STRATEGIC REVIEW 2016

What is the Strategic Review?

The Strategic Review is a document produced by the National Waste Programme Office on a three-yearly basis, aligned with the publication schedule for the UK Radioactive Waste Inventory (UKRWI). It provides a “state of the nation” snapshot view of the landscape for management of Low Level Waste (LLW) within the UK nuclear industry. The Strategic Review describes the LLW management environment by considering a number of interrelated thematic areas: waste management strategy, waste inventory, infrastructure, waste management performance (in terms of diversion and disposal performance), cost avoidance and innovation.

The aims and objectives of the Strategic Review are:

- To update the information baseline on the LLW management environment for the UK nuclear industry for 2016.
- To use the updated knowledge base to identify potential opportunities and synergies for improved LLW management across the industry.
- To provide a communications tool for stakeholders of the National Waste Programme and those with interest in the implementation of the UK Strategy for Management of Solid Low Level Waste from the Nuclear Industry (hereafter referred to as the Strategy).
- To support future iterations of the Strategy.

Document structure

The document is structured into four main sections:

- Section 1 (pages 2 to 8) provides information on the context, content and evolution of the national strategy and the National Waste Programme.
- Section 2 (pages 9 to 17) provides information on the status of strategy implementation in 2016. This is divided into separate sub-sections drawing together information based on the 5 strategic benefits of the National Waste Programme.
- Section 3 (pages 18 to 20) provides a summary of the challenges and opportunities facing strategy implementation (both current and future), and how the National Waste Programme and its stakeholders are addressing these.
- Section 4 (page 21) provides a glossary, bibliography and signposting to useful sources of information.

How to use this document

This Strategic Review has been produced as a series of A3 sheets which focus on different elements of the LLW management environment. As an assemblage of pages, the document provides an overview of the wider LLW management landscape. However, individual pages or sets of pages can be extracted and used to examine or communicate on specific elements of the strategic review. Each page contains a short overview, which describes the subject content, providing context and information on that individual aspect.

This document may be used as:

- A communication tool on strategy implementation for interested stakeholders.

Those users with less knowledge of the Strategy and the National Waste Programme will find Section 1 especially useful. Users with a more developed understanding of the Strategy and its implementation will find sections 2 to 4 most useful.
WHAT IS LOW LEVEL WASTE?

This sheet provides a definition of Low Level Waste (LLW), a description of how and where it is generated and information about the national inventory and predicted future LLW arisings.

Waste is any substance or object which the holder discards or intends or is required to discard. Radioactive waste is any material that is either radioactive itself or is contaminated by radioactivity, for which no further use is envisaged. Materials become radioactively contaminated when they come into contact with radioactive materials or airborne particulates. Materials may also become activated (radioactive) when subjected to radiation (for example being inside a nuclear reactor).

In the UK, radioactive wastes are classified according to their radiological properties:

- **Low Level Waste (LLW)** contains relatively low levels of radioactivity, not exceeding 4 gigabecquerels (GBq) per tonne of alpha activity, or 12 GBq per tonne of beta/gamma activity.
- **Very Low Level Waste (VLLW)** includes two sub-categories of LLW with specific activity limits.
- **Intermediate Level Waste (ILW)** exceeds the upper boundaries for LLW but does not generate a significant amount of heat, so does not require heat generation to be taken into account in design of storage or disposal facilities.
- **High Level Waste (HLW)** is waste which exceeds the upper radioactivity boundaries for LLW and where the temperature may rise significantly as a result of its radioactivity. The design of waste storage or disposal facilities has to take this into consideration.

LLW is generated by a diverse range of industries including the nuclear industry, the defence sector and non-nuclear users of radioactive material including hospitals, universities, research institutions and the pharmaceutical industry. The map shows the locations of major radioactive waste producing sites in the UK. There are many sites that produce small amounts of radioactive waste (such as hospitals, incinerators and educational facilities) that are not shown.

