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REGULATION OF FUEL CYCLE FACILITIES IN THE UK

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Abstract

The UK has facilities for the production of uranium hexaflouride, its enrichment, conversion into fuel and for the subsequent reprocessing of irradiated fuel and closure of the fuel cycle. All of these facilities must be licensed under UK legislation. HM Nuclear Installations Inspectorate has delegated powers to issue the licence and to attach any conditions it considers necessary in the interests of safety. The fuel cycle facilities in the UK have been licensed since 1971.

This paper describes briefly the UK nuclear regulatory framework and the fuel cycle facilities involved. It considers the regulatory practices adopted together with similarities and differences between regulation of fuel cycle facilities and power reactors. The safety issues associated with the fuel cycle are discussed and NII's regulatory strategy for these facilities is set out.

1. INTRODUCTION

The UK has facilities for dealing with all aspects of the nuclear fuel cycle from receipt of ore concentrate to recycling of reprocessed irradiated fuel. These facilities have been licensed nuclear installations since 1971 when British Nuclear Fuels Limited (BNFL) was created and separated from the United Kingdom Atomic Energy Authority (UKAEA). This paper discusses regulation of those plants. It does not consider fuel cycle facilities operated by other licensees including UKAEA. However the regulatory processes described in this paper are equally applicable to them.

While there are many similarities in the processes and requirements for regulating fuel cycle facilities and power reactors there are a number of significant differences. These differences arise from the physical and chemical states of materials being handled, their environment and mobility and the processes being carried out. The differences can lead to the need to adopt a different regulatory practice in order to meet a common regulatory principle.

One of the major areas of difference is waste management and decommissioning. These result in a number of specific safety issues which are discussed. As well as dealing with immediate issues there is also a requirement to have in place a strategy for ensuring a progressive and systematic reduction in the hazard.

2. UK REGULATORY STRUCTURE FOR FUEL CYCLE FACILITIES

HM Nuclear Installations Inspectorate (NII) was created as a result of the inquiry into the Windscale fire in 1957. Following a review of health and safety legislation in the early 1970's NII became part of the newly created Health and Safety Executive (HSE) in 1975. At the same time HSE took over the issue of nuclear site licenses from the Secretary of State. Nuclear site licenses are now issued by the Chief Inspector of Nuclear Installations on behalf of HSE.

There is a standard license which is common to any type of nuclear installation. It has 36 conditions attached to it. The conditions are not prescriptive in telling a licensee what to do. Rather, they are goal setting and require the licensee to 'make and implement adequate arrangements' for the control of various parts of its operations. It is for each licensee to determine what is appropriate and adequate for

its operations. Obviously NII has available appropriate sanctions if it considers a licensee's arrangements inadequate.
The license conditions cover all aspects of operations from design through construction commissioning and operation into decommissioning. They cover 'hard issues' such as modifications and maintenance and 'soft' issues such as training and instructions. One condition which was added in mid 1999 and came into full effect in April 2000 covers the control of organisational change.

3. FUEL CYCLE FACILITIES OPERATED BY BNFL AND URENCO

This paper relates to the fuel cycle facilities operated by BNFL and Urenco (Capenhurst) Ltd. The facilities are:-

BNFL Capenhurst

This is the site of the UK's original gaseous diffusion plant. The plant is shut down and the site is undergoing decommissioning.

Urenco Capenhurst

This site was created in 1993 by separating it from the original larger BNFL Capenhurst site. It contains centrifuge enrichment facilities. Some of the earlier centrifuge cascades are being decommissioned.

BNFL Springfields

This site has a number of processes, namely production of uranium hexafluoride, production of uranium metal magnox fuel, production of uranium dioxide powder and advanced gas cooled reactor oxide fuel and residue recovery. There are also older facilities on the site which have been decommissioned or are undergoing decommissioning.

BNFL Drigg

This site is the national low level waste repository. It also contains stores of plutonium contaminated material which are being recovered and repackaged to modern standards.

