Meeting:	NuLeAF Steering Group, 25 January 2012
Agenda Item:	9
Subject:	UK Response to the Fukushima Accident
Author:	Fred Barker
Purpose:	To report on developments and propose an appropriate NuLeAF strategic objective

Introduction

This report covers:

- key background;
- the Government response to the Weightman Report;
- the report of the EC 'Stress Tests' for UK nuclear power plants; and
- a proposed NuLeAF strategic objective.

Recommendation

That the Steering Group adopt the following strategic objective:

- with regard to the implications of the Fukushima accident for nuclear legacy management in the UK, to encourage the Government and the Office for Nuclear Regulation to ensure that appropriate actions are taken and improvements sustained, and to regularly communicate progress to stakeholders.

1 Background

The Weightman Report on the Fukushima accident was discussed with Dr Andy Hall, Deputy Chief Inspector of Nuclear Installations, at the afternoon session of the Steering Group (SG) meeting on 21 October. The report is available on the Office for Nuclear Regulation (ONR) website at Chief Nuclear Inspector's report on lessons from Fukushima. A briefing paper was prepared by the secretariat to inform discussion with Andy Hall. This is available on the NuLeAF website at Briefing_on_Weightman_report.

The SG will recall that the press release from the Department of Energy and Climate Change (DECC) about the final 'Weightman Report' stated that:

"Dr Weightman's final report found that:

- There is no reason to curtail the operation of UK operating sites, although operators should continue to follow the founding principle of continuous improvement.
- There are no fundamental weaknesses in the UK nuclear licensing regime or the safety assessment principles that underpin it …
- The final report also confirms Dr Weightman's advice … that he saw no reason to revise the strategic advice given by the regulators on which the Nuclear National Policy Statement was based, or any need to change present siting strategies for new nuclear power stations in the UK.
- The UK practice of periodic safety reviews of licensed sites provides a robust means of ensuring continuous improvement …
- The events at Fukushima reinforce the need to continue to pursue decommissioning of former nuclear sites with utmost vigour and determination.
- The regulator is satisfied with the responses and plans initiated by the Government and nuclear industry in response to the interim report."

The Weightman report also contained a series of recommendations for both Government and industry.

In the main, industry responded shortly after release of the Weightman report, confirming that it would implement the recommendations. See, for example, the press releases at EDF Energy commits to implement Weightman recommendations and Latest news - Sellafield Ltd.

2 Government Response

The Government responded on 1 December, outlining its plans to take forward work in the areas where ONR had identified actions of direct relevance to Government. The Government's response is attached as an Annex to this report.

The SG's attention is drawn in particular to the responses to:

- Recommendation IR – 3: about the review of national nuclear emergency planning arrangements. The response describes the review undertaken by the Nuclear Emergency Planning Liaison Group and DECC's intention to undertake a wider programme of work on nuclear emergency planning. This is considered further in a separate report to the SG.

- Recommendation FR – 5: about the adequacy of the existing system of planning controls for commercial and residential developments off a nuclear licensed site. The response states that this will be considered in the Government's work on the proposed National Planning Policy Framework for England.

3 Stress Tests

The ONR final report on the EC stress tests was published in early January 2012 and is available on the HSE website at Stress Tests Report.

The report explains that the UK lessons learnt and EC stress tests assessments share common themes and that the UK licensees and ONR are using the same or similar teams to ensure the reviews are completed efficiently and effectively.

The report concludes that the UK licensees have completed adequate stress tests reviews and that the reviews have not indicated any fundamental weaknesses in the definition of design basis events or the safety systems related to the stress tests to withstand them for UK nuclear power plants. It adds, however, that some aspects of the stress tests will need to be extended with more robust methodologies.

ONR explains that the stress tests process will finish when the improved processes, plant and procedures move into the licensees' normal procedures for change and review of safety cases in line with relevant licence conditions.

