



Department
of Energy &
Climate Change



The Scottish
Government
Riaghaltas na h-Alba



Llywodraeth Cymru
Welsh Government



DOE

UK Strategy for the Management of Solid Low Level Waste from the Nuclear Industry

February 2016



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URN 15D/472

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The Strategy and Strategic Environmental Assessment can be found on DECC's website:

<https://www.gov.uk/government/consultations/consultation-on-an-update-of-the-uk-strategy-for-the-management-of-solid-low-level-radioactive-waste-from-the-nuclear-industry>

Published by the Department of Energy and Climate Change

Contents

| | |
|---|----|
| Contents..... | 4 |
| Executive Summary | 5 |
| 1. Background, Scope and Roles..... | 7 |
| 2. UK Nuclear Industry LLW Strategy | 13 |
| 3. Key Influences and Issues | 25 |
| 4. Supporting Information..... | 29 |
| 5. References..... | 32 |
| 6. Glossary..... | 33 |

Executive Summary

This document is the UK strategy for the management of solid Low Level Waste (LLW) arising from the nuclear industry. It has been developed and prepared by the Nuclear Decommissioning Authority (NDA) on behalf of UK Government taking into account the responses from public consultation (January-April 2015) and is published jointly by the UK Government, the Scottish Government, the Welsh Government and the Northern Ireland Department of the Environment. It is relevant to all nuclear and non-nuclear industry waste producers (current and future), environmental regulators, waste planning bodies, waste management facility operators and suppliers of waste treatment services. The strategy will also be of interest to other parties potentially affected by LLW management, for example communities where waste is managed.

In March 2007 the UK Government and Devolved Administrations published the policy for the long term management of solid LLW in the UK. Within this policy they required the NDA to develop a UK strategy for the management of solid low level radioactive waste in the nuclear industry on their behalf.

In August 2010 the NDA published the UK Strategy for the Management of Solid Low Level Radioactive Waste from the Nuclear Industry; identifying a review cycle in line with that for the review of the NDA Strategy. The review process commenced in April 2014, with a public consultation on the revised strategy taking place between January and April 2015.

Since the publication of the original strategy, the LLW management environment has changed considerably, reflecting that many of the transformational activities identified in the strategy document have been delivered. The changes include:

- the diversion of significant volumes of LLW from the Low Level Waste Repository (LLWR);
- the development and use of alternate treatment and disposal routes;
- the application of the waste hierarchy by waste producers when making waste management decisions;
- the identification of opportunities for improvement and the sharing of good practices for LLW management;
- the engagement of a broad group of stakeholders within the process.

The direction of travel for the strategy remains unchanged, continuing the benefits that these extensive changes deliver. The three strategic themes espoused in the original document also remain unchanged:

- the application of the waste hierarchy;
- the best use of existing LLW management assets;
- the need for new fit-for-purpose waste management routes.

Various organisations have a role to play in the continued implementation of the strategy, which continues to be coordinated through the National LLW Programme, managed by LLW Repository Ltd on behalf of the NDA.

Strategies for the management of non-nuclear LLW and naturally occurring radioactive (NORM) waste have been published in recent years. There are synergies between these strategies in that they have similar strategic themes and rely on many of the same waste management routes. Government recognises this but also understands that there will be significant challenges to better integrating them during implementation. Therefore Government will retain separate strategies during the lifetime of this strategy but will continue to review this position as the three strategies mature.

The management of LLW on a nuclear site should be undertaken as part of a wider integrated framework for optimised waste management. The specific activity of LLW spans several orders of magnitude, which can influence how the waste is managed. Not all LLW can be safely disposed of at the LLWR; conversely some Higher Activity Waste (HAW) may be better managed within a LLW facility. Thus there are synergies between HAW policy and the LLW strategy which could be enabled by managing wastes using disposability assessment, as opposed to radiological classifications. Government will work with the Regulators, the NDA and waste producers to determine the practicalities and feasibility of adopting such an approach.

The strategy requires waste producers to manage their wastes in accordance with the waste hierarchy; which considers and utilises a range of methodologies to optimise waste management processes and make best use of existing assets. Thus the waste hierarchy is central to decision making in identifying the most advantageous option for LLW management.

Although the 2007 LLW policy mandated NDA to produce and publish this strategy, Government (in discussion with regulators and NDA) has published this revised strategy, bringing it in-line with other Government LLW strategies. Feedback from the industry and NDA in the last five years suggests this would be beneficial. NDA will continue to take the lead on reviewing the strategy on Government's behalf in future and LLW Repository Ltd will continue to implement it through the National LLW Programme.

This revised strategy document evidences that the direction of the strategy remains unchanged, as do the three themes espoused in the original document. It does, however, seek to reflect the significant changes which have occurred since the publication of the original document, to ensure that it remains fit for purpose for the UK nuclear industry until the next review cycle and beyond.

1. Background, Scope and Roles

- 1.1. This document sets out the revised UK strategy for the management of solid low level radioactive wastes arising from the nuclear industry.
- 1.2. While the scope and direction of the original strategy remain unchanged, this document reflects the progress that has been made since 2010. It also reflects the expected direction for Low Level Waste (LLW) management in the future. Central to the strategy is the implementation of the waste hierarchy, which supports the provision of continued capability and capacity for managing LLW in the UK. The original strategy and this revision have been prepared for the UK Government and Devolved Administrations by the Nuclear Decommissioning Authority (NDA) in response to the Policy for the Long Term Management of Solid Low Level Radioactive Waste in the United Kingdom (Ref. 1).
- 1.3. This strategy is relevant to all nuclear and non-nuclear industry waste producers (current and future), environmental regulators, waste planning bodies, waste management facility operators and suppliers of waste treatment services. The strategy will also be of interest to other parties potentially affected by LLW management, for example communities where waste is managed.

Background

- 1.4. In March 2007 the UK Government and Devolved Administrations (for Scotland, Wales and Northern Ireland, from here on referred to as 'Government') published the policy for the long term management of solid low level radioactive waste in the UK ('the policy'). This strategy was developed within the framework of the principles set out in the policy, which are:
 - the use of a risk-informed approach to ensure safety and protection of the environment;
 - the minimisation of waste arisings (both activity and volume);
 - the forecasting of future waste arisings, based upon fit for purpose characterisation of wastes and materials that may become wastes;
 - the consideration of all practicable options for the management of LLW;
 - a presumption towards early solutions to waste management;
 - the appropriate consideration of the proximity principle and waste transport issues;
 - in the case of long-term storage or disposal facilities, consideration of the potential effects of future climate change;
- 1.5. The overall aim of the policy was to set out the need for greater flexibility in managing LLW, recognising that previous Government policy was not developed to take account of large scale decommissioning and environmental restoration,

resulting in a lack of capacity at the LLW Repository (LLWR). The policy also set out a number of requirements for the NDA, including the development of a UK nuclear industry LLW strategy; developing a plan for the optimum use of the LLWR; and to make NDA LLW management facilities available to other nuclear and non-nuclear managers of radioactive waste where practicable to do so.

1.6. The first UK Nuclear Industry Solid LLW Strategy (Ref 2) was published in August 2010 following extensive development and consultation with stakeholders. Since the publication of the first strategy the LLW management environment has changed significantly, resulting in the majority of current nuclear LLW arisings being diverted from the LLWR (for example, between April 2014 and March 2015 over 85 % of LLW was diverted from the repository, some 12,700 m³ of LLW). This has been achieved through:

- the development and use of alternate treatment and disposal routes;
- the application of the waste hierarchy by waste producers when making waste management decisions;
- the identification of opportunities for improvement and the sharing of good practices for LLW management;
- the engagement of a broad group of stakeholders within the process;
- collaborative working between industry organisations;
- the introduction of a National LLW Programme, managed by LLW Repository Ltd, to coordinate the implementation of the UK nuclear industry LLW Strategy.

Within the original strategy document was a commitment to review the strategy in line with the five yearly review cycle of the NDA strategy. On behalf of Government, NDA in collaboration with LLW Repository Ltd, led the review and update of the strategy, both to reflect changes and developments in LLW management over the last five years and to set the framework for the continued development of the strategy over the coming years. The review process engaged key stakeholders, including representatives from regulators, Government, planning authorities, waste producers and the waste management supply chain, in a series of workshops to ensure that the review was comprehensive, taking account of a range of experiences and views. Accompanying this strategy review was a review and update of its Strategic Environmental Assessment (SEA) (Ref 3). The SEA is available from the DECC website alongside this strategy document.

1.7. Implementation of the strategy has resulted in significant quantities of LLW being diverted from disposal to the LLWR over the last five years. This is expected to continue as waste producers apply the waste hierarchy and divert wastes to alternative waste management and disposal facilities. The LLWR remains a key strategic asset for UK's management of LLW, enabling the successful execution of decommissioning and site restoration programmes and new build opportunities. The ongoing availability of other LLW management and disposal facilities depends upon the maintenance of suitable environmental permitting and planning permissions, as well as confidence within the supply chain in waste throughput to support investment, and broader availability of skills and capabilities to manage

such wastes. Therefore a key aim of this revised strategy is the continued development and maintenance of a robust, sustainable waste management infrastructure. There is recognition that, whilst the strategy has delivered a step change in LLW management practice, there are still areas of relative immaturity within the industry.

1.8. Since the development of the 2010 strategy, and in accordance with the policy, Government has developed strategies for the management of LLW from the non-nuclear industry comprising of:

- Strategy for the Management of Solid Low Level Wastes from the Non-nuclear Industry: part 1 Anthropogenic Radionuclides, published in March 2012 (Ref 4).
- Strategy for the Management of Naturally Occurring Radioactive Material (NORM) Waste in the United Kingdom published in July 2014 (Ref 5).

These non-nuclear strategies all depend on the same radioactive waste management infrastructure as the nuclear LLW strategy, and on the availability of suitable skills and capabilities. Government recognises that the strategies contain many synergies, but also recognises that there are opportunities as well as significant challenges to their better integration. Thus Government will retain separate strategies during the lifetime of this revised nuclear industry LLW Strategy, whilst continuing to review this position as the three strategies mature.

