SD:SPUR Scoping Document
Waste Management Framework Guidance Note No.2

Develop Management Strategy for Wastes and Materials

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PREFACE

This is the second in a series of four scoping reports that have been developed on behalf of the SD:SPUR Learning Network by Quintessa and Golder Associates. The scoping reports are intended to support the development of detailed guides relating to the management of decommissioning wastes and items from nuclear licensed sites. The need for such guides, covering activities and decision processes implemented by waste management practitioners, has been identified by members of the SD:SPUR Project Steering Group.

It is important to stress that the scoping documents are not themselves intended to serve as formative guidance. They are deliberately short in length, being aimed at identifying key issues that will need to be addressed, rather than developing such ideas to the level at which they can be considered to represent practical guides. A common format is followed in each case; following a brief introduction to the document, the text is then structured to provide a discussion of:

- Context: identification of the main considerations associated with this particular stage in the management process, including any relevant policies and regulations.
- Need: discussion of any existing guidance that may be relevant, and the scope of the guidance that ought therefore be provided by SD:SPUR.
- Relevance: consideration of the target audience and how the guidance might be used, wider concerns and developments, and the potential for referencing existing good practice guidance.
- Format: anticipated length and other features relating to presentation of the guidance document.

At the time of preparing this draft, there remains uncertainty as to whether the guidance itself is best presented as a single document, or in four separate guides. A single document would have advantages in terms of emphasising the degree of feedback and iteration that is inherent in developing and implementing a management strategy; however, it could prove to be of considerable bulk. For present purposes, the scoping documents assume that separate guides will be produced. If this path continues to be followed, a companion general 'handbook' for the process as a whole (drawing on outlines in existing SD:SPUR material) could help to present a more integrated picture and avoid duplication in the individual guides.

1 INTRODUCTION

This scoping report considers the development of a site wide strategy for wastes and items arising from the decommissioning of nuclear licensed sites.

The background SD:SPUR guidance document (Miller and Tooley, 2005) and the SD:SPUR Good Practice Tools document (Hill, 2007), both highlight that option selection for the management of specific assets and decommissioning wastes (Penfold and Paulley, 2009) should be carried out within the context of a broader site strategy. Strategy development concerns the definition of broad general principles and directions that will govern the management of materials and items arising from decommissioning. It involves consideration of the 'big picture' issues that serve to frame specific plans for how material and items will be managed.

Strategy development will be informed by the scoping and reconnaissance level characterisation of wastes and items, to define an initial inventory of materials, items and wastes within different categories (Needham and Penfold, 2009). It may also be influenced, over time, by the review of progress with implementation, based on monitoring and verification activities (Bjerregard and Towler, 2009), or as a result of changes to the wider context (national policy, technological developments, etc.).

2 CONTEXT

The context for determination of a site strategy for the management of decommissioning wastes and items is determined by national policy on the management of different classes of wastes and, specifically, the national strategy for low level waste management.

2.1 Relationship to National Policy

National policy for the management of low-level radioactive wastes (Defra et al., 2007) requires that waste management plans should be developed "*with appropriate regulatory and stakeholder involvement*" and should take into account current best practice. It is expected that plans will be based on, among other things:

- Use of a risk-informed approach to ensure safety and protection of the environment;
- Minimisation of waste arisings (both activity and mass);
- Forecasting of future waste arisings, based upon fit for purpose characterisation of wastes and materials that may become wastes;
- Consideration of all practicable solutions for the management of LLW;
- A presumption towards early solutions to waste management; and
- Appropriate consideration of the proximity principle and waste transport issues.

Policy makes specific mention of the Waste Management Hierarchy, noting that "*The objective for LLW management plans should be to deal with potential arisings at the highest practicable level of this hierarchy*". However, the policy statement explicitly recognises that there are limitations to application of the waste hierarchy in the management of legacy wastes, not least in relation to the possibilities for waste avoidance (where the emphasis is instead placed on avoiding contaminant migration and the generation of secondary wastes arising from treatment and processing).

In preparing programmes and plans for the decommissioning and clean-up of nuclear licensed sites, it is expected that arrangements and provisions for the management of LLW that is generated should be given consideration at the earliest possible stage.

In relation to stakeholder engagement, national policy requires that "*(n)uclear operators' proposed programmes and plans for the management and disposal of LLW should be developed by including wide stakeholder engagement to allow for an equitable approach. Such engagement should involve communities which may be impacted by the plans, including any host community in the vicinity of a waste treatment or disposal facility, and the local authorities concerned*". It is suggested that early involvement in the process is strategy development is both necessary and beneficial.