BNFL Sellafield

This is the largest and most complex of the fuel cycle facilities. It receives, stores and reprocesses irradiated magnox and oxide fuels. Associated with the reprocessing plants are facilities for conditioning and storage of high level liquid wastes prior to their vitrification.

The site also has associated intermediate level waste conditioning and storage facilities. Being the original site of the UK's atomic programme Sellafield also has a number of legacy facilities which contain various materials from the early years of the programme. There is, as a consequence, a large programme of post operational clean out and decommissioning.

4. REGULATORY PRACTICES

A site inspection plan is developed by NII's inspectors for each of the sites. These plans cover the programme for inspection for compliance with site license conditions and other legislation. They also identify those areas which will be subjected to themed inspections. Themed inspections may look at the same topic across a site or between sites. They enable NII's inspectors to benchmark performance identifying good practices and areas for improvement. In this way generic lessons can be quickly learned and measures taken to broadcast them widely. The plans also contain elements for project assessment management and reactive work.

Project assessment management covers the work required by NII's inspectors to manage the assessment of licensees' proposals to modify existing plant or construct new ones. This involves reviewing a licensee's proposal, determining which are to be subject to full assessment, managing that work and preparation of the appropriate legal documentation. Every licensing decision we make is supported by a report which sets out what has been done and why it is appropriate to grant permission.

Reactive work is work which has not been foreseen. It can arise from events or incidents or from findings of inspections. Being unforeseen it is not possible to say precisely what the work is or when it will arise. However, experience has shown that an allocation of about 15% of time to reactive work is necessary.

Compliance inspection is arranged so that all of the license conditions are inspected over a three year period. This may not seem onerous but it must be recognized that fuel cycle facility sites are large and multifunctional. A compliance inspection begins by taking the licensee's arrangements for managing a particular activity. After familiarization with these the inspector selects the precise activity to be inspected. When inspecting he is seeking to determine if the arrangements ensure the work is adequately controlled, that they are clear and unambiguous, that they are understood and that they are being followed. After the inspection the inspector records his findings.

Themed inspections can and do vary widely. At one end of the spectrum is the Team Inspection carried out at Sellafield in September 1999. Here the theme was control and supervision of operations. The reason for the inspection was an apparent increase in the number of events where control and supervision was seen as a root cause. This inspection lasted 2 weeks and involved a team of 13 inspectors with a wide range of backgrounds. Being site wide it was able to highlight examples of good practices and areas for improvement. A mark of BNFL's response to its findings can be seen in the number and magnitude of the changes which have taken place or are taking place. These included:

- a revised safety policy statement issued by BNFL;
- clearer lines of accountability;
- more consistent working methods across the site;
- more visibility of senior management at plant level.

BNFL is not programmed to complete its response until October 2002.

A lesser themed inspection, but one with a significant impact, was into the control of sealed radioactive sources. One NII inspector was investigating a reported loss of a source. Her findings led her to suspect that control might not be adequate across the site. She conducted a themed inspection with another colleague over two days. They found sufficient failings to justify the issue of an Improvement Notice. An Improvement Notice is an enforcement device available to all HSE inspectors and requires specified improvements to be made within a given time period. Adequate progress had not been made within the time allowed, including an extension to the original period. The inspector therefore initiated criminal proceedings against BNFL. The case was proven and BNFL was found guilty and fined.

NII mobilizes its reactive effort in accordance with HSE's four elements of policy on enforcement, namely targeted, consistent, proportionate and transparent. This means that NII chooses the events it wishes to investigate and those which it decides to stand back from and requires the licensee to submit an investigation report for review. In such cases NII takes into account the original event and the thoroughness of the licensee's investigation in determining what regulatory action, if any, is to be taken.

At the other end of the spectrum is a rapid response in which a team of inspectors is sent to site immediately. Where an event has actually terminated and the plant is safe NII will usually assemble the team to attend site on the next working day.