Low Level Waste

In the UK, solid radioactive wastes are defined according to three main categories: low, intermediate and high level wastes. Low Level Waste (LLW) lies at the bottom end of the radiological spectrum and is a broad category, ranging from waste that has very low levels of radioactivity to waste that may require engineered shielding.

Solid radioactive wastes have been produced, stored and disposed of by various industries in the UK since the 1920s. The main sources of waste generation since the 1950s have been nuclear energy development, nuclear power generation and the weapons industry. In addition, hundreds of non-nuclear industry users of radioactive materials produce radioactive wastes; for example universities, hospitals, the pharmaceutical industry, research establishments and the oil and gas industry.

The majority of UK LLW (by volume) arises at nuclear sites undertaking the following activities: fuel fabrication and uranium enrichment; nuclear power generation; spent fuel reprocessing; decommissioning and clean-up of nuclear sites; nuclear energy research and development; Ministry of Defence activities; and the manufacture of radioactive medical products.

LLW can be sub-divided into operational and decommissioning related material. Operational LLW typically arises from routine monitoring and maintenance activities, and includes plastic, paper, tissue, clothing, wood and metallic items. Decommissioning LLW mostly comprises building rubble, soil and various metal plant, equipment and items.

The LLW policy also introduced a sub-category of LLW, Very Low Level Wastes (VLLW). This category of waste has activity levels which are at the lower end of the LLW activity limit and can be managed by disposal to suitably permitted conventional landfill sites.

Further information on radioactive wastes in the UK can be found at the UK Radioactive Waste Inventory website: <https://www.nda.gov.uk/ukinventory/>

Scope

- 1.9. Government policy requires a strategy for the management of solid LLW from the nuclear industry. For the purposes of this strategy the nuclear industry is defined as sites that hold a nuclear site licence. This includes NDA Site Licence Companies (SLCs), existing commercial nuclear power stations, and certain Ministry of Defence and other defence related sites (i.e. those organisations involved in the generation of electricity by nuclear means, decommissioning of nuclear related facilities and organisations involved in maintaining the UK's nuclear deterrent). Certain other organisations hold nuclear site licences; they will have to take account of this strategy and the strategy for the management of LLW from the non-nuclear industry. Figure 1 below shows the location of the main waste producers and LLW management facilities.
- 1.10. The UK Government has put steps in place to facilitate new nuclear power generation and this strategy applies to new nuclear sites as they are developed. The design, construction and operation of any new sites must consider how best to incorporate this strategy into their waste management activities. Indeed, new sites are best placed to incorporate key elements of this strategy such as those steps higher in the waste hierarchy (the prevention and minimisation of waste).
- 1.11. A number of nuclear industry sites in the UK have, to a varying extent, some contamination of ground and groundwater. This strategy will be relevant to such material once a decision is made on whether it requires management as LLW. At the current time, the UK Radioactive Waste Inventory includes a quantity of contaminated ground that has been characterised and determined to be LLW. However, there is a greater quantity of material yet to be sufficiently characterised to determine the appropriate management option and hence the likely quantities of LLW that may arise. This strategy recognises that a risk-based approach to developing clean-up targets for contaminated ground and groundwater can contribute significantly to helping prevent the unnecessary generation of LLW.
- 1.12. This is a UK-wide strategy and therefore does not attempt to address site-specific issues. It is recognised that appropriate clean-up targets and waste management solutions at one site may be different to those at another site. As such, this strategy is not prescriptive about which management solutions should be used in specific circumstances.
- 1.13. In line with Government policy, this strategy sets the strategic direction for producers and managers of LLW. It is intended that its implementation will help ensure flexibility of options and continued capability and capacity for management of the UK's LLW.

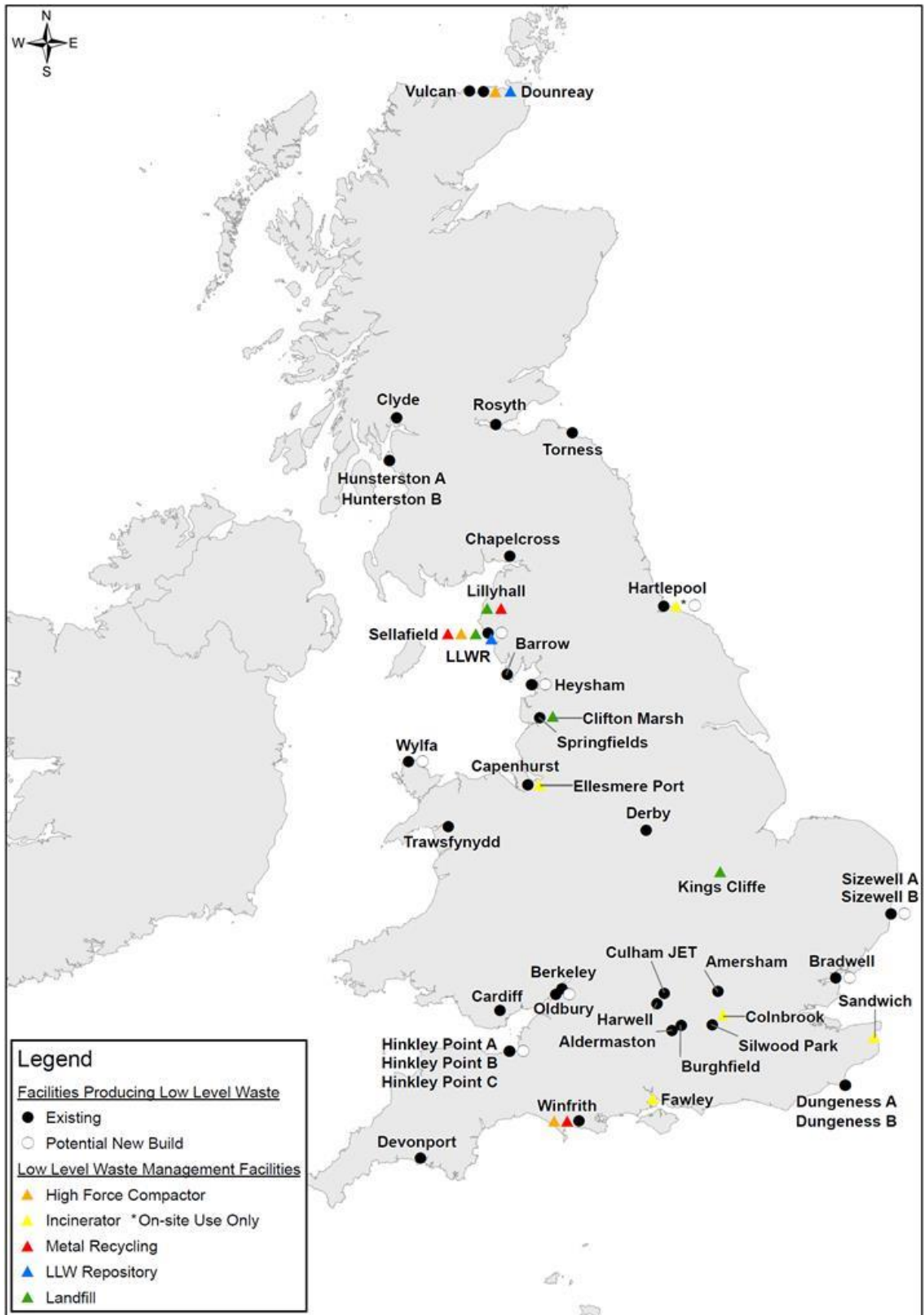


Figure 1: The UK nuclear industry and LLW management facilities

Roles

1.14. Stakeholders to the strategy have key roles in its implementation. These are summarised in Table 1 below.

| Stakeholder | Role |
|-------------------------------------|--|
| Government | Sponsor and owner of the LLW strategy. |
| NDA | <p>Owner and responsible for the decommissioning and clean-up of the UK's civil public sector nuclear sites including the operation of the LLWR.</p> <p>Lead the implementation of the LLW strategy, through the National LLW Programme on behalf of Government.</p> <p>Lead the periodic review of the strategy, at least in line with the NDA strategy review cycle.</p> <p>Make NDA LLW management facilities available to other nuclear and non-nuclear managers of radioactive waste, where it is practicable to do so.</p> |
| LLW Repository Ltd | <p>Lead the delivery of the National LLW Programme to implement the strategy across the industry on behalf of NDA and Government.</p> <p>Act as integrators for the strategy, through its Waste Services organisation.</p> <p>Manage the LLWR as the UK's national LLW repository.</p> |
| LLW Producers and Nuclear New Build | Implement the strategy within their organisations and sites, engaging with the National LLW Programme. |
| Regulators | Work with permitted and licenced sites to implement the strategy in a safe and compliant manner. |
| Supply Chain | Provide capability and capacity in the form of fit for purpose waste treatment and disposal routes to enable diversion from the LLWR. |
| Planning Authorities | To take account of this strategy within their mineral and waste local plans. |
| Public | To recognise the need for suitable facilities and routes to manage the LLW inventory and to engage with the industry. |

Table 1: Stakeholder roles

2. UK Nuclear Industry LLW Strategy

2.1. The three strategic themes of this strategy are:

- the application of the waste hierarchy;
- the best use of existing LLW management assets;
- the need for new fit-for-purpose waste management routes.

2.2. The strategy provides a framework for continued capability and capacity for the safe, secure and environmentally responsible management and disposal of LLW in the UK. LLW producers have already made significant changes to the way their LLW is managed and the supply chain has also responded with the development of new waste management routes. These efforts are recognised and will need to be built upon to continue the development of sustainable LLW management practice and infrastructure.

2.3. A National LLW Programme¹ was established to lead the implementation of the strategy. This is managed by LLW Repository Ltd on behalf of the NDA; and works with all stakeholders to the strategy to ensure its effective implementation through a range of programme and governance activities.