National policy recognises that re-use and recycling of LLW may be limited to particular waste forms. It also refers to guidance from the European Commission (EC, 1998; 1999; 2001) and International Atomic Energy Agency (IAEA, 2004) regarding recycling of radioactive wastes. It also underlines the Government's view that there should be opportunities for industry-wide initiatives to increase re-use and recycling of certain LLW forms.

2.2 Relationship to National Strategy

The LLWR site licence company is working together with NDA on the development of a national strategy for LLW management from nuclear licensed sites. A primary driver for this national review has been a recognition of the limited capacity for future disposals to the LLWR and the need for innovation in the management of anticipated arisings from the decommissioning programme.

The strategy is being developed in conjunction with the National LLW Strategy Group, convened by NDA, which participates in the development, review and approval of key strategic documents. A first draft of the national strategy has been prepared but, at the time of writing, this had not yet been approved by Government for release. Inevitably, strategic planning at a national scale on key issues affecting LLW management can have an important influence in framing the strategic options that will be implemented at individual sites. In particular, it is envisaged that national strategy may set out principles under which shared facilities might be used to serve the requirements of several sites.

2.3 Regulatory Requirements

The regulatory expectations of the NII (HSE, 2002a ;b) and environment agencies (Environment Agency, 2008a) are consistent with national policy, in so far as site licensees are required to establish a clear audit trail for the determination of a preferred management strategy. Furthermore, the Environment Agency (2008b) has established a set of key environmental principles that it expects to seek to apply in authorising radioactive waste management at nuclear licensed sites. Such principles are particularly relevant to determining strategic direction, and include, among others:

- sustainability;
- stakeholder involvement;
- integrated planning;
- protecting human health and the environment;
- management of uncertainties; and
- the precautionary principle.

It is also appropriate to note that Government is currently reviewing the system of "Exemption Orders" (EOs) made under the Radioactive Substances Act (RSA93)[1]. These permit wastes that are radioactive to be exempted from the provisions of the act (registration and authorisation) in certain situations, subject to limits on radioactivity content that ensure there are no unacceptable risks. However, it has been accepted that the existing EOs do not reflect the types of radioactive materials currently arising, as they were drawn up many decades ago. Specifically, they relate mainly to those materials and wastes at the lower activity end of the classification scale, which is the same range as that generally associated with SD:SPUR guidance.

The Government review is intended to result in a more relevant system of exemption, with criteria that more accurately reflect the specific hazards associated with particular radionuclides. At the time of writing, details of the new EOs remain unclear, although consultation to date has revealed a desire for substantial changes from certain sectors, while other stakeholders have advised caution. Novel proposals include the incorporation of risk-informed exemption/clearance procedures alongside the use of a radionuclide-specific activity concentration limit. One consequence of adopting such an approach may be that a broader range of waste management options is opened up for very low activity radioactive materials arising from decommissioning. The SD:SPUR project will need to take account of these developments in due course; however, it is not expected that Government's work will extend to providing detailed guidance on the practical management and decision-making required for such materials during decommissioning, the main focus of SD:SPUR.

Various regulations and regimes apply under EPA90 to the management and disposal of wastes that are demonstrated to be non-radioactive, excluded or exempt under RSA93. Which set of regulations apply depends, in part, on the physical and chemical properties of the waste, its potential for causing harm to the environment and the manner in which the waste is planned to be disposed. The provisions of the Waste Framework Directive (75/442/EEC), the recent Directive on Wastes (2008/98/EC) and the Landfill Directive (1999/31/EC) are notable.

2.4 Other Factors

A Site Waste Management Plan (SWMP) should be prepared for wastes arising from decommissioning a nuclear site in accordance with the Site Waste Management Plans Regulations 2008, although where a nuclear licensed site has an Integrated Waste Strategy (IWS) in place that includes waste from construction activities, a separate SWMP is not required, provided that all the obligations set out in the SWMP Regulations are included in the strategy and its supporting documents (Defra, 2008). The proper characterisation, forming part of an IWS or SWMP, of items and materials will provide the basis for their subsequent management, be that disposal to landfill, re-use on the nuclear site or at locations off-site, as considered appropriate for the different categories of material.

NDA guidance on IWS development IWS (NDA, 2006a; b) was published after the date of publication of the original SD:SPUR documentation (Miller and Tooley, 2005). The scope and content of any future SD:SPUR guidance related to the development of management strategies for decommissioning wastes and items needs to be mindful of NDA guidance, to reflect on where further clarification may

[1] See http://www.defra.gov.uk/environment/radioactivity/government/legislation/exemption.htm

be warranted in order to encompass wider stakeholder perspectives, and to incorporate key lessons learned from experience to date in IWS development.