Total volume of radioactive waste 2016-2119* (All UK waste producers, current & future wastes)
This sheet provides an explanation of the way in which the production, accumulation, transport and disposal of radioactive waste is regulated in terms of safety, security, environmental protection and planning.

**Environmental protection**

The environmental regulators regulate disposal of radioactive waste on and from premises, including nuclear licensed sites, under the relevant statutory legislation. A permit (under EPR 10) or disposal authorisation (under RSA 93) from the relevant agency is required to dispose of radioactive waste. Disposals include discharges into the atmosphere or water, disposals to land, and disposals by transfer to another site. Both LLW producers and those organisations offering waste treatment or disposal services require a permit or authorisation. Permits and authorisations held by waste producers now usually allow the transfer of waste to any holder of a suitable permit (or authorisation). This represents a shift in environmental regulation, from the previous regime in which the receiving sites were specified in the permit or authorisation. The environmental regulators regulate disposal of radioactive waste on and from premises, including nuclear licensed sites. In addition to the disposal of radioactive waste from sites, they are also responsible for the keeping and use of radioactive materials in areas which are not nuclear licensed sites, the environmental regulators are responsible for the keeping and use of radioactive materials in addition to the disposal of radioactive waste from sites.

The devolved administrations have separate regulators and differing environmental legislation; however, the requirements relating to management of LLW are largely the same across the UK. On sites which are not nuclear licensed sites, the environmental regulators are responsible for the keeping and use of radioactive materials in addition to the disposal of radioactive waste from sites.

**Safety and security**

ONR is responsible for the regulation of nuclear safety, conventional safety (under the HSWA) and nuclear security (through the Civil Nuclear Security (CNS) Programme) on nuclear licensed sites. ONR regulates the on-site arising and storage of radioactive waste from a nuclear safety, security and conventional health and safety perspective. On non-licensed sites, HSE has responsibility for enforcing the requirements of the HSWA, including the Ionising Radiations Regulations, made under the Act.

DNSR is responsible for ensuring nuclear safety and security within aspects of the UK Defence Nuclear Programme. ONR enforces some legislation within certain aspects of the Defence Nuclear Programme, including those defence sites which are nuclear licensed sites. Cooperation between DNSR and ONR is set out in a Letter of Understanding.

**Regulators:**
- Office for Nuclear Regulation (ONR)
- Defence Nuclear Safety Regulator (DNSR)
- Health and Safety Executive (HSE)
- Northern Ireland Environment Agency (NIEA)
- Scottish Environment Protection Agency (SEPA)
- Natural Resources Wales (NRW)

**Environmental Permitting**
- Environmental Permits (England and Wales) Regulations 2010 (EPR 10)
- Radioactive Substances Act 1993 (Scotland and Northern Ireland) (RSA 93)
- Nuclear Installations Act 1965 (NIA 65)
- Health and Safety at Work Act 1974 (HSWA)
- Ionising Radiations Regulations 1999 (IRR 99)
- Nuclear Industries Security Regulations 2003 (NISR)
- Radiation Emergency Preparedness Public Information Regulations (REPPIR) 2001

**Planning**

Land use planning in the UK is a devolved matter and separate planning policies and guidance frameworks are in place. Land use planning in England and Wales is the subject of the Town and Country Planning Act 1990 and associated regulations. In Scotland it is the Town and Country Planning Act (Scotland) 1997.

In England, a local plan must be prepared by local planning authorities consistent with national planning policy, and in accordance with the Planning and Compulsory Purchase Act 2004, the Town and Country Planning (Local Planning) (England) Regulations 2012 and the National Planning Policy Framework (NPPF). The local plan sets out local planning policies and identifies how land is used, determining what will be built where. Similar planning arrangements apply under the devolved administrations. Local planning authorities with minerals and waste planning responsibilities are required to produce plans to provide a framework for decisions involving these uses; they can produce combined minerals and waste plans.