Principles

2.4. Set out below are the key principles appropriate for the management of LLW throughout the UK. They provide overarching expectations for implementation of the strategy for waste producers, planning authorities, regulators, NDA and the supply chain:

- high standards of health, safety, security, environmental protection and public engagement are central to the development of appropriate waste management plans and their implementation;
- the waste hierarchy should be implemented by all producers of LLW;
- application of Best Available Techniques (BAT) / Best Practicable Environmental Option (BPEO) / Best Practicable Means (BPM) (referred from here on as 'BAT') by all producers of LLW. These are used to demonstrate the use of a robust decision-making process to identify the most advantageous option for LLW management;
- effective characterisation and segregation of waste, and material that will become waste, is critical to flexible management of LLW;

¹ The LLW National Programme has been developed to support the ongoing delivery of the UK Strategy for the Management of Solid Low Level Radioactive Waste from the Nuclear Industry. LLW Repository Ltd leads the delivery of the programme on behalf of the NDA and through collaboration with all the UK's LLW producers. Details of the programme can be found at: <http://llwrsite.com/national-waste-programme/>

- given the diverse physical, chemical and radiological nature of LLW, the availability of proportionately regulated waste management routes is essential;
- the development of new waste routes or approaches to the management of LLW requires appropriate engagement with local and national stakeholders;
- availability of robust, sustainable waste management infrastructure is essential for continued operations, hazard reduction and decommissioning;
- waste management decisions should be supported by sound business cases;
- integration of strategies for all wastes (both radioactive and non-radioactive, controlled waste) is important nationally and at a site level; local waste strategies and plans will be consistent with, and complement, national strategy and policy;
- best practices in waste management and any relevant learning from experience (LFE) is shared across the nuclear industry, including new build;
- problematic wastes should be dealt with at the earliest practicable opportunity and successful outcomes shared with other waste producers;
- opportunities to safely manage wastes at the boundary between LLW and Higher Activity Waste (HAW) as LLW should be considered within waste management decision making.

2.5. There are other policy and regulatory requirements and principles that apply to LLW management. Implementation of this strategy must be undertaken in compliance with all relevant legal and regulatory requirements. Further detail can be found in chapter 4; on the websites of the environmental regulators - Environment Agency (EA), Scottish Environment Protection Agency (SEPA), National Resources Wales (NRW) and the Northern Ireland Environment Agency (NIEA); the nuclear regulator, Office for Nuclear Regulation (ONR); and within the UK reports to the IAEA Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management. Information on the policy and regulatory requirements applicable to LLW management is also contained in the Lead Document for the UK National Programme for the Responsible and Safe Management of Spent Fuel and Radioactive Waste (Ref. 6).

Integrated Waste Management

2.6. The management of LLW on a nuclear industry site should be undertaken as part of a wider integrated framework, which includes other radioactive and directive

wastes² (solid, liquid and gaseous). These waste management practices must be optimised wherever practicable.

- 2.7. The specific activity of LLW spans several orders of magnitude and this can influence how the wastes are managed. Not all LLW can be safely disposed of at the LLWR; some LLW may need to be managed as HAW, as certain radiological or chemical criteria may make it unsuitable for disposal to a LLW facility. Conversely some HAW may be better managed within a LLW facility; for example, wastes that contain short lived radionuclides, or waste at the boundary between LLW and HAW.
- 2.8. In recognition of this, waste producers should seek to identify and implement opportunities for managing such boundary wastes in ways that optimise value and benefit. For example, certain waste types could be managed as a whole rather than by separating by radiological classification.
- 2.9. As a result, there are synergies between the HAW policies³ and the LLW strategy, and an optimised approach to radioactive waste management could be applied to make best use of capacity and capability within the industry. This could be enabled by managing wastes by disposability assessment, as opposed to radiological classifications; and would potentially provide a more integrated and optimised approach. Government will work with regulators, the NDA and waste producers to determine the practicalities and feasibility of adopting such an approach; recognising the importance of proportionate and coordinated stakeholder engagement in any potential change.
- 2.10. Figure 2 shows the waste management cycles for HAW, LLW and out of scope⁴ waste categories; and the opportunities to provide a more integrated approach at the classification boundaries.

² Wastes covered by the Waste Framework Directive (WFD) as revised, 2008.

³ Policies for the disposal of higher activity wastes differ in Scotland and in England/Wales. CoRWM defined HAW as HLW, ILW and LLW which cannot be disposed at the LLWR and recommended geological disposal as the best available approach for its management. This position has been adopted as policy in England and Wales, whereas Scottish policy is long term management in near-surface, near-site facilities as they do not have any HLW.

⁴ Out of scope wastes are wastes containing levels of radioactivity that are below clearance levels specified in the Environmental Permitting Regulations 2010 and Radioactive Substances Act 1993 and are not subject to regulatory control. Effectively 'out of scope' equates to 'not radioactive' for the purposes of this strategy.

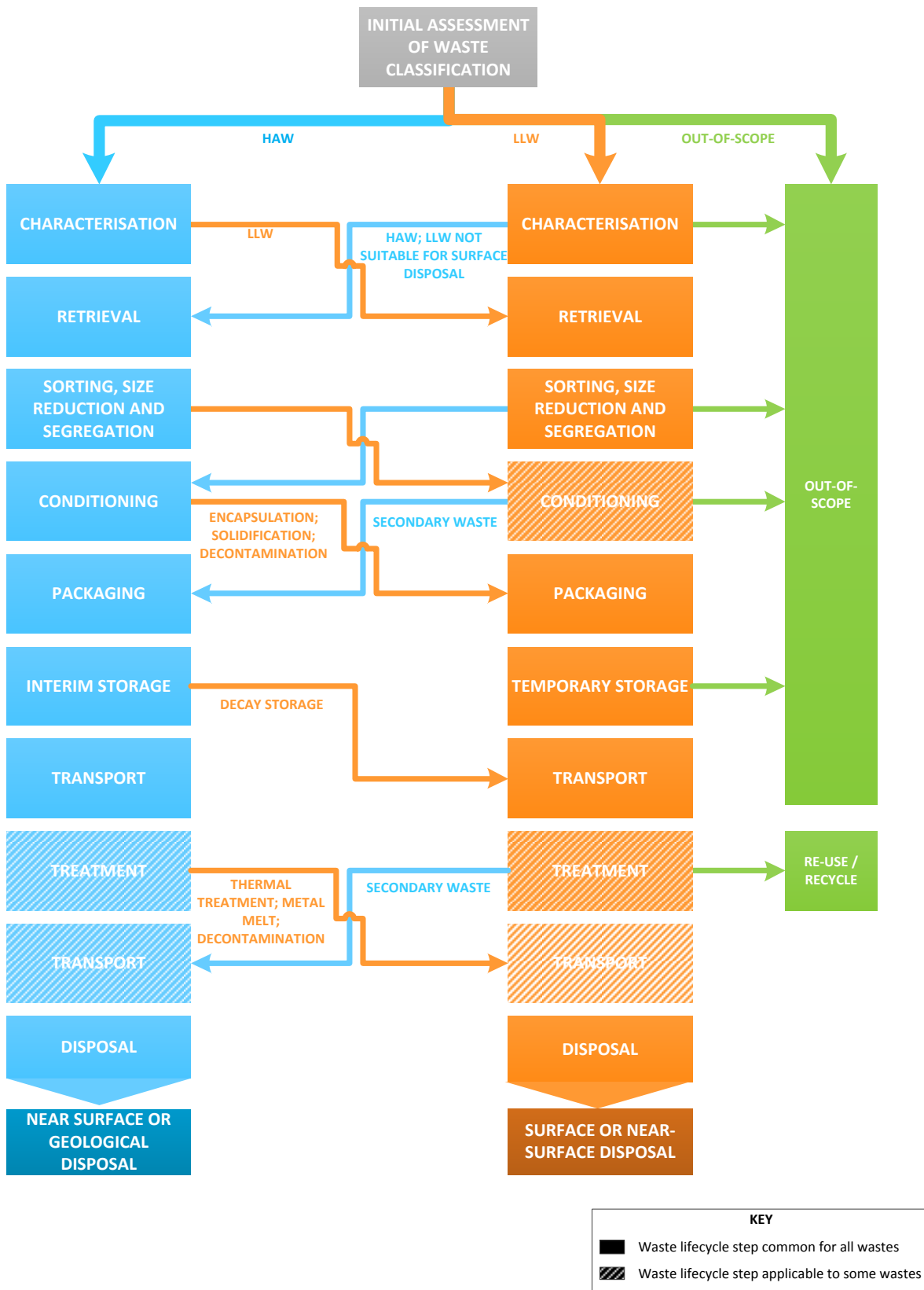


Figure 2: Radioactive waste management – lifecycle steps and integration opportunities

Waste management planning and decision making

- 2.11. Planning for the management of LLW occurs at a number of levels and is affected by a wide range of factors ranging from international policy, standards and guidance; UK policies, strategies and plans; to company or site specific strategies and implementation plans (see Figure 3).
- 2.12. Planning for the management of wastes is necessary across all aspects of the nuclear life cycle from design, construction, and commissioning through to operations and decommissioning. As nuclear plants tend to have long lifecycles, planning for waste management activities needs to be robust over the entire lifecycle of the plant or facility. This requires long term planning over several decades and results in the need to consider changing waste types, volumes and generation rates over the lifecycle.
- 2.13. Waste management decisions should not be taken on an ad-hoc basis. The policy requires waste managers to develop a LLW Management Plan, taking account of current and future arisings of LLW. This requirement can be met through the development of an organisational or site specific waste strategy, in which all wastes are considered, with particular emphasis on how the waste hierarchy has been addressed. The development of such plans should include appropriate engagement with stakeholders and must meet the needs of the regulators.
- 2.14. The process for deciding the best techniques for managing LLW in specific cases is important to the implementation of this strategy and should be made in an open and transparent manner. These decisions should be taken through the application of the BAT process (a requirement within waste producers' permits), which seeks to identify a practicable solution with the least environmental impact, whilst taking cognisance of other factors such as safety, security, sustainability and lifecycle costs.
- 2.15. Critical to choosing the best approach for managing LLW is the availability of robust information in the form of waste forecasts. These allow underpinned waste management decisions to be made and future infrastructure capacity and capability requirements to be predicted.