It anticipates that a further report confirming this transition will be published by ONR in the autumn of 2012. To support this and ensure appropriate progress is being made by the licensees, ONR has raised a series of 'Stress Test Findings', which state that the progress made in addressing the potential improvements identified both by the licensees and by the ONR findings, should be provided to ONR on the same timescale as that for HM Chief Inspector's recommendations (June 2012).

The Executive Summary from the ONR Stress Tests report is attached as Annex 2.

4 NuLeAF Strategic Objective

It was agreed at the AGM that the ED should draft an objective on the implications of the Fukushima accident for discussion at the next SG meeting.

In view of the developments outlined above, it is proposed that the SG adopt the following objective: with regard to the implications of the Fukushima accident for nuclear legacy management in the UK, to encourage the Government and the ONR to ensure that appropriate actions are taken and improvements sustained, and to regularly communicate progress to stakeholders.

ANNEX 1: GOVERNMENT RESPONSE TO WEIGHTMAN REPORT

I would like to thank you and your team again for the essential work that you have undertaken in preparing your full and final report on the events of the Fukushima accident and the implications for the UK nuclear industry.

I welcome the findings and recommendations of the report. I particularly note the re-iteration of your conclusion that you see no reason, in considering the direct causes of the Fukushima accident, for curtailing the operation of nuclear power plants or other nuclear facilities in the UK.

Having considered the findings of both your interim and final reports I continue to see no reason why the UK should not proceed with our current policy: that nuclear should be part of the future energy mix, as it is today, providing that there is no public subsidy, beyond that available to other low-carbon energy sources.

I set out below, in more detail, the Government's plans to take forward work in the areas where you have identified actions of direct relevance to us, namely recommendations IR 1-3 and FR 5-9.

As I have said before, safety is, and will continue to be, one of our leading priorities and it is essential that Government, Regulators and Industry maintain the pace and commitment to implementing the recommendations you have made, in line with the principle of continuous improvement in nuclear safety.

Recommendation IR - 1: The government should approach IAEA, in co-operation with others, to ensure that improved arrangements are in place for the dissemination of timely authoritative information relevant to a nuclear event anywhere in the world.

Recommendation FR – 9: The UK Government, nuclear industry and ONR should support international efforts to improve the process of review and implementation of IAEA and other relevant nuclear safety standards and initiatives in the light of the Fukushima-1 (Fukushima Dai-ichi) accident.

Action

The Government has continued to work with its partners in the G8, G20 and other international fora to ensure better compliance with international conventions and push forward work on enhancing nuclear safety standards established under the auspices of the IAEA.

The UK has participated in the IAEA activities that led to the development of the Director General's Action Plan and will continue to work with the IAEA to help ensure the delivery mechanism for the Action Plan is both robust and realistic - especially bearing in mind the significance of the work it proposes.

In meeting the actions proposed by the plan the UK have already committed, through the UK's statement at the IAEA Ministerial Conference, to participate in further IRRS peer review missions.

We are also already fully participating in the EU stress test initiative which fulfils the requirement to undertake a comprehensive assessment of safety at the UK's nuclear power plants.

We are also committed to working with our international partners to consider how the dissemination of information under the Convention on Early Notification of a Nuclear Accident can be further improved in terms of both efficiency and substance.

Recommendation IR - 2: The Govt should consider carrying out a review of the Japanese response to the emergency to identify any lessons for UK public contingency planning for widespread emergencies, taking account of any social, cultural and organisational differences.

Action

The Government is carrying out a review of the Japanese response to the widespread civil emergency that occurred following the Tohoku Earthquake and Tsunami of March 2011. We will then compare our findings with our own civil contingency planning to identify whether there are lessons that can be learnt from the Japanese experience to improve our own planned response to (catastrophic) emergencies.

The review will consider:

• What happened in Japan: the earthquake and tsunami and their impact

• The Japanese response to the range of diverse impacts that occurred across a large geographical area.

• Current UK risk identification, contingency planning and capacity building processes

• Key issues arising from the Japanese experience which have read across to UK contingency planning so that we can identify lessons to make our planning even more robust.

