrangements, did not result in any observable degradation in operations staff performance at this particular site. There are similar practices elsewhere in the nuclear industry and the experience with such practices is mixed.

113. Safety culture is a combination of a number of factors that are enumerated in INSAG-4, for example, and include knowledge and competence, communication and commitment. Within the UK the NII evaluates these factors through the routine site inspection programmes carried out by site inspectors as part of establishing how licensees are managing safety. NII seeks to gain confidence that a licensee's safety culture is appropriate and that it is consistent with current best practice. There is extensive examination and promotion of the factors that make up safety culture which contribute towards a positive safety culture. The UK Health and Safety Executive (HSE) has developed a safety climate tool which may be used for measuring safety culture within an organisation, and this is intended for use by the duty holder (licensee) rather than the regulator. This is a generic tool and is not specifically for nuclear operators, and although it has been used by a number of nuclear sites this has been relatively limited to date.

CONCLUSIONS AND KEY AREAS FOR FUTURE WORK

• UK is committed to the CNS objectives and meets the requirements of all its Articles

• Both the UK industry and the UK regulator are committed to continuous improvement

• It will continue to be necessary to respond to the challenge of economic deregulation of the electricity market and the introduction of LC36.

114. That ends my presentation. I will now take any additional questions that you may have.