**Transport and packaging**

In addition to the legislation applicable to all goods transportation in the UK, there exists legislation specific to dangerous goods; radioactive materials, including waste, are classed as ‘dangerous goods’ (Class 7: Radioactive Materials).

ONR Transport is responsible for regulating the safety (and in some cases security) of radioactive materials during transport in the public domain, by road and rail in Great Britain. ONR Transport also advises on the transportation of radioactive material by air and sea within UK territorial waters.

**Responsible authorities:**
- Local Authority Planning Inspectorate

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UK LLW POLICY AND STRATEGY

This page explains the differences between a policy and a strategy, describes the 2007 Policy for the Long Term Management of Solid Low Level Radioactive Waste in the United Kingdom (LLW Policy) and the 2016 UK Strategy for the Management of Solid Low Level Waste from the Nuclear Industry as well as the NDA Strategy and other LLW strategies.

**LLW Policy**

The Government’s LLW Policy, published in 2007, recognised that, at the time, there was insufficient disposal capacity in the UK for the solid LLW forecast to arise during the civil nuclear decommissioning programme. The policy recognised the opportunity to adopt a more flexible approach to the management of LLW and that waste producers should take the Waste Hierarchy into consideration in their decision making processes for radioactive waste. The Waste Hierarchy defines a ranked list of waste management options according to their environmental impact (see page 14).

The policy also placed responsibilities on the NDA, including:
- To lead the development of a strategy for solid LLW arising from the nuclear industry.
- To make LLW management and disposal facilities available to other nuclear and non-nuclear industry managers of radioactive waste, where appropriate and practicable.
- To develop and publish a plan for the optimal use of the Low Level Waste Repository (LLWR).
- To assess the extent to which other LLW disposal options might be employed to manage the waste arising from decommissioning and clean-up of its sites.
- To assess if and at what point in the future a replacement or replacements for the LLWR might be required.
- To assist the government in developing a strategy for waste arising from the non-nuclear industry.

**Nuclear industry LLW Strategy**

The UK Strategy for the Management of Solid Low Level Waste from the Nuclear Industry (the Strategy) was first published by the NDA, on behalf of the Government, in 2010, in response to the 2007 Policy. Its purpose was to drive a transformation in LLW management practices across the UK; to facilitate diversion of LLW away from disposal at LLWR; and to ensure that disposal capacity remained available to support the decommissioning of historic civil nuclear facilities. An updated strategy was published in 2016 by the Department for Energy and Climate Change (now the Department for Business, Energy and Industrial Strategy).

The Strategy’s three guiding themes remained unchanged from the 2010 strategy:
- Application of the Waste Hierarchy.
- The best use of existing LLW management assets.
- The need for new fit-for-purpose waste management routes.

**NDA Strategy 2016**

The NDA Strategy, published in 2016, describes the NDA’s overall strategy for waste management on its sites; for LLW this is to implement the nuclear industry LLW Strategy. The NDA Strategy for waste management includes:
- Ongoing pursuit of new management routes for LLW preserving capacity at the LLWR. This includes investigating opportunities to share waste management infrastructure across the estate and with other waste producers, where practicable.
- Support for an approach where wastes are managed according to the nature of the waste rather than simply the radioactive waste category which they fall into and disposed of in fit for purpose facilities that reflect the nature of the waste. This allows the optimisation of the use of the Waste Hierarchy for all wastes, not just LLW.

The NDA Strategy also includes a set of Integrated Waste Management guiding principles.

**Other LLW strategies**

The nuclear industry LLW strategy is complemented by LLW strategies for other sources of radioactive waste:

- **Naturally Occurring Radioactive Material (NORM) Strategy (2014)**
  - NORM waste arises from a number of sectors (e.g. oil and gas). The strategy covers all NORM waste, regardless of activity level, including solid, liquid and gaseous NORM wastes. Its objective is to ensure that secure, sustainable and resilient NORM waste management options are available in the UK. It supports the application of the Waste Hierarchy.