As part of these broad categories, we will also consider other cross-cutting issues which are crucial to ensuring the most efficient response possible.

We have already consulted with, and gained valuable evidence from, the Japanese Government and the FCO, as well as a range of publically available reports that have already been written about the emergency. In order to complete this review in a timely way, we will use the evidence currently available to inform our thinking, however it should be noted that the Japanese response to this crisis is still ongoing and further evidence continues to emerge: it is unlikely that final conclusions will be able to be drawn before the Japanese have been able to complete and evaluate their response in full.

Recommendation IR - 3: The Nuclear Emergency Planning Liaison Group (NEPLG) should instigate a review of the UK's national nuclear emergency arrangements in light of the experience of dealing with the prolonged Japanese event.

Action

In May, the Nuclear Emergency Planning Liaison Group (NEPLG) agreed, in response to Recommendation 3 of the Interim Weightman Report, to conduct a review of the UK's

national nuclear emergency arrangements in light of the experience of dealing with the prolonged Japanese event.

As part of that review, NEPLG has:

• Examined the decisions and actions that were taken in Japan to protect the public, and considered any lessons that the UK could learn from those actions;

• Re-evaluated radiation monitoring capacity and capability and coordination including the coordination of Radiation Monitoring Units, and monitoring of food and the environment, both during the acute and longer term recovery phases; it recommended that Central Government clarify the requirements for delivering the data and information in the event of a prolonged incident in the UK and that these arrangements be tested annually;

• Assessed central government response arrangements and in particular the provision of scientific and technical advice in the event of a nuclear emergency in the UK or overseas to ensure that COBR has one source of advice. It recommended that the Overseas Nuclear Emergency response plan be tested fully through the Nuclear Energy Agency International Exercise programme;

• Considered in some detail the response required for faults considered to be reasonably foreseeable and additionally the response required for 'beyond design basis' accidents and recommended that industry consider the planning assumptions for these. It also recommended that ONR should enforce a stronger testing regime which includes extendibility arrangements and overseas nuclear accident response; and

• It has continued work on capacity and capability of the Emergency Services including emergency exposures levels to ensure that the Fire, Ambulance and Police Services have a clear understanding of radiation exposure levels and the circumstances in which they can carry out their work. It recommended that emergency services and operators should liaise formally to determine emergency exposure levels.

The opportunities identified by NEPLG form part of a wider programme of work being taken forward by the Department of Energy and Climate Change (DECC). We are currently finalising the timelines for this programme and the work is being taken forward by DECC and other key delivery partners as a priority.

Recommendation FR-6: The nuclear industry with others should review available techniques for estimating radioactive source terms and undertake research to test the practicability of providing real-time information on the basic characteristics of radioactive releases to the environment to the responsible off-site authorities, taking account of the range of conditions that may exist on and off the site.

Action

The Office for Nuclear Regulation (ONR), the Met Office (MO), the Health Protection Agency (HPA) and the RIMNET team at the Department of Energy and Climate Change (DECC) are working together to further develop the capability to be able to respond quickly to any incident at a nuclear site anywhere in the world.

The objective of this capability is for the UK to be able to draw upon the collective resources and expertise of the operators, regulators and others, as necessary.

The work will build upon the existing arrangements in place for incidents in the UK whilst developing an appropriate basis and supporting procedures for overseas responses. ONR and UK operators will advise on the plant status and potential source terms, MO will consider the dispersion of materials in the atmosphere and HPA will advise on critical groups, the most appropriate pathways and other dose factors.

Together they will provide an auditable means of assessing the potential impact of an incident on the UK or its citizens. Any results will be displayed using DECC's RIMNET system.

This work is being coordinated by DECC with input from other Government Department and Agencies, including GO Science. The aim is to produce an initial tool for use by Spring 2012.

Recommendation FR-7: The Government should review the adequacy of arrangements for environmental dose measurements and for predicting dispersion and public doses and environmental impacts, and to ensure that adequate up to date information is available to support decisions on emergency countermeasures.

