

**INTEGRATION  
A BETTER WAY TO MANAGE NUCLEAR LIABILITIES**

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**ABSTRACT**

On the 1st of April 2005 the management of civilian nuclear liabilities in the United Kingdom will enter a new era with the creation of the UK Nuclear Decommissioning Authority (NDA). The NDA has been set up to deliver accelerated decommission of the UK civilian liability at a reduced cost to the UK taxpayer. The NDA will operate in a framework of openness and transparency to all parties.

The UK's civilian nuclear liability is diverse and complex – the result of over 50 years of research, power generation and chemical reprocessing. Standards and expectations have changed enormously since the first nuclear plants were constructed and operated. The challenge of decommission the liability and the associated remediation of the sites is, therefore, significant.

The number and diversity of waste streams present within the UK civilian liability is considerable. Decommissioning and site remediation will present further waste streams and associated challenges. The cost of managing these wastes will represent one of the most significant costs in discharging the liability. To ensure that the best value for money is achieved site operators and the NDA will need to integrate waste management activities across individual sites and the UK as a whole.

Much has been done in the UK to develop strategies for managing wastes arising from decommissioning and site-remediation. However, better integration of waste streams can bring about significant improvements in the ways that wastes arising from decommissioning and site-remediation. The NDA and the regulatory community have identified the benefits that can be achieved from integration and are actively pursuing opportunities with the current operators. Guidance to operators on the scope and content of an integrated waste strategy is currently under development. It is hoped that the guidance will promote the concept of the integrated waste strategy. It will also provide operators of decommissioning sites with additional tools that will allow them to develop and implement strategies that will bring about improvements in their decommissioning performance.

**INTRODUCTION**

On the 1st of April 2005 the management of civilian nuclear liabilities in the United Kingdom will enter a new era with the creation of the UK Nuclear Decommissioning Authority (NDA).

The NDA has been set up to deliver accelerated decommissioning of the UK civilian liability at a reduced cost to the UK taxpayer. The NDA will operate in a framework of openness and transparency to all parties.

Those nuclear sites in the UK that are to transfer to NDA ownership will face the challenge of decommissioning in an increasingly commercial environment. The ability to manage the waste arising from decommissioning programmes will be key to the success of all the sites' decommissioning programmes. Understanding the opportunities and risks associated with both radioactive and non-radioactive waste management has the potential to benefit site operators, the NDA and, ultimately, the UK taxpayer.

Waste management strategies have and continued to be developed to support activities at decommissioning sites. To date, there has been limited integration of these strategies on a site or national basis. The need for better coordination and integration has been identified by the NDA and its partners during the preparations to set up the NDA in April 2005.

This paper presents a number of the arguments for better integration of waste strategies in the UK's decommissioning sector, provides a summary of progress to date on the development of integrated waste strategies and identifies future plans for the implementation of such strategies.

### **The Need for Better Integration**

The UK's civilian nuclear liability is diverse and complex – the result of over 50 years of research, power generation and chemical reprocessing. Standards and expectations have changed enormously since the first nuclear plants were constructed and operated. The challenge of decommission the liability and the associated remediation of the sites is, therefore, significant.

The number and range of waste streams present within the UK civilian liability is considerable. Decommissioning and site remediation will present further waste streams and associated challenges. The cost of managing these wastes will represent one of the most significant costs in discharging the liability. To ensure that the best value for money is achieved site operators and the NDA will need to integrate waste management activities across individual sites and the UK as a whole.

The requirement for strategies to address waste management issues is not new to the UK's nuclear industry. Many strategies already exist and are derived from a wide range of requirements. A number of these requirements are summarised below:

**International and Government policy.** International policy influences include EU waste management principles, the Waste Framework Directive and the Basic Safety Standards Directive 2000. UK policy areas include the UK Strategy for Radioactive Discharges, Cm2919 and developments within the Department of Trade Industry that resulted in the creation of the NDA.

**Regulatory requirements.** Nuclear sites are required to produce decommissioning programmes as part of the UK nuclear safety licensing process. The environmental regulators now expect that applications to discharge radioactive waste will be underpinned by strategic thinking in the form of BPEO studies. Security plans are required by the Office of Civilian Nuclear Security to identify the measures taken by sites to mitigate postulated

threats. Planning authorities may include strategic elements when granting planning permission for both construction and demolition activities.

**Customer requirements.** Currently the civilian nuclear liability operates as a number of government agencies. Programmes and plans are developed on a routine cycle to meet the needs and expectations of the sponsoring Government departments. Preparations for the creation of the NDA has resulted in detailed decommissioning programmes (Lifecycle Baselines) being created. Near term work plans supplement the decommissioning programmes and will form the basis of contracts between the NDA and the decommissioning sites.