In principle, the decommissioning wastes (both radioactive and non-radioactive) component of a site-integrated waste strategy should cover broadly the same ground as that required in relation to this particular stage in the SD:SPUR management process. However, it is worth noting that other factors (including regulatory principles established by the environment agencies, noted above) may have an important influence on the determination of strategy. For example, Government policy on low-level radioactive waste (Defra et al., 2007), notes that there is a 'presumption towards early solutions', which could potentially be taken as a discouragement to store very low-activity wastes on site until such time as they can be put to re-use.

3 NEED

As noted above, the development of a national LLW strategy for nuclear licensed sites should provide important support to the development of site-based strategies. Likewise, the requirement to produce a site integrated waste strategy should in principle go a long way towards framing the definition of management strategies for wastes and items arising from decommissioning. However, whereas the IWS guidance itself (NDA, 2006a; b) places emphasis on implementation of the waste management hierarchy and BPEO-type options appraisal studies, it is not necessarily fully consistent with the latest Environment Agency (2008b) guidance on key environmental principles (see above), which cover a broader range of strategic planning considerations.

SD:SPUR is in a position to develop specific practitioner guidance that is informed by the national strategy (when it has been published) and seeks to integrate this with IWS requirements and the latest regulatory expectations regarding application of environmental principles in relation to RSA93 authorisation. Specific areas where development can be made are highlighted below. Further topics may potentially be added following publication of the national strategy document.

3.1 Decision Support Tools

The existing SD:SPUR guidance provides a fairly clear and comprehensive description of options assessment methodologies. For example, it considers how sustainability considerations interact with the BPEO concept, presents the main stages of a BPEO/BPM approach to comparing options, describes the types of management options for broad categories of wastes, and the criteria by which they can be assessed.

In relation to the evaluation of strategic options, EA and SEPA's guidance on BPEO (Environment Agency and SEPA, 2004) provides a good foundation in terms of the general approach to options appraisal. Such decision support tools can be helpful, provided it needs is recognised that, in general:

- Judgment and subjectivity cannot be avoided in decision making. The principle role of a systematic decision support process is to reveal such factors and make their role transparent.
- A quantitative approach to making judgments helps to crystallize thoughts and prompt debate on trade-offs, but it is necessary to beware of false precision, especially where evidence to support decision making may be limited.

- It is the process of going through the method that enables thinking to be challenged, so that sources of confidence relevant to decision making clearly expressed, and to learn what matters to the decision.

It is also important to recognise that systematic methods used to evaluate and compare options are robust to, uncertainties in the underlying evidence. In this respect, there is an important interface to waste characterisation (Needham and Penfold, 2009), as well as to uncertainties in the broader context within which strategy has to be defined. Confidence in decision making depends on having a clear understanding of the quality and reliability of evidence supporting the comparison of options (see, for example, Funtowicz and Ravetz, 1990))[2].

Moreover, experience has shown that, while options evaluation methodologies can help to inform strategy development, there is a broader requirement for clear guiding principles and objectives to be identified, and to demonstrate how these logically and practically fit together within a coherent overall approach.

3.2 Stakeholder Engagement

It is considered good practice to involve a range of stakeholders in the development of strategic plans for wastes and materials management. This has a range of potential benefits. First, it helps to provide assurance that the decision making will be open and transparent, and that there will be room to air any specific concerns about the nature of the strategy. At the same time, stakeholder inputs are likely to be valuable to site managers in guiding thinking about priority issues. Input at the strategic level is particularly important given that there are potentially a wide range of basic principles at stake.

Key areas of involvement include the preliminary scoping of the strategy development exercise – seeking the views of stakeholders on how the process (including the detailed assessment of strategic options) should be carried out and who should be involved. It is also important that opportunities are provided for review as the process continues, and that the logical basis for determining overall strategic direction is capable of being clearly explained.

Broader guidance on stakeholder involvement has been developed as part of the SAFEGROUNDS guidance, and it can be supposed that the general elements of such guidance are equally applicable in the context of SD:SPUR.

3.3 Key Strategic Questions

Key issues that will need to be tackled in determining overall strategy for the management of wastes and materials – which in turn will influence the detailed characterisation strategy and choice of management options – include:

- Acceptability of off-site management solutions.
  In addition to questions regarding possible disposal off-site, this encompasses consideration of possible shipment of bulk materials for treatment elsewhere, to enable re-use and/or recycling either on the site, or at another site. Such options may potentially be identified as a component of

[2] Issues surrounding the evaluation of uncertainty and quality in quantitative information, and implications for its use to guide policy development are discussed at http://www.nusap.net/.

national LLW strategy – if not in the first publication, then potentially at a later date. Off-site shipment of materials for treatment potentially also include overseas options for treatment to recover useful materials. National LLW policy (Defra, 2007) emphasises the importance of the proximity principle, but also notes that export to other European Union countries can in principle be authorised for the recovery of re-usable materials, with the presumption that (as a general rule) wastes will be returned to the UK.