- **Anthropogenic Radionuclides Strategy (2012)**
  - The strategy aims to provide guidance on LLW from the non-nuclear industry. It provides information on how the regulatory framework should be applied to LLW, particularly the need for waste management plans, waste minimisation at source and application of the Waste Hierarchy.

**NDA Integrated Waste Management Principles**

- Supporting key risk and hazard reduction initiatives by enabling and delivering a flexible approach to long-term waste management.
- Consideration of the entire waste management lifecycle.
- Application of the Waste Hierarchy.
- Supporting timely characterisation and segregation of waste.
- Where appropriate, providing leadership aimed at integrating waste management delivery across the estate and the supply chain.
- Promoting the use of robust decision making processes to identify the most advantageous options for waste management.
- Enabling the availability of sustainable, robust infrastructure for continued operations, hazard reduction and decommissioning.
- Management of wastes according to their nature, rather than waste categorisation.

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**What NDA Strategy means for LLW management:**

The NDA Strategy, published in 2016, describes the NDA’s overall strategy for waste management on its sites; for LLW this is to implement the nuclear industry LLW Strategy. The NDA Strategy for waste management includes:

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**Government strategy** describes how the government intends to implement its policy. Strategies provide a more detailed plan and outline the measures the government intends to take in order to implement its policies.
WHAT DO UK POLICY AND STRATEGY MEAN FOR WASTE PRODUCERS?

This page sets out in more detail what the UK LLW Policy and Strategy mean for producers and holders of LLW, including how the Policy and Strategy principles are applied on nuclear sites.

### The Policy: What does this mean for waste producers?

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<th>What the UK LLW Policy means for waste producers</th>
<th>What does this mean for waste producers?</th>
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<tr>
<td>Requires consideration of all practicable options for management of LLW, with disposal above or below ground for LLW that remains following application of the Waste Hierarchy. Controlled burial (disposal to appropriately regulated landfill) is included, and decay storage and incineration may be considered as options, subject to safety case and regulatory approvals.</td>
<td>Waste producers must consider all options for the management of LLW. LLW can be managed by a number of routes. The policy also introduced a definition for VLLW: VLLW can be sent to appropriately permitted landfill sites as it does not require the level of engineered protection provided by the LLWR. Waste producers must conduct a proper assessment of the options available for management of their waste, for example through risk assessment / optimisation studies. This requirement is also imposed by the site's environmental permit (EPR 10) or authorisation (RSA93) which places a requirement for the waste to managed in line with Best Available Techniques (BAT) / Best Practicable Means (BPM).</td>
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<tr>
<td>Sets out the requirement for LLW management plans, as part of wider integrated waste management strategy, for consideration by the regulators.</td>
<td>Waste producers must produce a waste management plan, for consideration by their environmental regulator. The plan must take into account all current and future arisings and their radiological and non-radiological properties. For NDA sites, Integrated Waste Strategies are the response.</td>
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<tr>
<td>Describes a risk informed approach to LLW management and disposal, including defining a post-close risk target.</td>
<td>Disposal sites have site-specific environmental safety cases (ESC), which provide evidence that a risk target has been met. Waste producers must comply with disposal sites’ Waste Acceptance Criteria (WAC) which are based on their environmental permits, as derived from their ESC.</td>
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<tr>
<td>Describes the need for waste managers to minimise arisings of LLW and minimise the requirements for its disposal, by planning to manage waste in accordance with the Waste Hierarchy.</td>
<td>Waste producers must consider the Waste Hierarchy, to minimise waste arisings, and the volume of waste sent for disposal. Waste producers use available techniques including characterisation, sorting and segregation, volume reduction, decontamination and decay storage.</td>
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<td>Describes the ‘presumption towards early solutions’.</td>
<td>Where appropriate, waste producers should implement a treatment or disposal solution for their waste at the earliest practicable opportunity.</td>
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<td>Requires appropriate consideration of the ‘proximity principle’ and waste transport.</td>
<td>Waste producers should consider the proximity principle when making LLW management decisions, taking into account the location of waste treatment and disposal facilities. Transport must be considered as part of options assessment.</td>
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### Strategic Theme: Application of the Waste Hierarchy