**Operational and business needs.** Operations on a nuclear site will be supported by a number of location driven strategies to support business delivery and efficiency.

Clearly there are strong interdependencies between the strategies listed above. Conflicts will also exist in the development and integration of such strategies. Arguably a mechanism for identifying and strengthening the former and mitigating against the latter would be beneficial. Such an opportunity was identified during a meeting of the NDA's National Regulatory Forum (NRF). The NRF was established by the Department of Trade and Industry to identify and address regulatory issues and concerns during the period leading to the establishment of the NDA. The NRF agreed to investigate the opportunities afforded by better integration in waste management and set up a sub-group to investigate and report on IWS. Initially the sub-group involved regulators and members of the NDA team but has been expanded to incorporate industry representatives in-line with the NDA's commitment to 'triangular' working.

### **Benefits of Better Integration**

The IWS sub-group discussed the benefits of better integration during the early stages of its deliberations. Given the constitution of the group at the time of the discussion it was inevitable that the benefits were biased towards the needs of regulators and the NDA. Key benefits are summarised below:

**Decommissioning Programmes.** The availability of waste routes is key to the success of the decommissioning programmes at nuclear sites. The provision of a robust IWS will allow sites to underpin the programmes submitted to the NDA.

**Regulatory Compliance.** Strategic planning for waste minimisation and waste management are requirements of both safety and environmental legislation. A robust IWS has the potential to enhance levels of regulatory compliance on nuclear sites.

**Interdependencies.** Waste streams and waste routes on nuclear sites have many interconnections and interdependencies. An IWS will identify those links that are vital to delivery of the decommissioning plan.

**Links to Other Strategies.** A nuclear site's overall business strategy will be made up of a number of sub-strategies. An IWS would allow links to be developed to these other strategies and inform the site's business strategy.

**Risk management tool.** An IWS will promote a better understanding of waste management issues and allow risks and uncertainties to be identified, prioritised and managed.

### **Definition of an Integrated Waste Strategy**

The Environment Agency reviewed its expectation of an IWS from an environmental perspective and concluded that an IWS should be derived mostly from existing documents that consider the following topics:

How the creation of waste will be minimised

How the unnecessary introduction of waste into the environment will be avoided

How to ensure that radioactive wastes are safely disposed of, at appropriate times and in appropriate ways. This should include details of the reference techniques, consistent with BPM/Best Available Techniques, which will be used for minimisation of discharges to the environment.

How the strategic management of radioactive wastes arising from operations, decommissioning and site restoration will be undertaken.

How the concentrate and contain principle will be applied in practice.

How the characterisation, segregation and categorisation of wastes will be undertaken and dilution prevented

How progressive reductions in discharge limits and discharges will be achieved and how any exceptional case needing increases to limits will be handled. To this end the strategy will need to point to a document that provides predictions of future discharges.

How and when Best Practicable Environmental Options (BPEO) assessment should be undertaken

How and when Best Practicable Means (BPM) assessment(s) should be undertaken

How monitoring and radioactive waste and the environment should be undertaken.

The National Regulatory Forum sub-group considered the definition of IWS as part of its on going deliberations. The group was faced with the challenge of developing a definition that was both descriptive and succinct. After considerable discussion the following was agreed:

*A site optimised Integrated Waste Strategy (IWS) addresses the management of all form of waste, both radioactive and non-radioactive, and of material, which may become waste in the future. It includes what is disposed of to the environment, what requires to be stored, as well as covering waste creation and its avoidance and minimisation. On and off-site aspects are considered and reviewed for synergies. An IWS can be considered to be optimised when it is the outcome of a systematic and consultative decision making process that has considered a range of options and their practicability taking into account all relevant factors.*

### **Developing an Integrated Waste Strategy**

Current thinking on the development of integrated waste strategies is developing rapidly. The Environment Directorate General of the European Union has produced guidance on the

preparation of waste management plans and suggests a number of elements for inclusion. These are summarised below:

**Background.** Summary of legislation and policy influences, description of objectives, inputs from consultation processes.

**Status.** Sources of waste, waste streams, quantities, waste management options, waste collection and treatment, economy and financing and assessment of previous objectives.

**Planning.** Assumptions for planning; determination of objectives for waste streams, waste sources and waste management options and a plan of action for achieving the objectives.

Most of the information required to support the development of an IWS will already be available at nuclear sites in the UK. This should allow for the rapid development of a baseline IWS which reflects the current status at the site. Information on current waste management strategy and plans are to be compiled and analysed against any current and future challenges, objectives and constraints. There is an expectation that ground rules applied to the baseline will have been clearly understood and that the baseline, assumptions and constraints will be interrogated to determine how the IWS can be improved during future iterations. The Environment Agency has considered environmental objectives for an IWS and these are listed in the 'Definition' section of this paper.