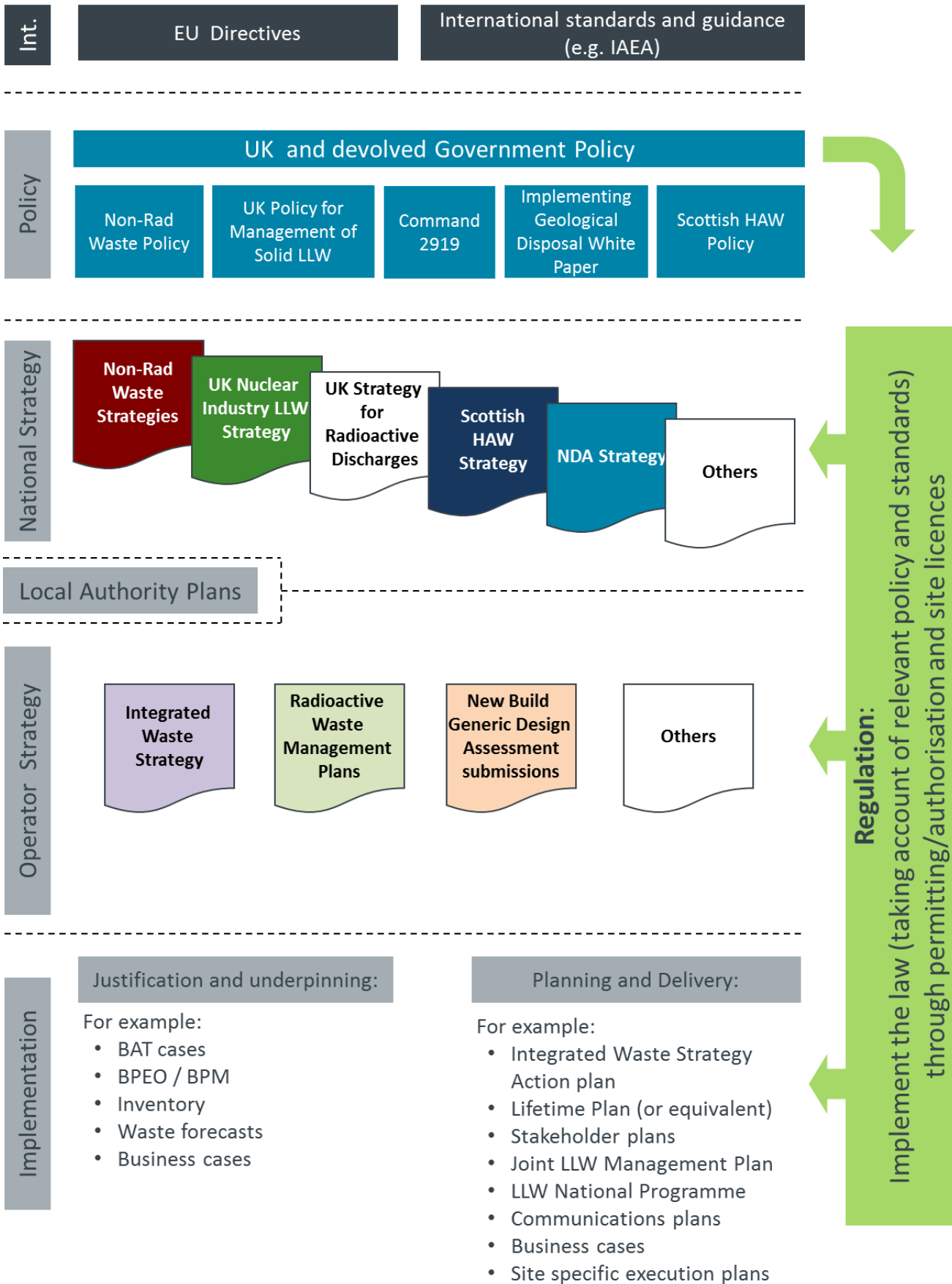


Figure 3: Waste management and policy framework

Characterisation and waste information

- 2.16. Obtaining good quality (i.e. accurate and up-to-date) waste management information involves the characterisation of waste and materials located at each site; maintaining inventories for waste volumes, packages, and waste content; and the real-time use and archiving of records. Robust and appropriate data and information are critical to effective decision making.

Characterisation

- 2.17. In order to obtain good quality information, waste producers need to undertake effective characterisation programmes to determine what waste will arise and when. This means obtaining appropriate information on the physical, chemical and radiological properties of the waste. Characterisation is essential to support effective waste routing and application of the waste hierarchy. The time and effort required to effectively characterise waste should not be underestimated and should be included in lifetime planning arrangements. Significant time savings and cost benefits can be delivered when waste management and decommissioning programmes are characterisation led, because there is the potential to identify alternate management options for waste populations.

Waste Information

- 2.18. Radioactive waste information is collated in the UK Radioactive Waste Inventory (UKRWI) (Ref. 7). Information in the inventory helps the UK to plan safe and efficient management routes to meet our reporting requirements to the European Union (EU) and the International Atomic Energy Agency (IAEA) and provides clear and accessible information to the public. The UKRWI provides a reference for Government and its agencies, and others with a role or interest in the management of radioactive waste, for example the supply chain. Its publication is one facet of the continuing commitment of the UK Government and the organisations responsible for radioactive wastes to openness and transparency in matters relating to the management of these wastes.
- 2.19. The inventory does not include wastes from proposed new nuclear power stations because they are still at the planning stage. The UKRWI will be updated as reactor designs and operating plans for the new plants are confirmed. It is likely that the volume of waste arisings from these new plants will be much lower than existing facilities.
- 2.20. A number of initiatives have been implemented to improve inventory data and the understanding of wastes that need to be managed. These include improved waste forecasting templates which require additional assessment of the potential to apply the waste hierarchy to the various LLW streams. There is recognition that further development of the inventory data set would provide benefits, enabling more robust decision making across the whole LLW management cycle. This could include the provision of information by potential waste management route rather than by source, for example, to support the supply chain and the wider industry in business planning. Data on the waste inventory can be found on the UK Radioactive Waste Inventory Website: <https://www.nda.gov.uk/ukinventory/>

- 2.21. Many waste producers also produce shorter term, more detailed forecasts of LLW arisings to facilitate their LLW management activities. These forecasts are useful to support a range of business decision making processes both within waste producers and the supply chain. The opportunity also exists for the accuracy and visibility of this forecast data to be improved; and for there to be greater alignment with the longer term inventory data sets.
- 2.22. Waste Planning Authorities use waste forecast information in the development of their local waste plans; the availability of accurate information is important to underpin them.

Managing LLW

- 2.23. This strategy requires waste producers to manage their LLW in accordance with the waste hierarchy. This requires consideration and utilisation of a range of methodologies to optimise their waste management processes and to make best use of existing assets. Within the policy there is also an expectation that waste producers should seek to secure solutions sooner rather than later, to avoid leaving issues for future generations.
- 2.24. The nature of some LLW may require the development of new waste management solutions.

The Waste Hierarchy

- 2.25. The waste hierarchy (otherwise known as the waste management hierarchy) was first introduced in 1975 as EU waste policy in the Waste Framework Directive for non-radiological waste ('directive waste'). It is an integral part of the development of integrated waste strategies at nuclear and non-nuclear sites. Application of the waste hierarchy is central to the successful implementation of this strategy:
- the waste hierarchy is recognised as good practice in waste management;
 - Government policy states that waste should be dealt with at the highest practicable level in the hierarchy;
 - disposal capacity is a precious resource and there is a need to move away from reliance on disposal of LLW to reduce the impact of LLW management;
 - managing waste in ways other than disposal will extend the life of the LLWR and other disposal sites;
 - where practicable, waste producers should seek to move the management of their wastes up the hierarchy.

2.26. Implementation of the waste hierarchy is mandated by policy and environmental regulation throughout the lifecycle of a facility and is recognised as good practice in all aspects of radioactive and non-radioactive waste management. It is also an essential consideration for determining BAT.

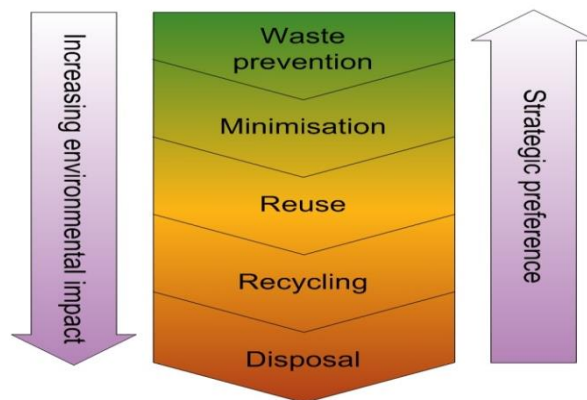


Figure 4: The waste hierarchy

Waste prevention

2.27. There is a significant opportunity to avoid the generation of LLW (and other wastes) across the UK. Waste prevention is the highest level of the waste hierarchy and potentially yields the greatest benefit. The strategy also recognises a hierarchy for waste prevention specific to LLW management;

- i. Avoid creating any waste
- ii. Avoid creating any radioactive waste
- iii. Avoid creating any radioactive waste with activity above defined out of scope levels

2.28. Across the lifecycle of a facility, from design through to decommissioning, the principle of waste prevention must apply, including within nuclear new build.

Minimisation of waste

2.29. Where wastes cannot be prevented they should be minimised both in terms of volume and level of activity. Waste minimisation includes a range of approaches which can be applied individually or in combination to reduce, as far as reasonably practicable, the volume and / or activity of the waste requiring management as LLW. The choice of technique is determined by the properties of the waste and covers techniques such as sorting, segregation, decontamination and improved characterisation.

2.30. Opportunities exist to undertake characterisation activities such that the waste can be sentenced appropriately; for example to support reclassification to Very Low Level Waste (VLLW) or out of scope. The UK regulatory framework includes

exemption orders which can be used to remove the requirement for registration or authorisation of some radioactive wastes⁵, if it can be demonstrated that specific requirements are met. With respect to LLW from the nuclear industry, these requirements broadly relate to demonstrating that the waste does not present a significant hazard because of its very low levels of activity.