Action

In the event of a radioactive release from a nuclear site, the operators are responsible for carrying out monitoring in the immediate vicinity with the Health Protection Agency (HPA) coordinating monitoring further afield; this information together with emergency plans is used for the immediate emergency response.

These arrangements are kept under review by the National Emergency Planning Liaison Group. There are a number of other initiatives in this area, including a review of the Radioactive Incident Monitoring Network (RIMNET), which is the UK Government's emergency management system for overseas nuclear accidents, which comes under the Department for Energy and Climate Change (DECC). It supports, in addition to its original function, the national level response to civil and military incidents that may occur within UK borders.

In addition, HPA, the Environment Agency (EA) the Scottish Environment Protection Agency (SEPA) and the Northern Ireland Environment Agency (NIEA) all carry out or coordinate routine environmental monitoring for radionuclides. In the event of a radiological emergency, this routine monitoring would be enhanced if necessary and used to provide information that would support later decisions on emergency countermeasures. The Met Office has the capability for providing atmospheric dispersion information in real time following any incident in the UK and worldwide. Met Office is part of a collaboration, coordinated by DECC, with contributions from the Office for Nuclear Regulation (ONR) and HPA to develop a tool for estimating the spatial distribution of radiation doses in real time following a radiation release in the UK or elsewhere. The different initiatives should ensure that information is available to support decisions on emergency countermeasures.

Recommendation FR-5: The relevant Government departments in England, Wales and Scotland should examine the adequacy of the existing system of planning controls for commercial and residential developments off the nuclear licensed site.

Action

The ONR included Dr Weightman's recommendation on planning controls around nuclear sites in their consultation response to the Government's proposed National Planning Policy Framework for England (NPPF). Work on the NPPF is ongoing and the recommendation will be considered further in that context.

Planning is a devolved matter and, as such, the Government's NPPF process only applies to England, however we will continue to work closely with our colleagues in the Devolved Administrations on this issue.

Recommendation FR-8: The Government should consider ensuring that the legislation for the new statutory body requires ONR to be open and transparent about its decision-making, so that it may clearly demonstrate to stakeholders its effective independence from bodies or organisations concerned with the promotion or utilisation of nuclear energy.

Action

The work that is currently taking place on the creation of a statutory ONR has at its heart the transparency of the regulator and its relationship with Government (including bodies concerned with the promotion or utilisation of nuclear energy).

The intention is for the statutory ONR's five year Strategy, annual plan, annual report and accounts to all be shown to Parliament as well as widely published by the statutory ONR itself. In addition, the Secretary of State will report to Parliament on any directions that he gives to the statutory ONR as well as the use of his powers such as making appointments to the statutory ONR Board. In addition, the statutory ONR will report every five years to Parliament on the functioning of the nuclear regulatory regime.

All of these measures, the creation of the statutory ONR's Board and giving the statutory ONR powers and duties over nuclear regulation in its own right (not currently the case), will lead to greater transparency. This will help to clearly show the statutory ONR's effective independence from anybody concerned with the promotion or utilisation of nuclear energy.

CHRIS HUHNE

ANNEX 2: EXECUTIVE SUMMARY FROM EC 'STRESS TESTS' FOR UK NUCLEAR POWER PLANTS NATIONAL FINAL REPORT

Following the events at Fukushima, Japan, on 11 March 2011, the nuclear industry in the UK responded quickly to review UK plants against seismic and flooding hazards. HM Chief Inspector of Nuclear Installations was asked by the Secretary of State for Energy and Climate Change to produce interim and final reports on the lessons to be learnt from these events for the UK nuclear industry. Subsequently, the European Council (EC) requested a review of safety at European nuclear power plants (NPP) and the European Nuclear Safety Regulators Group (ENSREG) produced criteria and a plan for this review, now known as the "stress tests".