Development of the IWS will inevitably be an iterative process. The information gathered during the baseline exercise will be progressively challenged to determine how the developing IWS meets the following questions:

To what extent does the current waste management system meet the site's objectives for hazard and environmental risk reduction, waste prevention/minimisation, recycling/recycling/energy reduction and the provision of safe disposal facilities?

To what extent does the current waste management system address the environmental, health, safety and security issues in the relevant area of the waste management plan?

To what extent does the current waste management system represent an adequate administrative and organisational framework in terms of efficiency in the relevant area?

What changes to the current waste management system are required to meet current objectives; improve environment, health, safety and security issues and improve efficiency and efficacy?

The ultimate goal is to have an IWS that meets all the objectives as far as is reasonably practicable. This is the 'optimised' IWS. It is accepted that the IWS can only be considered as optimised at one point in time due to the continuously changing nature of the influences on the IWS. The frequency at which a site's IWS will require revision and further optimisation will rely on the judgement of the site and other key stakeholders. A key benefit is that work undertaken to develop and optimise the IWS can be used to meet a host of other requirements such as BPEO/BPM reviews, reviews of decommissioning strategies and corporate reporting. This should prevent unnecessary repetition of effort and improve business efficiency.

## **Implementation of an Integrated Waste Strategy**

The successful implementation of an IWS will rely on commitment from nuclear sites in a number of key areas. These include but are not limited to the following:

**Culture.** Decommissioning of nuclear sites will require a change of thinking from short-term, operational issues to longer term, strategic thinking. The challenge of implementing cultural change should not be underestimated given that workers are ultimately working their way out of their jobs.

**Arrangements.** Nuclear sites will need to develop robust arrangements to support implementation of the IWS to ensure that its currency and value to the business is maintained. Examples include review processes and change management procedures. Many of these arrangements will already exist to support other requirements at the sites. Effort will be required to identify any requirements specific to IWS and to incorporate them into business systems.

**Infrastructure.** The IWS will identify limitations in the existing waste management infrastructure at nuclear sites. Resources will need to be made available to fund any enhancements required to implement the IWS.

## **Summary of Progress to Date**

One of the most significant achievements of the NRF sub-group has been to focus the minds of a number of key stakeholders in nuclear decommissioning on an issue of growing importance. Initially the discussion was between the NDA and the regulatory community who debated key drivers and established the current definition. Representatives of the nuclear industry have now joined the group to promote triangular working.

The Environment Agency has recently varied authorisations granted under the Radioactive Substances Act 1993 (as amended) to require the production of integrated waste strategies at BNFL's Sellafield site. The Agency currently proposes to make the development and implementation of IWS a requirement of all authorisations granted under RSA93. To promote consistency it is likely that the Scottish Environment Protection Agency (SEPA) will follow the Environment Agency's lead and change its standard template.

The Environment Agency is also in the process of developing guidance on its expectations of an IWS. This activity is being supported by Entec UK Ltd. The contents of this paper have been predominantly drawn from this piece of work. It is anticipated that the guidance will be available to the Environment Agency for discussion with BNFL Sellafield early in 2005.

The nuclear industry, led by UKAEA, are developing a specification for a site based IWS. Currently the specification provides a skeleton on to which sites will be able to hang the flesh of the IWS. The approach is broadly similar to that being developed by the Environment Agency.

In addition to the work being undertaken on IWS nuclear sites continue to develop their decommissioning programmes in line with the requirements of the NDA. Currently the NDA requires that the programmes be subject to an annual revision cycle. The near-term work plans will form the basis of the site operators' contracts with the NDA from the 1<sup>st</sup> of April 2005. The requirement to develop and implement IWS on decommissioning sites will progressively be incorporated into the annual review cycle.

## **Plans for the Future**

The work of the IWS sub-group of the NRF will continue for the foreseeable future. Further refinements of information to support the IWS approach are expected. The NDA is currently considering, on the advice of the sub-group, whether to make the provision of an IWS a contractual requirement with the decommissioning sites. Such a move would require all NDA sites to develop and implement an IWS to a programme agreed with the NDA and other key stakeholders.

## **CONCLUSIONS**

Decommissioning of the UK's civilian nuclear liabilities present significant challenges in the field of both radioactive and non-radioactive waste management for which many strategies have been developed. Key stakeholders in the decommissioning process have identified that greater integration of waste management strategies will be of significant benefit. Guidance on the production of integrated waste management strategies are currently being prepared by nuclear site operators and regulators. The Nuclear Decommissioning Authority is currently reviewing the need to include integrated waste strategies in the decommissioning programme requirements for nuclear sites.