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<th>Strategic Theme</th>
<th>What does this mean for waste producers?</th>
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<tbody>
<tr>
<td>Application of the Waste Hierarchy</td>
<td>Waste producers seek to move the management of their wastes up the Waste Hierarchy (see Benefit 4). Its use is mandated by environmental regulations and is essential for determining BAT. Waste generation is avoided or minimised, equipment is reused or waste treatment is used to recycle materials or to recover energy. Disposal is the least preferred option.</td>
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<tr>
<td>Making best use of existing assets</td>
<td>Waste producers optimise waste management processes to minimise the quantity and volume of waste that is sent to the LLWR and to permitted landfill sites. Waste producers should make best use of on-site and off-site recycling and treatment facilities to reduce the volumes which require disposal.</td>
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<tr>
<td>New and fit for purpose waste management routes</td>
<td>Supply chain organisations develop and provide alternative waste management routes, which can be used by waste producers. Waste producers have established onsite processes to allow the use of routes other than disposal of their LLW to the LLWR, and use characterisation and segregation to ensure waste is consigned to the most appropriate route.</td>
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### Case Study: Sellafield Ltd

In the last three years, Sellafield Ltd has made the following improvements to its LLW management arrangements in order to implement the Waste Hierarchy and to reduce volumes of waste sent to the LLWR for disposal:

- Expansion of their Waste Management Service team to provide a frontline guidance and support service. The team drives avoidance and minimisation of waste across the site.
- Developing and implementing an asset re-use process.
- Engaging with a wider range of suppliers providing metals recycling services; this has enabled a greater volume and range of redundant metallic plant items to be recycled.
- The range of material segregated for incineration has been broadened to encompass oils, oil-contaminated materials, bulk wood and bulk plastic.
- Working with service suppliers providing an alternative disposal service has enabled alternative disposal of broader range of hazardous wastes and VLLW.
- 88% of waste is now diverted from the LLWR.
WHAT IS THE NATIONAL WASTE PROGRAMME?

The National Waste Programme was established to implement the Strategy on behalf of the NDA and Government. This page describes the programme, its vision, mission and some of the supporting arrangements.

What is the National Waste Programme?

The National Waste Programme was established to lead and coordinate the implementation of the 2010 UK Strategy for the Management of Solid Low Level Waste from the Nuclear Industry. This is achieved through a range of programme and governance activities, working collaboratively with stakeholders to deliver a transformation in LLW management practice across the UK.

The 2016 Strategy requires the National Waste Programme to continue to support the ongoing delivery of the Strategy. The changes in waste management practices and the development of new waste management routes, which have been achieved to date, need to be fully embedded and built upon, to continue strategy implementation.

The Vision

Optimised LLW management across the UK that delivers value for money

The Mission

A national programme that achieves a self-sustaining culture for optimised LLW management across the UK, delivered through:

- A governance framework that drives the implementation of the Strategy.
- The sharing of best practice and learning from experience to support continuous improvement.
- A sustainable infrastructure providing fit for purpose LLW management solutions that deliver value for money.

The National Waste Programme Office

The National Waste Programme was established in 2011 to lead the transformation of LLW management practices and culture needed to deliver the Strategy. The National Programme Office, part of LLW Repository Ltd, leads and coordinates the delivery of the programme, on behalf of the NDA, by:

- Commissioning, facilitating and delivering projects across the nuclear industry to support the sharing of learning and best practice.
- Collating and reporting information and details of key projects, activities and delivery milestones being implemented across stakeholder organisations.
- Managing the governance arrangements of the programme to support its effective delivery.