The UK lessons learnt and EC stress tests assessments share common themes and the UK licensees and the Office for Nuclear Regulation (ONR) are using the same or similar teams to ensure the reviews are completed efficiently and effectively. HM Chief Inspector's interim and final reports were published in May and October 2011 respectively. This report is the national UK stress tests report to the EC presenting the results from the stress tests as applied to UK NPPs. These should be considered in relation to the fundamental philosophy for nuclear safety of continuous improvement, as embedded in UK law for licensed nuclear power plants, of reducing risks so far as is reasonably practicable.

As a result of ONR's inspections and technical exchange meetings with the licensees along with a review of the licensees' submissions, ONR confirms in this report that the UK licensees have completed adequate stress tests reviews in line with ENSREG specification. Notwithstanding this, it is also clear to ONR that, to date, the licensees have concentrated on demonstrating compliance with modern standards for "design basis" events and identifying means to ensure greater robustness for events "beyond design basis" rather than, at this time, undertaking detailed theoretical calculation of margins for which there are likely to be considerable uncertainties. This is a reasonable strategy given the timescales but does not negate the need for licensees to address the ONR findings defined below.

Neither the reviews undertaken by the licensees for the stress tests, nor the earlier national reviews has indicated any fundamental weaknesses in the definition of design basis events or the safety systems related to the stress tests† to withstand them for UK NPPs. However, some aspects of the stress tests will need to be extended with more robust methodologies. In the meantime, ONR expects UK licensees to implement reasonably practicable safety improvements they have already identified to enhance the resilience of emergency response equipment and severe accident procedures in a timely manner.

As noted above, the UK lessons learnt and EC stress tests assessments share common themes and in response to both licensees have derived a significant number of potential improvements, mainly to enhance resilience for emergency actions following events beyond the design basis or not currently foreseen, and also to enhance margin assessment methods. There are also potential improvements to the type or number of barriers to some hazards, e.g. flooding, which should increase defence in depth against events beyond design basis.

The full list of further studies and potential improvements (referred to as "*Considerations*" by the licensees) to increase defence in depth against events beyond design basis identified by the licensees is extensive and wide-ranging and is detailed within this report.

Further to the additional studies and potential improvements identified by the licensees ONR's review of the licensees' stress tests has resulted in a number of findings as detailed below. Some of these findings reinforce or extend those identified by the licensees while others are additional to those already identified.

It should also be noted that the findings raised in this report generally relate to more specific aspects of the recommendations already raised by HM Chief Inspector of Nuclear Installations. A table mapping licensees *Considerations*, the Chief Inspector's recommendations and ONR's stress tests findings (STF) is included in the report to show their relationship.

ONR expects that the stress tests process will finish when the improved processes, plant and procedures move into the licensees' normal procedures for change and review of safety cases in line with relevant licence conditions. It is anticipated that a further report confirming this transition will be published by ONR in the autumn of 2012. To support this and ensure appropriate progress is being made by the licensees, ONR has raised an STF (number 19), which states that the progress made in addressing the potential improvements identified both by the licensees and by the ONR findings, should be provided to ONR on the same timescale as that for HM Chief Inspector's recommendations (June 2012). It is expected that these will include the status of plans for delivery of remaining items and details of improvements that have been implemented.

ONR will also seek to take advantage of the EC's peer reviews not only of this report but the totality of the process to identify further opportunities for continuous improvement.

Note, the findings below relate only to the licensees considered within this report, i.e. those who deal with operating or defuelling NPPs – namely EDF Energy Nuclear Generation Ltd (EDF NGL), Magnox Ltd, Sellafield Ltd, and Dounreay Site Restoration Ltd (DSRL). Defuelled reactors, as former NPPs, are out of the scope of EC stress tests. They are nonetheless considered in a similar process, being conducted in parallel by ONR which covers all other licensed nuclear installations within the UK. The degree to which each finding applies to each NPP is subject to the point in the lifecycle of the plant and will need to be agreed with ONR.

