

Implications of Recent Legislation and Strategy Developments in UK - Impact on Regulation of Radioactive Waste Management at Nuclear Installations

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ABSTRACT

Recently a number of factors are having a significant impact on the environment within which the UK nuclear industry operates. This presents a challenge for regulators and how they ensure delivery of proportionate regulation. The traditional organisations that made up the nuclear operators/ licensees that Health and Safety Executive (HSE) has regulated for over 30 years have changed radically with new company structures still being developed leading to the increased nuclear industry fragmentation. HSE already has some regulatory experience in this area but the pace of change is increasing as a result of competition for contracts to operate UK sites or facilities. This has already resulted in HSE undertaking a significant programme of work to regulate the relicensing of such sites to new organisations.

In response to this more dynamic environment we are examining our approach to regulation plus the safety assessment standards that need to be adopted within this changing environment. This paper will outline recent examples of how HSE has adapted its regulatory approach to specific case studies, along with discussion of how it intends to apply standards at a national and international level to illustrate the challenges that are faced in a changing operating environment.

INTRODUCTION

The introduction of increased competition in the UK nuclear industry is continuing to result in new organisational structures. Whilst historic regulatory frameworks are sufficiently flexible it has given rise to the need for the UK regulator to adapt its approach. The paper discusses some recent experience and future challenges

REGULATORY SYSTEM

Health and Safety Executive (HSE) is the executive arm of the Health and Safety Commission (HSC), it aims to ensure that the risks to people's health and safety arising from work activities are properly controlled. The Nuclear Installations Inspectorate (NII), which is part of HSE, aims

to secure the maintenance and improvement of standards of safety at licensed nuclear installations.

HSE's method of regulation is explained in "Reducing risks, protecting people"[1] and in further guidance on its website [2],[3],[4]. The main aim in health and safety legislation is that risks have been reduced to as low as reasonably practicable (ALARP). Essentially therefore duty holders are expected to assess risks and then control them or mitigate the effects. The gross disproportion test is used to judge whether the measures taken are ALARP, this is the test in UK law.

The Health and Safety at Work Act 1974 (HSWA 74) is the umbrella legislation covering the safety of workers and the general public in the UK with more specific requirements in associated statutory provisions, which (for nuclear sites) include the Nuclear Installations Act 1965 (as amended) (NIA 65). Under NIA 65, no site may be used for installing or operating any nuclear installation unless a site licence has been granted by the HSE.

NIA65 allows HSE to attach such conditions to the site licence as may appear to HSE to be necessary or desirable in the interests of safety, or as it may think fit with respect to the handling, treatment and disposal of nuclear matter, including radioactive waste. It is largely through this route that we achieve our regulatory aims. The conditions, which are attached to a licence, are essentially goal setting and generally require the licensee to make and implement adequate arrangements. The arrangements that the licensee develops constitute elements of a safety management system to suit its business needs. The non-prescriptive nature of the licence conditions enables a continuous and flexible form of regulation that can be applied throughout all stages in the operation of a nuclear installation, including decommissioning.

There are 36 standard licence conditions [5]. The licence conditions cover topics such as the production of safety cases, records, control of operations, maintenance and changes to the plant, ensuring staff are suitably qualified and experienced, managing organisational change and dealing with incidents and emergencies. There are specific licence conditions related to the control of nuclear matter, the accumulation, containment and disposal of radioactive waste, and another covers the arrangements to be made for decommissioning including the production of decommissioning programmes.

The principal requirement of a licensee is that it should be a corporate body, which is in day-to-day control of the site, and which possesses the capability to understand the safety case for the plant, including any operational limits. A central requirement is for the licensee to produce adequate safety cases for all operations that may affect safety. From these are derived operating limits and conditions, maintenance and other safety requirements.

Government policy on radioactive waste management was reviewed in 1994/95 and the conclusions of that review were set out in "Review of Radioactive Waste Management Policy, (Cm 2919)" with subsequent modifications [6],[7],[8]. Subsequently the Government appointed a new body (the Committee on Radioactive Waste Management [CoRWM]) to review options for managing solid radioactive waste in the UK and to recommend the option, or combination of

options, that can provide a long-term solution, providing protection for people and the environment. This has recently reported [9] and will be considered further later in this paper.