National Waste Programme Blueprint, Benefit Map and Joint Waste Management Plans

The National Waste Programme Blueprint describes what LLW management practice aims to look like at the end of the programme; it is supported by the National Waste Programme Benefit Map.

The Blueprint is a live document which evolves throughout the programme. It was most recently published in 2016. It describes the UK LLW management environment in 2015 (the start state), in the medium term (2020) (the interim state) and in the long term (2030) (the end state). These future states are to be achieved through the delivery of specific projects and activities within the programme.

The Blueprint forms part of the governance arrangements that drive the implementation of the strategy and is used to set priorities for work within the National Waste Programme and across the industry.

The National Waste Programme Benefit Map identifies the underpinning business changes, projects and enablers required to deliver the future state described in the Blueprint.

Joint Waste Management Plans (JWMPs) are produced jointly by waste generating organisations and LLW Repository Ltd. They are five year rolling plans which are updated on a six-monthly basis. The JWMPs provide a five year forecast of LLW arisings for an organisation’s site or sites. For the NDA estate, JWMPs also identify transformational projects and activities which support the implementation of the Strategy within the organisation, alongside an overview of the organisation’s current LLW management arrangements. Their purpose is to demonstrate how the organisation is engaging with the National Waste Programme in order to improve their implementation of the Strategy, through the delivery of the Programme Blueprint. The progress made by organisations against their JWMPs are reported in the National Waste Programme Quarterly Report published on the LLW Repository Ltd website (www.llwrsite.com).
This page provides a summary of the principles that guide the delivery of the National Waste Programme, as well as the expected outcomes and the benefits that will be delivered throughout the life of the programme, to 2030. Each of the strategic benefits is described in further detail in the remainder of this document. This page also presents a summary of the main stakeholders to the National Waste Programme.

### Delivery Principles

1. A governance framework that drives the implementation of the Strategy
2. A sustainable infrastructure providing fit for purpose LLW management solutions that deliver value for money
3. The sharing of best practice and learning from experience to support continuous improvement

### Stakeholders

Stakeholders to the National Waste Programme include:

- All nuclear industry radioactive waste producers including nuclear sites owned by the NDA, public sector bodies such as the Ministry of Defence, and private sector bodies such as power generators and medical or nuclear services companies, organisations planning or carrying out nuclear new build activities, as well as smaller waste producing organisations.
- The supply chain, who provide a wide range of waste management services for LLW management, including waste treatment and disposal services, packaging, transport and characterisation services.
- Regulators, local government, devolved administrations and UK Government, including planning authorities, the NDA and advisory bodies such as the Nuclear Legacy Advisory Forum (NuLeAF).
- The public.

### 2030 Programme Outcomes

- Disposal capacity is available for LLW that requires an engineered solution.
- Best value LLW management solutions have been implemented and LLW management costs are reduced.
- Sustainable, fit for purpose, proportionately regulated management routes are available for all LLW types.
- Fit for purpose inventory datasets and waste forecasts are available.
- Environmental impact remains a key consideration within LLW management.
- LLW management is aligned with hazard reduction, operations and site restoration programmes.
- Stakeholders engage with and collectively support good LLW management practice.
- The right skills and behaviours are embedded to deliver optimised waste management.
- LLW management processes are streamlined across the waste lifecycle.
- The UK’s radioactive waste strategies are integrated.
- Waste management decision making uses risk based disposability assessments.
- Good practice and learning from experience is routinely shared across the industry.

### Strategic Benefits

1. The life of the LLWR is increased to 2130.
2. Overall waste management costs are reduced.
3. Optimised LLW management supports & enables effective hazard reduction & decommissioning.
5. Stakeholders to the Strategy are increasingly engaged with its delivery.