- 2.31. Separating wastes where they are mixed or before they can become mixed can enable management by the most appropriate route. Segregation of wastes at source, where practicable, is the preferred option for this activity in order to reduce reworking of the waste; however in some circumstances segregation in later waste management stages may be necessary.
- 2.32. Decontamination of facilities and materials has significant potential to minimise the amount of waste that needs to be managed as LLW. There is a range of mature decontamination techniques already available and in use. Given the complexity of nuclear industry operations, however, there are opportunities to develop additional innovative approaches to solve future challenges.
- 2.33. Decay storage is an opportunity to minimise the radioactivity of waste. Whilst decay storage of waste to out of scope levels or levels suitable for alternative management options may have benefits, there are also significant challenges that need to be overcome, including rigorous characterisation before and after storage, availability of space, regulatory requirements, stakeholder acceptance and strategic fit with decommissioning strategies. Decay storage is, however, particularly useful for those wastes containing radionuclides with a short half-life and should be considered on a case-by-case basis.

Reuse

- 2.34. The LLW policy recognises the opportunities for appropriate reuse of materials before they become waste. Opportunities for reuse exist well before a material becomes waste, for example plant, equipment and buildings which have reached the end of their original intended purpose but may continue to have value elsewhere. Waste producers should seek to exploit these opportunities where practicable.
- 2.35. For example, the NDA operates an Asset Transfer Website for plant and equipment which enables potential users to identify equipment that has come to the end of its original intended use. This system has seen a significant amount of plant and equipment reused within the NDA estate at considerable cost saving. There are similar processes in use elsewhere in the industry and there may be opportunities to share information and learning.
- 2.36. Soil and rubble can be reused on sites, for example in landscaping and void filling. However these activities require appropriate authorisations and need to consider the site end state, as well as the suitability of the material for the intended solution. Future guidance from regulators will provide clarification on this issue.

⁵ Exemption orders apply to certain materials or wastes where risks have been assessed and activity is low enough that some or all aspects of radiological regulatory controls are reduced or removed

Recycling

- 2.37. Recycling materials for further use presents a significant opportunity to the nuclear industry. Specifically, this strategy recognises metal treatment and recycling as the main opportunity in this area, although there are opportunities for recycling of other wastes, such as concrete and rubble. Recycling can involve the use of treatment and conditioning techniques such as surface decontamination, melting, crushing or grading; and activities including characterisation, monitoring and sentencing of materials support effective recycling.
- 2.38. Surface decontamination of metal wastes already takes place in the UK, both on nuclear sites and at commercial facilities. Metals which require melting/smelting in order to effect decontamination currently have to be sent to overseas facilities and it is envisaged that there will be increasing capacity constraints in this market as global decommissioning programmes ramp up. The challenge will be to maintain and enhance these routes as part of a robust, sustainable waste infrastructure.
- 2.39. Metal treatment has been demonstrated to be the preferred option at a UK strategic level when resource preservation, best use of disposal capacity and environmental responsibility are considered. Recycling should be the preferred way forward for the treatment of this waste; recognising that the waste producer must make a BAT case to confirm the validity of the option for a specific waste population.
- 2.40. Opportunities to increase the capacity and capability in the supply chain would benefit from improved forecasts of arisings. Improvements to the UKRWI will support increased visibility of waste volumes, timing of arisings and potential routes.

Waste volume reduction

- 2.41. Whilst volume reduction is not formally a step in the waste hierarchy, it has an important role to play in the provision of optimised disposal. For those wastes that are not amenable to management at higher levels in the hierarchy, and therefore require disposal, it is vital that the best use is made of the disposal capacity. Reducing the volume of the waste to be disposed is an effective way of achieving this. Typical methodologies for volume reduction include:
- compaction, whereby wastes are compacted within drums or boxes to reduce the volume of wastes for disposal;
 - thermal treatment, where suitable wastes are treated by incineration or other thermal techniques to destroy the organic component of the waste and reduce its volume.
- 2.42. Both of these technologies are mature and have been utilised for radioactive wastes for a number of years. There are a number of available routes within the supply chain capable of managing wastes from the nuclear industry.

Waste disposal

- 2.43. The aim of the strategy is to apply the waste hierarchy where practicable and minimise disposal of LLW. Whilst the strategy seeks to significantly reduce the

reliance on disposal for the management of LLW, it recognises that there are some wastes that are not amenable to being managed at higher levels in the waste hierarchy. Where waste does require disposal, this should be achieved in the optimal way (by applying BAT) in order to minimise the impact of those disposal activities.

2.44. There are a range of disposal options in use by the nuclear industry. These include:

- the use of suitably permitted commercial landfill sites that can accept lower activity LLW for controlled burial;
- on-site disposal facilities which can accept certain types of LLW;
- engineered disposal facilities, including the LLWR and the new near-site Dounreay repository.

2.45. Disposal capacity for all wastes is a precious resource and must be used sparingly; as such every effort should be made to avoid the use of disposal wherever practicable.

2.46. LLWR is a key asset to the UK. Radioactive waste has been disposed of at LLWR since 1959 and the facility provides a high level of safety, security and environmental protection for the disposal of a wide range of solid low level wastes by offering a multi-barrier containment system. Continued availability of this facility is central to this strategy, ensuring that the UK is able to effectively manage radioactive waste. The strategy looks to extend the life of this facility to ensure capacity in the long term for existing and new build waste producers.

2.47. Some LLW is unable to be disposed of at the LLWR due to its specific radiological or chemical properties and this waste will require management as HAW. Conversely there is some HAW, particularly with short-lived isotopes or those wastes lying at the LLW-HAW boundary that may be more appropriately managed within the LLWR. The Environmental Safety Case for the LLWR forms the basis for the Environment Agency's permitting considerations and this governs what can be disposed at the site. There may be opportunities within the nuclear industry to explore the use of near-surface management routes for short-lived ILW.

Packaging and transport

2.48. Packaging and transport are key enablers to the delivery of this strategy.

2.49. The majority of LLW disposed of in the UK at engineered disposal facilities is packaged in various types of isofreight containers, which are grouted prior to disposal to minimise void space and improve long term wasteform performance. Typically the container is also used for transporting the waste to its final destination.

2.50. A range of package designs are available for use with LLW being sent for treatment or for disposal at permitted landfill sites. Many of these are available as part of LLW Repository Ltd.'s national container supply service through its customer contracts.

- 2.51. There are opportunities to optimise and standardise package designs to meet the needs of waste producers as the types of LLW change through their facility lifecycles. The industry, through LLW Repository Ltd's packaging and logistics service, will continue to focus on these opportunities.
- 2.52. The movement of radioactive waste in the UK is governed by the Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009 (Ref 8) and is regulated by ONR Radioactive Materials Transport.
- 2.53. It is recognised that transport of LLW is a significant stakeholder concern, particularly for residents of the communities with facilities nearby. The social and environmental impacts of waste transport are a function of the number of movements, the distance travelled and the mode of transport utilised. There is an opportunity to transfer a portion of waste movements from road to rail and also to utilise sea transport, where appropriate. However, the desire to alleviate concerns over transport needs to be balanced with the practicality of alternatives and the relatively low risk presented by the transport of LLW.
- 2.54. There are opportunities to further optimise transport operations to minimise 'empty miles' and maximise the use of rail over road. The national transport service, managed by LLW Repository Ltd as part of its Waste Service Organisation, acts as an integrator for transport and will continue to work to optimise the transport of LLW.

3. Key Influences and Issues

- 3.1. This document does not provide plans for the implementation of the strategy. However, key implementation influences and issues are discussed below to provide clarity and future expectations. Plans and projects to support the implementation of the strategy are included in the National LLW Programme which is led by LLW Repository Ltd on behalf of the NDA.

Stakeholders to the strategy and their engagement

- 3.2. As stated in the policy, this strategy should be used as guidance by national, regional and local planning authorities when preparing and reviewing their planning strategies for waste management.
- 3.3. Waste managers and facility operators should recognise the importance of early dialogue with local government decision makers (e.g. waste planning authorities in England) to help inform the preparation of local waste development documents and the handling of planning applications. It is important to work in constructive

partnership with local government decision makers as delays can arise if a proposed development is not adequately conceived or does not pay due regard to local planning policies. In contrast, where proposals reflect those policies and their preferred locations for waste management facilities, applicants should expect timely and informed consideration of planning applications.

3.4. The success of this strategy will rely on action by all parties involved in the management of LLW. To ensure commitment to effective and efficient implementation, organisations will need to work closely to achieve the best results for all parties involved. Key stakeholders directly involved in the implementation are shown in Figure 5.