HSE's EXPECTATIONS

As explained earlier the licensing regime is goal setting rather than prescriptive and therefore HSE does not generally issue guidance to the nuclear industry on its expectations. However it has published for many years the Safety Assessment Principles [10] used by its inspectors in assessing licensees' proposals. These have been revised and were published at the end of 2006. The revised SAPs place greater emphasis on decommissioning, radioactive waste and radioactive contaminated land reflecting the increased importance of these areas. All the SAPs have been updated in line with relevant international standards and are therefore a sound basis on which to judge applications to build any new facilities. HSE also issues more detailed guidance to its Inspectors in the form of assessment and inspection guides [11],[12]. This most recent publication has been the subject of consultation with industry and other stakeholders.

Radioactive Waste Management

There are four fundamental expectations for the management of radioactive waste, which, should be met so far as is reasonably practicable, they are:

- i) Production of radioactive waste should be avoided. Where radioactive waste is unavoidable, its production should be minimised.
- ii) Radioactive material and radioactive waste should be managed safely throughout its life cycle in a manner that is consistent with modern standards.
- iii) Full use should be made of existing routes for the disposal of radioactive waste.
- iv) Remaining radioactive material and radioactive waste should be put into a passively safe state for interim storage pending future disposal or other long-term solution.

These represent the fundamentals that are used in examining individual safety cases for waste management facilities and site integrated waste strategies.

CHALLENGES

The regulatory system that has been described has evolved in recent years to reflect changes in the type of nuclear industry in the UK. It is fair to say that the fundamentals of the system reflected a time when most of the operating companies were state owned bodies that bought in very limited resource from the market plus there was limited true competition. This changed with privatisation of a number of company's in the late 80's and early 90's. The pace of change has continued with the industry looking more and more at how it can become more efficient and effective. Different organisational models developed. HSE also did not stand still and began to consider more closely its expectations and published notes of applicants, which has recently been updated [13].

Licensees will be required to demonstrate appropriate management of the organisational change, at any time, to ensure that safety standards are maintained. HSE will require licensees to prepare detailed programmes and describe their arrangements, including an appropriate management structure and staffing levels, both to fulfil key roles associated with licensees' responsibilities under the site licence and to provide the general infrastructure to support a project.

Contractors are being used increasingly and contribute valuable skills and expertise. HSE has been considering the implications of the use and control of contractors, and other arrangements such as partnering, and has presented its views on a number of occasions [14],[15],[16]. In this context, the term intelligent customer has been in use for several years, and essentially it means that a licensee must take steps to retain an adequate capability within its own organisation to understand the nuclear safety requirements of all of its activities, and also those of any contractors; to take responsibility for managing safe operation; and to set, interpret and ensure the achievement of safety standards. The licensee cannot seek to discharge this role through the use of contractors and must itself be intelligent enough to do these things for the activities of its contractors.

New Organisational Structures

An example of the model that has become more common in UK is the contractorisation of the Atomic Weapons Establishment at Aldermaston and Burghfield. The approach adopted was to have a management company and a Site Licensee Company (SLC). It is the SLC that is subject to the regulatory requirements. In order to licence the SLC, HSE carried out detailed assessments of the company's ability to discharge the functions of a site licensee. This took place over a number of years before the first license was granted. Additionally a further review was undertaken as part of consideration of a new contract and the grant of a new licence. In June 2001, HSE published a report on the performance of AWE plc as a licensee twelve months after the relicensing of the Aldermaston and Burghfield sites [17]. HSE's overall conclusion at that time was that AWE's performance had been satisfactory and demonstrated that the licensee had successfully managed health and safety. The new contractor had not only built on the strengths of the previous contractor but had also undertaken some initiatives to improve safety performance and progress in the areas of waste management and decommissioning. This conclusion is still valid today based on our regulatory activities.

The initial contract awarded, to the new licensee, covered a ten-year period from April 2000. Subsequently, an extension of the contract from 10 to 25 years was offered by Ministry of Defence, accepted by AWE Management Limited, and announced in January 2003. The MoD decision to offer the extension was based on the successful performance of the contractor during the initial two and a half years of the 10-year contract.

This approach has an advantage in that if a new management company were appointed for any reason the SLC would be largely unchanged. Only the management company would change and the SLC would remain as a competent body with its core competence in terms of staff retained.

This work along with the work we had undertaken concerning control of organizational change with a number of licensees, provide valuable experience and examples for NSD in meeting the

challenges resulting as part of the formation of the Nuclear Decommissioning Authority (NDA) in 2005. This also created a number of new licensee organizations and HSE demonstrated its ability to successfully regulate using license condition 36 concerning Management of Change.