- Relationship to the site end state.
  Management strategies for materials and items arising from decommissioning are closely linked to the decommissioning programme and End State planning . For example, if there is no conceivable re-use for particular buildings, there may be little point in expending effort in decontamination to clearance levels (except in so far as it may enable alternative uses for the building rubble, once demolished). Other key considerations may include land availability for temporary storage of bulk materials and items, and the possible development of on-site disposal facilities for high volume VLLW that cannot readily be re-used, recycled or disposed of elsewhere.

- Potential requirements for segregation.
  Detailed characterization to support selective dismantling and segregation of materials is valid if it is judged that appropriate recycling or re-use options for different materials can be identified. If not, then the appropriate strategy may be to demolish building in bulk. Bulk demolition can also potentially avoid the costs of decontamination and/or segregation, provided that a suitable re-use strategy can be identified for the very lightly contaminated bulk materials that will result.

  An important consideration here may be the acceptability of 'diluting' contamination in bulk quantities of material to support on-site re-use strategies as VLLW. So-called 'blending' of higher and lower activity wastes to achieve a lower waste classification for disposal is not generally considered acceptable. However, it is not necessarily the case that the same rules should apply in relation to the dilution of localized (but hard to remove) contamination within a bulk quantity of (say) metal or concrete rubble, prior to recycling.

4 RELEVANCE

Guidance on the development of management strategy for decommissioning materials is particularly relevant at present due to the programme of work to decommission NDA sites. SD:SPUR guidance will be relevant to the majority (by volume) of material to arise on these sites. In particular, there may be opportunities to adopt more sustainable practices that those currently in place and to learn from experience in the non-nuclear construction industry. There may also be opportunities to make the process of determining and implementing management strategy more efficient and to foster a greater consistency in approach.

Whilst there is clearly an awareness of SD:SPUR and its guidance, it is unclear how routinely it is used. This may be because the guidance is not in the form of an accessible and practical guide. This could be addressed by focusing on describing its application in the specific case of decommissioning materials. The document should therefore take a fresh approach, explaining the whole process in a practical way, but linking and signposting existing guidance. The real test of the success of the

guidance will be the extent to which it is routinely used, and seen as enabling better decisions to be made at the project level, rather than just fulfilling regulatory requirements.

Although some shortcomings are evident in the existing SD:SPUR guidance in terms of its direct application to strategy development, it nevertheless provides much valuable information and is a foundation for the more practical set of guides that is proposed. Similarly, with due consideration for the difference in the area of application, the SAFEGROUNDS guidance suite provides a lot of relevant information (not least in respect of stakeholder involvement), as discussed in preceding sections.

An important challenge will be to ensure that the guidance establishes standard options identification and evaluation methodologies that clearly reflect the wider principles underpinning strategy development. Strategy provides a broad 'direction' for site management activities, but may evolve over time, either in the light of lessons learned, or in response to performance monitoring.

The audience for the guide is expected to be waste management practitioners, in the main, but a version should be available that can be used by other potentially interested parties, to ensure that stakeholders have a broad appreciation of the key issues at stake.

5 FORMAT

The document should by very clear about how an optimised strategy development/options assessment process should work. Process diagrams and case studies are likely to be very helpful in guiding the reader. It will be useful and relevant to signpost relevant best practice, regulatory and other sorts of guidance, both in the UK and elsewhere. Where possible, the aim should be to provide case studies – initially, these could potentially be drawn from existing IWS developments for decommissioning wastes; subsequently more specific SD:SPUR related studies could potentially be incorporated. The aim will be to acknowledge the complexity of the issues being addressed without proposing processes that are in themselves too complicated to be easily understood or applied. There should therefore be an overall emphasis on key principles and their implications.

The format of the guide should assist in promoting the practicality and accessibility of the guidance. Whilst it is likely that further consultation with potential users will be needed, simple features like flowcharts, textboxes, checklists and a register of key questions to be addressed in establishing strategic principles would also help to ensure a more accessible document.

So far as is possible, the document should not repeat guidance that is available elsewhere (other SD:SPUR guidance and that written by regulators and other organisations – e.g. in relation to IWS development) at length. However, if a complete process description is to be produced it will be necessary to identify and document the key points. References to these and other key documents (not least the national LLW strategy, when it is published) should be related to the specific section or paragraph of the document.

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