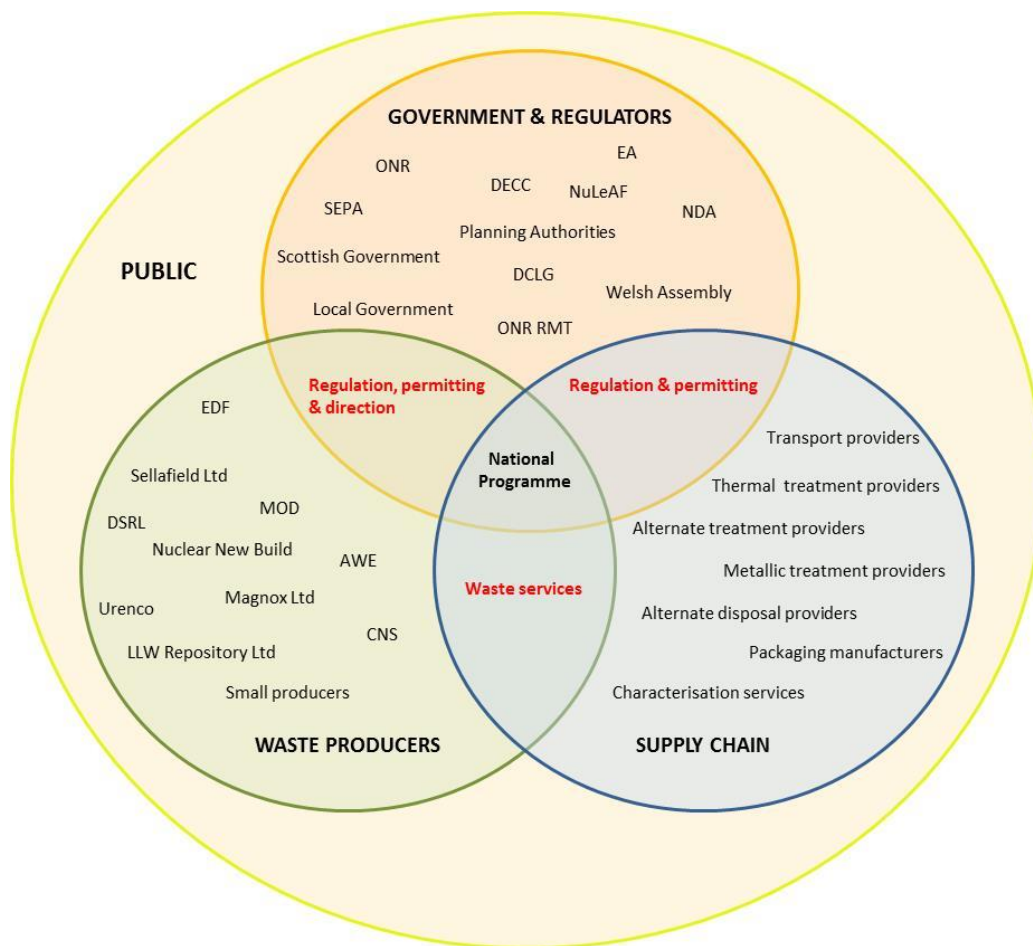


Figure 5: Key stakeholders to the strategy

3.5. The strategy has been developed to deliver benefits across the UK. However, it is recognised that this strategy has an impact at every level, including regional, local and within communities. Radioactive waste, even LLW and VLLW, can raise particular concerns for the public and local communities.

3.6. In light of the above, it is essential to undertake careful and considered engagement with local communities early in the waste management planning and

decision making process, particularly where the implementation of this strategy leads to proposals for new waste management facilities or changes in approach to LLW management. Such engagement needs to be open and transparent in order to build confidence and credibility. There is no single organisation responsible for ensuring that this dialogue takes place, but is shared between all organisations involved in the implementation of this strategy:

- engagement with communities during the permitting and planning process for new or existing facilities;
- waste supply chain engaging with their communities;
- waste producers engaging with their communities;
- local authorities, as part of their duty to cooperate when developing mineral and waste local plans.

3.7. Fora for engagement are required, such as the LLW Strategy Delivery Overview Group⁶, to provide the opportunity to work together and focus on the delivery of the strategy. These fora also have a role in the sharing of good practice and for the collation of information and opportunities in LLW management between stakeholders.

3.8. Government will encourage further development of the engagement process to meet the needs of the maturing strategy through the National LLW Programme.

Low Level Waste issues that require further consideration

3.9. This strategy captures the management of all LLW generated within the UK nuclear industry. It is recognised that the management of certain wastes may need to be addressed by waste producers in a manner to also meet other strategic considerations.

Contaminated ground

3.10. Where sites in the UK have or are found to have ground and groundwater contaminated by radioactive substances, remediation may require the management of substantial quantities of material. Whilst the management of radioactively contaminated ground does not have to result in the generation of waste, it is likely that some ground may be consigned as LLW. There is a significant amount of potentially contaminated ground that has not yet been declared as waste because it is not yet characterised sufficiently and a management option has not yet been selected. This quantity of material is in excess of the current total inventory of LLW.

3.11. In the short term, the nuclear industry is working with regulators to fully understand the requirements for sites which have ground contaminated and/or ground

⁶ The LLW Strategy Delivery Overview Group includes representatives from NDA, Regulators, waste producers, DECC, Local Government and the waste management supply chain and provides a forum to review the national LLW programme progress, share information on case studies & best practice and share views, expertise and concerns. The group provided a key input in the 2014 strategy review.

potentially contaminated with radioactive and non-radioactive substances. NDA are also working with the regulator community and sites to fully understand the options available for land quality management in the context of the desired site end state.

- 3.12. As understanding improves in the longer term, this may impact the LLW strategy because of the need to develop solutions to manage these wastes. Alignment with the waste hierarchy should be part of determining the way forward.

Innovation

- 3.13. The nature of some LLW may require the development of new waste management solutions. For example, innovation may be required to solve specific issues such as problematic wastes or to improve LLW management effectiveness.
- 3.14. The majority of R&D work associated with LLW management is undertaken by waste producers driven by a particular need at that site; however there are some issues which are common to a number of sites and there is benefit in jointly assessing the issues and identifying how best to take this forward. The NDA undertakes direct research where there is a multi-site or cross industry need. Where there is a technology gap along these lines they determine how the need can be addressed, either through R&D driven by waste producers or centrally through directly funded work; for example, as part of NDA's R&D portfolio and strategy.
- 3.15. The Energy Act 2004 instructs the NDA in carrying out its duties to ensure the adoption of what it considers to be good practice at its sites. It is clearly evident that there is much good practice already in place in the management of LLW in the nuclear industry and the dissemination of this good practice takes place through the National LLW Programme.

Monitoring strategy implementation and risk management

- 3.16. Since the publication of the first version of this strategy document in 2010 there has been significant development in how strategy implementation is monitored through the National LLW Programme.
- 3.17. The LLW Repository Ltd Programme Office publishes a range of metrics which evidence the implementation of the strategy. These metrics currently focus on the LLW management performance within the NDA estate and it is recognised that the opportunity exists for the wider nuclear industry to contribute to these metrics to provide a more complete picture of industry performance.
- 3.18. The National LLW Programme also supports waste producers in the development and publication of plans evidencing their approach to strategy implementation (for example through Joint Waste Management Plans). There is an opportunity for the wider nuclear industry to develop similar plans in collaboration with the National LLW Programme.
- 3.19. The NDA holds the strategic risk register for this strategy and it is managed through the National LLW Programme risk process. The strategic level threats and

opportunities are reviewed at least on an annual basis or when there is a significant event which could impact the strategy. The process also identifies actions to mitigate against the threats and to maximise the probability of the opportunities being realised.

4. Supporting Information

Regulatory framework

Environment

- 4.1. The main environmental legislation used to regulate the disposal of radioactive waste in the UK is the Environmental Permitting (England and Wales) Regulations 2010 (EPR 10) (Ref 9) in England and Wales and the Radioactive Substances Act 1993 (RSA 93) (Ref 10) in Scotland and Northern Ireland. Although the legislation is different, the regulatory systems are very similar in practice across the UK. The environmental regulators responsible for the regulation of radioactive substances are the Environment Agency (EA) in England, Natural Resources Wales (NRW) in Wales, the Scottish Environment Protection Agency (SEPA) in Scotland and the Northern Ireland Environment Agency, (NIEA) in Northern Ireland.
- 4.2. There is a mature regulatory framework for activities involving the management of LLW so as to protect the public and the environment. Authorisations under RSA93 and permits under EPR 10 require operators to demonstrate that they are applying BPM and BAT respectively to minimise the volume and activity of radioactive wastes, thus ensuring doses to people and the environment are as low as reasonably achievable (ALARA).
- 4.3. All materials are radioactive to some extent, however there are some wastes which are not required to be subject to specific regulatory control, because the levels of radioactivity contained within it are either not possible to control, or are so low that regulation is not warranted. Such radioactive wastes are classified as out of scope wastes and can be disposed of in the same manner as other municipal, commercial and industrial wastes i.e. to landfill or incineration, without specific authorisations under the RSA 93 or EPR10⁷.
- 4.4. The developers and operators of facilities for solid radioactive waste disposal (i.e. low level waste repositories or landfill sites that could take LLW and High Volume VLLW) have to demonstrate to the regulators that the facilities will adequately

⁷ Guidance on out of scope waste and waste exemptions can be found at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69357/pb13624-rsl-guidance-110914.pdf

protect people and the environment. To do this, they will need to show their approach to developing and operating the facilities, and also demonstrate that the location, design, construction, operation and closure of the facilities will meet a series of principles and requirements. The environmental regulators (see 4.1), have published guidance (called Near-surface Disposal Facilities on Land for Solid Radioactive Wastes - Guidance on Requirements for Authorisation, GRA⁸) which sets out these principles and requirements, and which indicates how they are likely to be interpreted. The guidance also provides information about the associated framework of legislation, government policy and international obligations and has been used to support the development of existing specified landfill sites.

Safety

- 4.5. Under UK law (the Health and Safety at Work etc. Act 1974) employers are responsible for ensuring the safety of their workers and the public, and this is just as true for a nuclear site as for any other.
- 4.6. This responsibility is reinforced for nuclear installations by the Nuclear Installations Act 1965 (NIA65), as amended. Under the relevant statutory provisions of the NIA a site cannot carry out certain activities prescribed in the Act unless the user has been granted a site licence by the Office for Nuclear Regulation (ONR)⁹.
- 4.7. The ONR sets out in conditions attached to a site licence the general safety requirements to deal with the risks on a nuclear site which Licensees must comply with. These licence conditions include specific requirements relating to the accumulation and storage of radioactive wastes on nuclear sites.
- 4.8. The nuclear licensing regime is complemented by the Ionising Radiations Regulations 1999 (IRR99) which the ONR also enforces on nuclear sites. This general health and safety legislation will also apply to non-nuclear sites which treat or dispose of LLW.
- 4.9. The safety of any LLW treatment or disposal activities not carried out on nuclear sites will continue to be regulated under the IRR99 by the Health and Safety Executive (HSE). These regulations place requirements on any employers whose practices involve work with ionising radiations to monitor exposure to ionising radiations and apply necessary controls in order to keep such exposure as low as is reasonably practicable. These regulations also include legal limits on worker exposure to radiation.
- 4.10. Under the terms of relevant Memoranda of Understanding (MoU), ONR consults with the Environment Agency or SEPA regarding environmental issues relating to its regulation of nuclear sites.