The impact of the NDA has been to introduce greater competition for the operation of the sites that it owns as well as greater use of contractors that provide services to the SLC. Information on this aspect is set out in its strategy [18]. In general terms the contracting and organizational model that is being adopted by NDA is set out in figure 1. The features of this model are described later in the paper in the context of specific examples.

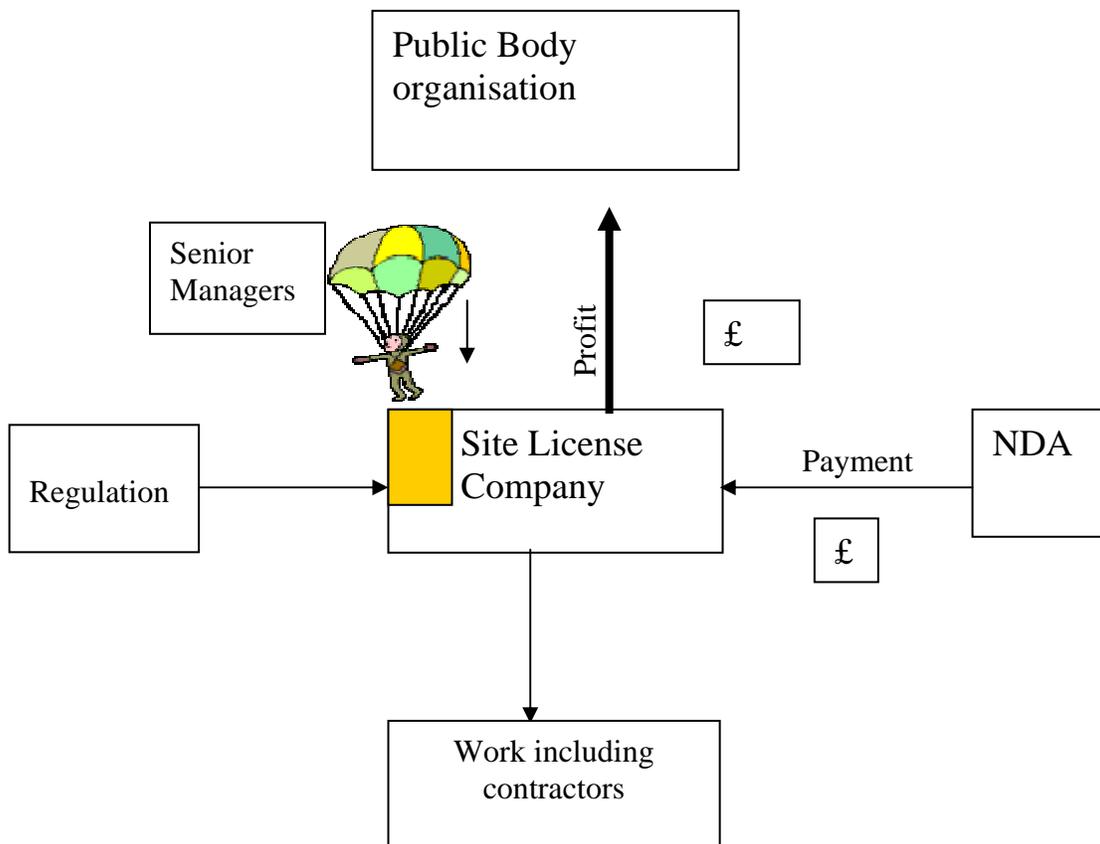


Fig 1: Diagrammatic illustration of proposed structures.

The key regulatory features that have arisen from our considerations and are applicable to the future challenges concern;

- Intelligent Customer
- Controlling Mind
- Competence

These are discussed in the following examples

RECENT DEVELOPMENTS AND CHALLENGES

Low level waste disposal

Currently there is only one low level waste repository in the UK that is licensed by NII, this is located near Drigg in Cumbria and currently operated by British Nuclear Group Sellafield Ltd. The LLW Repository, is the first of the sites that are owned by NDA's to be competed. The contract is to be awarded for a term yet to be specified in late 2007. A key feature of the contract will be the development of a UK-wide Low Level Waste plan covering all 20 sites owned by the NDA. This will aim to treat waste management in a more proactive and sustainable manner based on the waste hierarchy principles of avoid, reduce, re-use, recycle, and only then disposal. The contract will also include, subject to the granting of appropriate permissions, the design and build of an additional vault at the Drigg site.