Finding No.	ONR's Stress Tests Findings
STF-1	Licensees should provide ONR with the decision-making process to be applied to their *Considerations* along with a report which describes the sentencing of all their *Considerations*. The report will need to demonstrate to ONR that the conclusions reached are appropriate.
STF-2	The nuclear industry should establish a research programme to review the Seismic Hazard Working Party (SHWP) methodology against the latest approaches. This should include a gap analysis comparing the SHWP methodology with more recent approaches such as those developed by the Senior Seismic Hazard Analysis Committee (SSHAC).
STF-3	Licensees should undertake a further review of the totality of the required actions from operators when they are claimed in mitigation within external hazards safety cases. This should also extend into beyond design basis events as appropriate.
STF-4	Licensees should undertake a further systematic review of the potential for seismically-induced fire which may disrupt the availability of safety-significant structures, systems and components (SSC) in the seismic safety case and access to plant areas.
STF-5	Licensees should further review the margins for all safety-significant structures, systems and components (SSC), including cooling ponds, in a structured systematic and comprehensive manner to understand the beyond design basis sequence of failure and any cliff-edges that apply for all external hazards.
STF-6	Licensees should review further the margin to failure of the containment boundary and the point at which containment pressure boundary integrity is lost should be clearly established for the advanced gas-cooled reactors (AGR) and Magnox stations.
STF-7	Licensees should undertake a more structured and systematic study of the potential for floodwater entry to buildings containing safety-significant structures, systems and components (SSC) from extreme rainfall and / or overtopping of sea defences.
STF-8	Licensees should further investigate the provision of suitable event-qualified connection points to facilitate the reconnection of supplies to essential equipment for beyond design basis events.
STF-9	Licensees should further investigate the enhancement of stocks of essential supplies (cooling water, fuel, carbon dioxide, etc.) and extending the autonomy time of support systems (e.g. battery systems) that either provide essential safety functions or support emergency arrangements.

STF-10	Licensees should identify safety-significant prime mover-driven generators and pumps that use shared support systems (including batteries, fuel, water and oil) and should consider modifying those prime movers systems to ensure they are capable of being self-sufficient.
STF-11	Licensees should further consider resilience improvements to equipment associated with the connection of the transmission system to the essential electrical systems (EES) for severe events.
STF-12	Magnox Ltd should assess the progressive loss of electrical systems on all aspects of the fuel route and address any implications.
STF-13	Magnox Ltd should demonstrate that all reasonably practical means have been taken to ensure integrity of the fuel within the dry fuel stores in the extremely unlikely event of the natural draft air ducting becoming blocked.
STF-14	Licensees should confirm the extent to which resilience enhancements are to be made to existing equipment and systems that are currently installed at nuclear power plants. Information should be provided on the equipment and systems that may be affected and the nature of the resilience enhancements, including interconnectivity with mobile back-up equipment.
STF-15	Licensees should complete the various reviews that they have highlighted so that ONR can assess their proposals and associated timescales. These reviews should look in detail at on-site emergency facilities and arrangements, off-site facilities, facilities for remote indication of plant status, communication systems, contents and location of beyond design basis containers and the adequacy of any arrangements necessary to get people and equipment on to and around site under severe accident conditions. Any changes to arrangements and equipment will require appropriate training and exercising.

STF-16	Licensees should review the symptom-based emergency response guidelines (SBERG) and severe accident guidelines (SAG) taking into account improvements to the understanding of severe accident progression, phenomena and the equipment available to mitigate severe accident. This review should also take into account the fuel route. Once completed, appropriate training and exercising should be arranged.
STF-17	Licensees should further review the systems required to support long-term claims on the pre-stressed concrete pressure vessel containment capability in severe accident conditions.
STF-18	EDF Energy Nuclear Generation Ltd should complete its feasibility study into the installation of filtered containment venting, installation of passive autocatalytic hydrogen recombiners and flexible means of injecting water into the Sizewell B containment.
STF-19	Reports on the progress made in addressing the conclusions of the licensees Considerations and the ONR findings should be made available to ONR on the same timescale as that for HM Chief Inspector's recommendations (June 2012). These should include the status of plans and details of improvements that have been implemented.