⁸ The guidance can be found at: http://www.sepa.org.uk/radioactive_substances/radioactive_waste/near-surface_disposal.aspx

⁹ The Office for Nuclear Regulation is an independent, statutory regulator of nuclear safety, security and conventional health & safety at nuclear sites.

Planning

- 4.11. Land use planning in the UK is a devolved matter and separate planning policies and guidance frameworks are in place.
- 4.12. Land use planning in England and Wales is the subject of the Town and Country Planning Act 1990 and associated regulations as amended. In Scotland it is the Town and Country Planning Act (Scotland) 1997 and in Northern Ireland the Planning (Northern Ireland) Order 1991. It operates through two interlinked processes: the provision of policy frameworks in spatial plans or local development plans in Wales, and the control of development. The policy adopted in plans is the predominant “material consideration” in determining a planning application for a specific development. For this reason, land use planning in the UK is often said to be ‘plan-led’.
- 4.13. In England, national planning policy for waste is set out in the Department for Communities and Local Government document National Planning Policy for Waste¹⁰ which streamlines waste planning policy making it more accessible to local authorities, waste developers and local communities and is supported by planning guidance.
- 4.14. In Wales, Planning Policy Wales (PPW) sets out land use planning policies of the Welsh Government with specific waste planning policy Detailed in Technical Advice Note 21 (TAN21)¹¹
- 4.15. Scottish Planning Policy is informed by two key documents, the National Planning Framework and Scottish Planning Policy. Additional guidance on planning and waste is contained in Planning Advice Note 63 (PAN 63)¹². This is being redrafted to include coverage of planning for provision for treatment and disposal capacity for LLW.
- 4.16. In Northern Ireland Planning Policy Statement 11 (PPS 11)¹³ sets out the Department of the Environment’s policies for the development of waste management facilities and explains the relationship between the planning system and those authorities responsible for the regulation and management of waste. The Department is currently undertaking a comprehensive review of existing planning policy in order to bring forward a single planning policy statement in advance of the transfer of planning powers to District Councils in 2015 as part of the larger Local Government Reform Programme. It should be noted however that there are no nuclear facilities in Northern Ireland and therefore no local demand for nuclear waste management. The LLW produced in Northern Ireland currently

¹⁰ Policy can be viewed at:

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/364759/141015_National_Planning_Policy_for_Waste.pdf

¹¹ TAN 21 can be viewed at: <http://wales.gov.uk/docs/desh/publications/140228technical-advice-note-21-en.pdf>

¹² PAN 63 can be viewed at: <http://www.scotland.gov.uk/Publications/2002/02/pan63/pan-63>

¹³ PPS 11 can be viewed at:

http://www.planningni.gov.uk/index/policy/policy_publications/planning_statements/pps11-waste-management.pdf

comprises of very small volumes that typically arise in non-nuclear industries (e.g. hospital waste).

5. References

| No. | Reference |
|-----|--|
| 1. | Policy for the Long Term Management of Solid Low Level Radioactive Waste in the United Kingdom, by Defra, DTI and the Devolved Administrations, March 2007 |
| 2. | UK Strategy for the Management of Solid Low Level Radioactive Waste from the Nuclear Industry, NDA, August 2010 |
| 3. | UK Strategy for the Management of Solid Low Level Radioactive Waste from the Nuclear Industry: Strategic Environmental Assessment, NDA, 2015 |
| 4. | Strategy for the Management of Solid Low Level Wastes from the Non-nuclear Industry: part 1 Anthropogenic Radionuclides, UK Government, March 2012 |
| 5. | Strategy for the Management of Naturally Occurring Radioactive Material (NORM) Waste in the United Kingdom, Scottish Government, July 2014 |
| 6. | Lead Document setting out the United Kingdom's National Programme for the Responsible and Safe Management of Spent Fuel and Radioactive Waste |
| 7. | UK Radioactive Waste Inventory as at 1 April 2013, NDA, March 2014 |
| 8. | Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009, DfT, July 2009 |
| 9. | Environmental Permitting (England and Wales) Regulations 2010 (EPR 10), UK Government, April 2010 |
| 10. | Radioactive Substances Act 1993 (RSA 93), UK Government, 1993 |

6. Glossary

Activity

The number of atoms of a radioactive substance which decay by nuclear disintegration each second. The unit of activity is the Becquerel (Bq), which is equivalent to one disintegration per second.

As Low As Reasonably Achievable (ALARA)

The ALARA principle is contained in the Euratom Basic Safety Standards Directive 96/29, which is transposed into UK law. Essentially, it requires that all reasonable steps should be taken to protect people and the environment. In making this judgement factors such as the costs involved in taking protection measures are weighed against benefits obtained, including the reduction in risks to people and the environment.

AWE

Atomic Weapons Establishment is a site licence company responsible for provision and maintenance of nuclear warheads for the UK's Continuous At Sea Deterrent, Trident.

Best Available Techniques (BAT)

BAT is defined (using the definition in article 2 of the Pollution Prevention & Control (PPC) Directive) as the most effective and advanced stage in the development of activities and their methods of operation, which indicates the practical suitability of particular techniques for providing, in principle, the basis for emission limit values designed to prevent and, where that is not practicable, generally to reduce emissions and impact on the environment as a whole. The OECD definition of BAT is best available technology; which is taken to mean the latest stage of development (state of the art) of processes, of facilities or of methods of operation which indicate the practical suitability of a particular measure for limiting discharges. The BAT NICOP defines Best Available Techniques (BAT) as the latest stage of development of processes, facilities or methods of operation which indicate the practical suitability of a particular measure for limiting waste arisings and disposal. In determining what constitutes BAT consideration shall be given to;

1. comparable processes, facilities or methods which have been tried out successfully
2. technological advances and changes in scientific knowledge and understanding
3. the economic feasibility of such techniques
4. time limits for installation in both new and existing plants
5. the nature and volume of the disposals concerned

It follows that BAT will change with time in the light of technological advances, economic and social factors, and changes in scientific understanding.

Best Practicable Environmental Option (BPEO)

In the context of authorisations under RSA93, for nuclear sites, the options assessment method currently used is Best Practicable Environmental Option (BPEO). BPEO was described by the Royal Commission on Environmental Pollution, Twelfth Report (Cm 210) 1988 as "... the outcome of a systematic and consultative decision-making procedure which emphasises the protection and conservation of the environment across land, air and water. The BPEO procedure establishes, for a given set of objectives, the option that provides the most benefit or least damage to the environment as a whole, at acceptable cost, in the long-term as well as in the short term". A BPEO study is usually carried out by or on behalf of the waste producer and assessed by the relevant environment agency as a basis for its regulatory decision-making.

Best Practicable Means (BPM)

BPM is a term used by SEPA in authorisations issued under the RSA93. Essentially, it requires operators to take all reasonably practicable measures in the design and operational management of their facilities to minimise discharges and disposal of radioactive waste, so as to achieve a high standard of protection for the public and the environment. BPM is applied to such aspects as minimising waste creation, abating discharges, and monitoring plant discharges and the environment. It takes account of such factors as the availability and cost of relevant measures, operator safety and the benefits of reduced discharges and disposals. If the operator is using BPM, radiation risks to the public and the environment will be ALARA.

Capenhurst Nuclear Services (CNS)

CNS is a wholly owned subsidiary of URENCO Ltd situated in the North West of England. Its main activities include the management of uranic materials, decommissioning and waste management. CNS operates as a tenant on the URENCO nuclear licenced site and provides decommissioning services under contract to the NDA.

Command 2919 (Cm2919)

The Review of Radioactive Waste Management Policy: Final Conclusions White Paper published in July 1995.. Areas of this statement have been superseded by the decisions and actions of subsequent UK Government administrations. Parts of Cm 2919 were superseded by Government's revised LLW Policy (March, 2007).

Controlled burial

Also known as "special precautions burial", this is a process of disposal for solid LLW that has an activity level above that which would allow it to be disposed of as VLLW. Controlled burial takes place at landfill sites used for the deposit of substantial quantities of ordinary refuse but which are approved for the disposal of radioactive substances. Typically, controlled burial has various limitations placed on its use in terms of maximum activity per waste container, type of container, surface dose rate of container, and depth of burial beneath earth or ordinary waste.

Department for Communities and Local Government (DCLG)

A ministerial department supported by ten agencies and public bodies with responsibility for supporting local government.

Decay storage

The process of allowing material containing short-lived radionuclides to decay so that the final waste is easier to dispose of as radioactive waste, or until the point where the waste becomes exempt from specific regulatory requirements. Used extensively in hospitals and research establishments, and to some extent by the nuclear industry.

Department of Energy and Climate Change (DECC)

The UK Government Department with responsibility, *inter alia*, for policy on radioactive waste in England and for the UK's role in international law and agreements on radioactive waste.

Decommissioning

The process whereby a nuclear facility, at the end of its economic life, is taken permanently out of service and its site made available for other purposes.

Decontamination

Removal or reduction of radioactive contamination.

Directive Waste

Directive waste is the term used in national legislation to describe waste which (a) falls within the definition in Article 1(1)(a) of the Waste Framework Directive (WFD) and (b) is not excluded from the scope of the WFD under Article 2(1)(b).

Disposal

In the context of solid waste, disposal is the emplacement of waste in a suitable facility without intent to retrieve it at a later date; retrieval may be possible but, if intended, the appropriate term is storage. Disposal may also refer to the release of airborne or liquid wastes to the environment (i.e. emissions and discharges).

Dose

A general term used as a measure of the dose absorbed by man from radiation, measured in sieverts, and its sub-multiples (millisieverts – mSv - equal to one thousandth of a sievert, or microsieverts, equal to one millionth of a sievert). Radiation dose is received from many sources – of the average annual dose of 2.6 mSv, 85 per cent comes from natural background radiation, 14 per cent from medical sources and the remaining one per cent from miscellaneous man-made sources.

Dounreay Site Restoration Ltd (DSRL)

A site licence company responsible for the clean-up and demolition of Britain's former centre of fast reactor research and development, situated on the north coast of Scotland.