This represents a significant development in terms of strategic options for a large part of the nuclear industry in UK as well as the potential change of operating organisation. As outlined in the AWE situation the concepts of a management company (now referred to as a Public Body Organisation, PBO) that owns a site licence company and the regulatory implications are applicable. However in this case there are far more options in terms of the potential management organisations and the type of site licence company that is proposed. HSE has also had to work within the constraints of a contract letting process. Whilst this posed resource constraints for the regulator the decision was taken that early engagement was still beneficial. To ensure that all potential contractors were given the same information, industry days were organised so that the regulatory system and our expectations could be clearly set out.

Licensee must be a corporate body in day to day control of the site i.e. the responsible 'controlling mind'. The site licence company must have direct responsibility for the operations and make its own decisions, particularly in respect of safety. The senior management of the SLC must have contracts of employment that are aligned to the goals of the SLC. This gave rise to the concept of the "parachutee" a person initially employed by the PBO but parachuted from the PBO into the SLC and employed by the SLC.

The SLC must be a competent body and must satisfy HSE that it has a safety management prospectus and other arrangements in place that meet HSE's expectation for a licensee set out in "Notes for Applicants" [13]. This will include ensuring that its staff are suitably qualified and experienced. This applies to all roles as part of good management practice but is particularly relevant to posts that undertake a safety function. Robust management arrangements need to be in place for the control of operations and to ensure that there is adequate succession planning in

terms of the skills and competence of the organisation to discharge its function as a site license holder. This is an issue where HSE has observed that there is a reducing pool of competence from which to draw upon to enable either succession planning and refreshment programmes. It is for this reason that HSE has been supportive of measures taken to set up the Dalton Institute at the University of Manchester and the development of the nuclear skills academy.

These arrangements also apply to any contractors intended to be used by a prospective licence holder. HSE has had significant experience concerning control of contractors carrying out work on licensed sites. There has to be clarity about control and responsibility so that the SLC is the controlling mind and remains in day to day control of the site.

HSE's aim is to ensure that effective proportionate, risk-based regulation is delivered. It is for this reason that we encourage an approach of early engagement. In doing so there is no intention to be prescriptive and provide detail of how the legislation may be met, as this remains the responsibility of the SLC. At this early stage the aim is to ensure that prospective contractors fully understand the legal requirements and are thus in a position to more efficiently develop and manage a site license company in accordance with their legal obligations

Intermediate Level Waste Management in the future

In September 2001, Government instigated the first stage of its Managing Radioactive Waste Safely Programme (MRWS). This led to the appointment of the independent Committee on Radioactive Waste Management (CoRWM). Its objective was to provide recommendations on the long term management of the UK's higher activity radioactive wastes that inspired public confidence and were practicable in securing the long term safety of those wastes. In summary, the three main elements of CoRWM's recommendations [9] are:

- geological disposal is currently the best form of long term management for the UK's higher activity radioactive waste;
- there should be a commitment to the safe and secure interim storage of the waste during the period it will take to plan and construct the geological disposal facility; and
- the UK should look to develop partnership arrangements, linked to appropriate involvement and benefit packages, with local authorities/communities as a means of securing facility siting.

The Nuclear Decommissioning Authority will be given the responsibility for developing and ensuring delivery and implementation of the programmes for interim storage and implementing geological disposal. This means that the owner of most of the waste in the UK is now responsible for the development of a repository for disposal.

The organisational management models described previously are likely to apply. NDA will ultimately run a competition for an organisation or organisations that will be tasked with, over a period of time, development of the repository concept and its safety case as well as its eventual

operation. From a regulatory perspective this creates an organisation that initially does not have a site. Nevertheless it is our expectation that the Notes for Applicants [13] will be used as a reference point to enable prospective PBO's to develop proposals for an organisation that is capable of being licensed that has all the skills and expertise required.