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LLW Management Practices Prior to 2007:
- Most LLW from the nuclear industry in the UK was disposed of at the LLWR.
- Supercompaction prior to disposal for volume reduction was used for some waste.
- A few waste producers used onsite incinerators.
- The LLWR was managed as part of Sellafield and supercompaction, LLW disposal and packaging services were offered.
- Small volumes of waste were managed away from the LLWR using onsite and offsite infrastructure.

- LLW Repository Ltd established:
  - The Alternative services framework.
  - The Expert services framework.
- The volume of waste diverted away from disposal at the LLWR exceeded 10,000m³ for the first time.

The Policy for the Long Term Management of Solid Low Level Radioactive Waste in the United Kingdom was published by the Government. It recognised that the disposal capacity of the LLWR would not be sufficient to meet future demand if the existing waste management practice continued. It required the NDA to publish a new strategy for the management of LLW from the nuclear industry, on behalf of the Government.
- The LLWR was separated from Sellafield and LLW Repository Ltd was established as the Site Licence Company (SLC).

The updated UK Strategy for the Management of Solid Low Level Waste from the Nuclear Industry was published by the Department for Energy and Climate Change. The three guiding themes in the strategy document remained unchanged from the 2010 Strategy document.
- Planning permission for construction of further waste vaults and disposal of waste was obtained.
- Additional waste treatment sites for metals became available through the LLW Repository Ltd Waste Services Contract.
The first benefit to be delivered by the National Waste Programme is extension of the life of the LLWR to 2130. This is the period in which all of the waste from decommissioning of the UK’s extant civil nuclear facilities is expected to arise. Extending the lifetime of the LLWR to this date would lead to considerable cost avoidance by averting the need for a second repository. This is achieved by applying the Waste Hierarchy to divert waste away from the LLWR, treating metallic and combustible wastes and disposing of waste characterised as VLLW in appropriately permitted landfill sites.

Diversion vs. disposal

From 2008/09 to 2015/16, over 50,000m³ of waste has been successfully diverted away from the LLWR, with the majority of this diversion occurring over the last three financial years. As a result of the increasing diversion of waste, the amount of waste disposed of annually at the LLWR decreased from 4,760m³ in 2008/09 to 1,690m³ in 2015/16. Maintaining similar diversion rates in the future will ensure enough capacity in the LLWR to dispose of all waste up to 2130, avoiding the need for a second repository.

LLWR volumetric disposal capacity usage

This chart compares the LLWR vault capacity used against the planned capacity usage according to UKRWI 2013 and the capacity that would have been used if no treatment options were utilised. This graph starts in April 2013; up to this point 266,180m³ of waste had been consigned to LLWR for disposal in the vaults. At this volume, Vault 8 would have been full. Following the successful granting of planning permission in 2015, the disposal capacity at the LLWR increased (with higher stacking allowed at Vault 8 and disposal capacity in Vault 9) and has enabled the potential for additional vaults to be constructed in the future. Continuing to divert waste away from the repository will result in the life of the LLWR being extended as the capacity will be used at a lower rate, as illustrated by the actual disposal with and without diversion trend lines.

Dounreay LLW disposal facility

The vaults constructed at Dounreay are for disposal of waste from the Dounreay site (operated by DSRL) and the MOD’s nearby Vulcan site. There are currently two vaults, one for bagged demolition waste, including concrete, rubble and soil, the second for LLW packaged in ISO containers, which are grouted to remove voidage. Phase 2 of the project will see the construction of two further vaults, with additional vaults constructed sequentially as required.

Scottish government direction required DSRL to undertake disposal of radioactive waste as near to the site where the waste was generated as possible.

Active commissioning began in April 2014 and the vaults are now fully operational. Associated waste facilities have also been commissioned by DSRL, including the supercompaction facility, known as WRACS, and a grouting facility for LLW disposal containers.

Waste services

In addition to waste producers’ onsite capabilities and direct contracts with supply chain organisations, the LLWR Repository Ltd waste services frameworks are available to waste producers to enable them to access a range of waste management routes.