EDF Energy (EDF)

Operator of nuclear, gas and coal power stations across the UK.

Environment Agency (EA)

The environmental regulator for England. The Environment Agency's role is the enforcement of specified laws and regulations aimed at protecting the environment, in the context of sustainable development, predominantly by authorising and controlling radioactive discharges and waste disposal to air, water (surface water, groundwater) and land. In addition to authorisations issued under Environmental Permitting Regulations 2010, the EA also regulates nuclear sites under the Pollution Prevention and Control Regulations 1999 and issues consents for non-radioactive discharges. The EA provides services to support Natural Resources Wales for the regulation of nuclear sites in Wales.

Exemption Order (EO)

The radioactive waste regulations, EPR2010 and RSA93, make provision for certain low activity wastes, when used for certain purposes and when managed in particular ways, to be excluded from particular regulatory provisions made under the Act.

Higher Activity Waste (HAW)

HAW comprises all High Level Wastes and Intermediate Level Wastes, and a small fraction of LLW with a concentration of specific radionuclides that prohibits its disposal at existing and planned future disposal facilities for LLW.

Health and Safety Executive (HSE)

A statutory body whose role is the enforcement of work related health and safety law under the general direction of the Health and Safety Commission established by the Health and Safety at Work Act 1974.

Integrated Waste Strategies (IWS)

An integrated waste strategy is not a legal requirement but is required of contractors working under the auspices of the NDA. It covers solid radioactive waste in all categories (i.e. LLW, ILW, HLW) and non-radioactive and hazardous wastes. The objective of an IWS is to set out the SLC's strategy, describing how a waste producer optimises its approach to waste management in an integrated way, detailing the waste streams and discharges expected from current and future operations and the actions required to improve the approach to waste management. The NDA IWS template is considered to be good practice.

Intermediate level waste (ILW)

Radioactive wastes exceeding the upper activity boundaries for LLW but which do not need heat to be taken into account in the design of storage or disposal facilities.

Landfill

The disposal of waste by shallow burial. Modern landfills are lined to reduce seepage of material from the site into the environment, and once full, are capped to reduce rainfall entering the site.

Low Level Waste (LLW)

Includes metals, soil, building rubble and organic materials, which arise principally as lightly contaminated miscellaneous waste. Metals are mostly in the form of redundant equipment. Organic materials are mainly in the form of paper towels, clothing and laboratory equipment that have been used in areas where radioactive materials are used – such as hospitals, research establishments and industry. LLW contains radioactive materials other than those acceptable for disposal with municipal and general commercial or industrial waste. It is defined as: “radioactive waste having a radioactive content not exceeding four gigabecquerels per tonne (GBq/te) of alpha or 12 GBq/te of beta/gamma radioactivity”.

Low Level Waste Repository (LLWR)

The LLWR is in Cumbria and has operated as the national LLW disposal facility since 1959. Wastes are placed in containers (some waste will have been compacted first) before being transferred to the facility, the containers grouted and disposed of in engineered concrete vaults. The LLWR is owned by the NDA and currently operated by a consortium of companies called UKNWM.

Local community

In the context of this document, those communities which may be impacted by waste management plans, including any host community in the vicinity of a waste treatment or disposal facility and the local authorities concerned.

Magnox Ltd

Site licence company responsible for the decommissioning and clean-up of twelve nuclear sites across the UK.

Ministry of Defence (MOD)

Ministerial department responsible for protection of the security, independence and interests of the UK at home and abroad

Natural Resources Wales

The environmental regulator for Wales. Its role is the enforcement of specified laws and regulations aimed at protecting the environment, in the context of sustainable development, predominantly by authorising and controlling radioactive discharges and waste disposal to air, water (surface water, groundwater) and land. The Environment Agency carries out the nuclear element of their responsibilities on their behalf.

Nuclear Decommissioning Authority (NDA)

The NDA was set up on 1 April 2005, under the Energy Act 2004. It is a non-departmental public body with designated responsibility for managing the liabilities at specific sites. These sites are operated under contract by site licensee companies. The NDA has a statutory requirement under the Energy Act 2004, to publish and consult on its strategy and annual plans, which have to be agreed by the Secretary of State and the Scottish Ministers.

Nuclear Installations Act 1965 (NIA65)

UK legislation which provides for the operation and regulation of nuclear installations within the UK.

Nuclear Legacy Advise Forum (NuLeAF)

A special interest group created under the auspices of the Local Government Association to bring together local authorities with common concerns about radioactive waste management and nuclear decommissioning.

Office for Civil Nuclear Security (OCNS)

The independent security regulator for the UK civil nuclear industry.

Office of the Nuclear Regulator (ONR)

The Office for Nuclear Regulation (ONR) independently regulates nuclear safety and security at 37 nuclear licensed sites in the UK. It also regulates the transport of radioactive materials and works closely with the IAEA and European Commission to ensure that the UK's safeguarding obligations are met. The ONR operates a goal-setting regime setting out its regulatory expectations, and requiring licensees to determine and justify how best to achieve them. ONR has 36 conditions attached to each nuclear site licence within which the licensees are expected to operate. A combination of ONR's assessment and inspection functions allow ONR to judge whether licensees are meeting their legal obligations.

Planning authorities

A general term for those regional planning bodies and local authorities throughout the UK who are responsible for the preparation of planning strategies and for determining applications for construction and operation of waste treatment and disposal facilities that may be sited in their area of responsibility.

Proximity principle

The Proximity Principle is a key element of EU environmental and municipal waste management policy. It was introduced in Article 5 of the Waste Framework Directive (75/442/EEC as amended by Directive 91/156/EEC), and is incorporated into UK waste strategy documents.

Radioactive waste

Any material contaminated by or incorporating radioactivity above certain thresholds defined in legislation, and for which no further use is envisaged, is known as radioactive waste. (See RSA93 and NIA65.)

Regulators

In the context of this document, principally those bodies responsible for the regulation of the nuclear industry and non-nuclear industry LLW producers and treatment and disposal suppliers (see Environment Agency, SEPA, NRW, ONR, and the Office for Civil Nuclear Security.)

Risk

The chance that someone or something that is valued will be adversely affected by a hazard, where a hazard is the potential for harm that might arise, for example, from ionising radiation.

Radioactive Waste Regulations

In England and Wales disposals of radioactive waste are regulated under the Environmental Permitting Regulations 2010 (EPR2010). In Scotland and Northern Ireland regulation is under the Radioactive Substances Act 1993 (RSA93).

Scottish Environment Protection Agency (SEPA)

SEPA is the environmental regulator for Scotland. Its role is the enforcement of specified laws and regulations aimed at protecting the environment, in the context of sustainable development, predominantly by authorising and controlling radioactive discharges and waste disposal to air, water (surface water, groundwater) and land. In addition to authorisations issued under the RSA93, SEPA also regulates nuclear sites under the Pollution Prevention and Control Regulations and issues consents for nonradioactive discharges.

Sellafield Ltd

Site licence company responsible for the safe decommissioning and clean-up of the Sellafield site.

Sentencing

The step of the waste management process at which the decision is made that an article or substance is clean, excluded, exempt or radioactive.

Stakeholders

People or organisations, having a particular knowledge of, interest in, or be affected by, radioactive waste, examples being the waste producers and owners, waste regulators, non-Governmental organisations concerned with radioactive waste and local communities and authorities.

Storage

The emplacement of waste in a suitable facility with the intent to retrieve it at a later date.

Strategic Environmental Assessment (SEA)

SEA refers to the type of environmental assessment legally required by EC Directive 2001/42/EC in the preparation of certain plans and programmes. The authority responsible for the plan or programme must prepare an environmental report on its likely significant effects, consult the public on the report and the plan or programme proposals, take the findings into account, and provide information on the plan or programme as finally adopted.

URENCO

Nuclear site licence company situated in the north west of England that produces enriched uranium for nuclear power generation.

Very low level waste (VLLW)

Covers waste with very low concentrations of radioactivity. It arises from a variety of sources, including hospitals and the wider non-nuclear industry. Because VLLW contains little total radioactivity, it has been safely treated by various means, such as disposal with municipal and general commercial and industrial waste directly at landfill sites or indirectly after incineration. Its formal definition is:

(a) in the case of low volumes ('dustbin loads') of VLLW "Radioactive waste which can be safely disposed of to an unspecified destination with municipal, commercial or industrial waste ('dustbin' disposal), each 0.1m³ of waste containing less than 400 kilobecquerels (kBq) of total activity or single items containing less than 40 kBq of total activity.

For wastes containing carbon-14 or hydrogen-3 (tritium):

(i) in each 0.1m³, the activity limit is 4,000 kBq for carbon-14 and hydrogen-3 (tritium) taken together

(ii) for any single item, the activity limit is 400 kBq for carbon-14 and hydrogen-3 (tritium) taken together

Controls on disposal of this material, after removal from the premises where the wastes arose, are not necessary.

(b) in the case of high volumes of VLLW "Radioactive waste with maximum concentrations of four megabecquerels per tonne (MBq/te) of total activity which can be disposed of to specified landfill sites. For waste containing hydrogen-3 (tritium), the concentration limit for tritium is 40MBq/te. Controls on disposal of this material, after removal from the premises where the wastes arose, will be necessary in a manner specified by the environmental regulators".

Waste Framework Directive (WFD)

The EU Waste Framework Directive provides the legislative framework for the collection, transport, recovery and disposal of waste, and includes a common definition of waste. The directive requires all member states to take the necessary measures to ensure waste is recovered or disposed of without endangering human health or causing harm to the environment and includes permitting, registration and inspection requirements

Waste manager

Any organisation that currently has responsibility for the safe and environmentally responsible disposition of specific radioactive wastes in accordance with regulatory requirements and the funding thereof. The organisation may or may not equate to the waste producer, who generated the waste in the first instance, as the responsibilities listed above may have passed to another organisation in the interim.

Waste producer

The organisation that produced radioactive waste in the first instance. The waste producer may or may not equate to the current waste manager, as responsibility for the waste may have been passed to another organisation in the interim.

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URN 15D/472