The process we anticipate is that there will be an initial stage over the next 12 months where there will be a competition process leading to a contract let with a new organisation. In this respect it is anticipated that a similar approach will be adopted by HSE as has been undertaken for the low level waste repository. The details of the contract that will be developed have not yet been established but it is likely that the contractor will have responsibility for the ILW repository safety concept and development of that safety case for a site. Hence initially the safety case will not be site specific, nor will there be any site works. Traditionally NII and the other regulators would not be directly involved until there is a site and an application to the regulators is made. However as this has implications for how ILW is managed across UK sites the regulators consider that earlier regulatory engagement and controls will be required. This is likely to involve further evolution of our regulatory approach but the fundamentals are not anticipated to change. We anticipate that the organisation responsible for development of the repository safety case will be under regulatory scrutiny. In order to facilitate this process and provide guidance work has commenced on production of updated regulatory guidance on waste packaging and conditioning for those wastes that are likely to go to a repository. This guidance will be available on the HSE web site when available.

Energy Review

In July 2006 the UK government published a report setting out the conclusions of its Energy Review. The review set down proposals for meeting the UK's energy needs over the next 30 to 40 years. The government concluded that new nuclear power stations could make a significant contribution to meeting the UK's energy policy goals. Many of the proposals in the review report will need further consultation, after which the Government intends to publish a White Paper around the end of 2006. The review makes a number of proposals to address potential barriers to new build, and HSE is currently developing guidance for potential providers of new stations. The HSE web site describes the work that is being done by NII in order to be ready to start work on design assessment, should it be asked to do so [19].

SAFETY ASSESSMENT PRINCIPLES

The safety case for any new facility, including a new reactor, will be assessed by NSD in relation to HSE's Safety Assessment Principles for Nuclear Facilities. These principles provide inspectors with a framework for making consistent regulatory judgments on nuclear safety cases. The Safety Assessment Principles have recently been reviewed and updated, including benchmarking against IAEA Safety Standards. The principles, which address all aspects of the safety case, apply to existing facilities as well as proposed new facilities. The concept of "so far as is reasonably practicable " applies to the majority of the principles, in accordance with the UK's non-prescriptive regulatory approach.

In the case of radioactive waste, the principles include a requirement for a radioactive waste management strategy for the licensed site. This should address waste arising from proposed new facilities, as well as current and future inventories from existing facilities. The strategy should look ahead and demonstrate how all radioactive waste arising on the site will be managed as far as ultimate disposal where relevant. The principles also require the safety case to show that the generation of radioactive waste by the facility has been prevented or, where this is not reasonably practicable, minimised in terms of quantity and activity.

The principles recognise the importance of characterisation and segregation, and require the safety case to demonstrate the provision of suitable and sufficient design features, locations, equipment and arrangements for these activities and for other waste management operations. As regards the storage of waste on site, the expectation is that radioactive wastes should be promptly disposed of when a suitable disposal route is available. Where this is not possible, however, the waste will be stored in accordance with good engineering practice and in a passively safe state.

The principles encompass the need to take account of decommissioning at all stages in the life cycle of a facility and require decommissioning strategies to be prepared and maintained for each site. These should be integrated with all other related strategies, such as the waste management strategy discussed above.

It is expected that a decommissioning plan should be produced for each nuclear facility and maintained throughout the lifecycle of the facility taking into account, for example, operational process changes, advances in technology, plant modifications, and other changes to the state of knowledge of the facility which could effect decommissioning. The principles also recognise the importance of records to effective waste management and decommissioning, and require that information that might be required now and in the future should be recorded and preserved. These records could include, for example, the as-built facility design and subsequent modification, operational history, incidents, radioactive substances in the facility, the physical condition of the facility, and the knowledge of staff. Other principles are concerned with the need to maintain an adequate safety management system during periods of significant organisational change, and with the safety implications of changes to safety functions and arrangements when the state of the facility is changing quickly.

The principles recognise the need for a proportionate approach. For example, the type of information and level of detail required to demonstrate compliance with a principle should be commensurate with the type and status of the facility, the associated radiological hazard, the quantities of material involved, and the stage of the project.

CONCLUSIONS

The historic examples reviewed and the discussion of the recent challenges show that the regulatory framework in UK is sufficiently flexible to adapt to new business models and external challenges. There is no need to change the law although some alterations to some regulations may be required. The key change is likely to be in terms of how we work. Greater emphasis has been placed on ensuring that our interventions are at the right time and in the right place. This is reflected in updated guidance and recognition that early involvement is appropriate but this does not signal any agreement to a particular process.

The revised SAP's are an important development and provide a framework for the future and reflect a proportional regulatory approach that is applicable to any new build.

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Note: internet references are correct at the time of writing (November 2006) however the author takes no responsibility for their being correct at later dates.

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