5. SIMILIARITIES IN REGULATION OF FUEL CYCLE FACILITIES AND POWER REACTORS

The obvious areas of similarity lie in compliance inspection and the use of themed inspections. Similar standards are required for licensees' arrangements and compliance with them. There were some differences which previously arose from the way the two industries developed which have now been resolved. Two particular examples are the setting up of structured review meetings and the method of regulating plant outages.

In the first case stand back review meetings were not held at the fuel cycle facilities. Instead more local reviews of plant safety performance took place. This was found to be too plant focused and the overview was not always clear. Now there are review meetings with the senior management of each of the operating businesses. These provide the opportunity to more formally measure progress on clearance of safety issues. The site inspector always takes part in these meetings and in the prior briefing of NII management.

Outages in fuel facilities may be different in that a complete plant close down, as occurs with a reactor, may not necessarily take place. However the principles of good regulation still apply. The first principle is to operate to the licensee's outage planning timetable. If NII, as the regulator, is expecting a licensee to carry out particular safety related improvements then the licensee needs to know in good time. The principle also applies to plant inspections which may need the provision of specialist equipment with a long lead time. Having agreed the safety related work programmes and the performance criteria well in advance of the outage NII then plans its own outage inspection strategy.

During the outage any inspection results can be treated on a 'by exception' basis as the performance criteria will have been previously agreed. This frees the time of NII and licensee staff during the normally busy outage period so they can concentrate on key safety issues. The process also speeds the administration of issuing the regulatory Consent to permit plant restart.

6. DIFFERENCES IN APPROACH

The differences between fuel cycle facilities and power reactors which have safety implications are:

- fuel cycle facilities are usually multi plant sites with integrated dependencies on one another;
- fuel cycle facilities have numerous plants which cannot be shutdown in the same way as a reactor;
- radioactivity is in a more mobile but less energetic state;
- contamination and ventilation issues are more critical in fuel cycle facilities;
- fuel cycle facilities utilize aggressive chemicals;
- the legacy issues associated with the nuclear programme.

These differences lead to a modified regulatory approach. For example there is greater focus on control of operations in view of the greater reliance on administrative controls as opposed to engineered safety features in reactors. There is also more emphasis on criticality control in view of the greater mobility of fissile species. A third area, again due to mobility of species, is radiological protection of staff. Rigorous control of the potential for contaminating personnel is mandatory.

7. SAFETY ISSUES

One of the key safety issues in fuel cycle facilities is the maintenance of safety in legacy plants. Many of these plants are old and of uncertain condition and/or content. Post operational clean out is necessary before the plants can be decommissioned. The issue is one of how to ensure adequate progress is being made when there is apparently little effective incentive on a licensee to proceed. Fortunately UK law gives NII powers to require progress to be made. Failure to comply would be a criminal offence.

Other safety issues NII is currently addressing are:

- ensuring that there are sufficient suitably qualified and experienced staff;

- emergency arrangements; how do you account for everyone on a large site?
- measurement and improvement of safety culture;
- production of more user (operator) friendly safety cases.

8. REGULATORY STRATEGY

It is important to have short, mid and long term strategies for regulating fuel cycle facilities. The short term strategy involves ensuring the continued safety of the plants concerned. The mid term strategy is to encourage the licensee to put in place its programme for the progressive and systematic reduction of the hazard from legacy wastes. This will involve the recovery of the material, conditioning it and storing it in a safe, passive and monitorable state.

NII's long term strategy is to effectively regulate the licensee's programmes. To this end NII has issued specifications under the site licence in order to formalise the process. End dates have been set and programmes to achieve this are now awaited.

9. CONCLUSIONS

NII recognises that there are differences in the approach to the regulation of fuel cycle facilities and power reactors. However this is achieved within the standard licensing system within the UK. NII has developed and is applying a strategy for both ensuring the continuing safety of the facilities and reducing the hazard from legacy materials.

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