LLWR planning permission

In July 2016, a planning application was approved enabling operations at the LLWR to continue until around 2050.

The planning permission enables the phased construction of an extension to Vault 9 (9a) and two new vaults where LLW will disposed of in grouted containers. The permission also allows higher stacking of containers in Vault 8 and the disposal of containers in Vault 9, where they could previously only be stored.

In addition, it permits the construction of a final cap over existing and new vaults and the seven landfill style trenches where waste was disposed of prior to the opening of the site’s first vault in 1988. This cap will ensure the longer term environmental safety of the site and will provide protection to the environment from disposed waste.
BENEFIT 2: OVERALL WASTE MANAGEMENT COSTS ARE REDUCED

The second benefit to be delivered by the National Waste Programme is a reduction in overall waste management costs. Cost avoidance is achieved through diversion of radioactive waste to more cost effective routes.

Previous and projected cost avoidance and case studies are provided below.

Cost avoidance performance and projection

From 2009/10 onwards, cost avoidance of the order of £150m has been achieved by diverting waste away from the LLWR, through use of the LLW Repository Ltd waste services frameworks, self performance by Site Licence Companies and through direct contracts with service providers. This is as a result of the lower costs associated with diverting waste to other routes, such as metals or combustible waste treatment, or disposal to landfill as VLLW; cost avoidance is calculated using the published cost norms.

The largest cost avoidance is achieved through the use of disposal as VLLW to appropriately permitted landfill sites, which is significantly less expensive than disposal as LLW at the LLWR. From 2017/18 to 2020/21, further cost avoidance is predicted. This prediction is made based on forecasting, by waste producers, of the amount of waste which they will produce and which will be diverted to each of the treatment or disposal routes. The strong upwards trend in predicted cost avoidance arises from continued strong use of the VLLW disposal route, reflecting the range and pace of decommissioning and demolition activities across the industry.

In-situ disposal

In 2016, a public consultation was held on the environmental regulators’ joint draft Guidance on the Requirement for Release of Nuclear Sites from Radioactive Substances Regulation (GRR). This document sets out how the environmental regulators will regulate the in-situ disposal of radioactive waste. Such waste may include contaminated material used to fill underground voids, below ground structures and pipework. The GRR sets out the requirement for site operators to demonstrate that their site will be safe for its next planned use if radioactive materials are left in-situ. The use of the guidance is being trialled at Magnox's Trawsfynydd and Winfrith sites and DSRL’s Dounreay site, in a year long trial. Use of in-situ disposal provides an opportunity to reduce the requirement for disposal of some wastes at offsite facilities, thereby reducing retrieval, transport and disposal costs.

Case study

LLW Repository Ltd—legacy Concargo boxes

In 2016, 21 redundant legacy Concargo Boxes, used on the LLWR site, were disposed of at conventional landfill following re-characterisation. The original assumption that they were radioactive was tested by conducting additional monitoring. This was achieved by removing all the metal stillages, so that every part of the stillages and boxes could be accessed and monitored. All 21 boxes were confirmed as out of scope of regulatory control, and therefore did not have to be treated as radioactive waste. This approach delivered significant cost avoidance compared with disposal to the LLWR, and conserved valuable space at the LLWR, in line with LLW management good practice.

ILW—LLW reclassification

The reclassification of waste classified as ILW in the UKRWI, to LLW, allowing the use of LLW treatment and / or disposal routes, can represent a significant cost saving for waste producers. This case study is an example of ILW to LLW reclassification.

Fuel Element Debris (FED)

Magnox Ltd originally intended to treat FED from its Bradwell site using a dissolution process, which had been used successfully at Dungeness. It was believed that all of the FED was ILW, however, through characterisation, Magnox Ltd identified that a proportion of the Bradwell FED was actually LLW, rather than ILW. Magnox carried out a Best Available Techniques assessment which identified that the preferred option for the lower activity FED material was disposal to the LLWR. A programme of work, undertaken through close collaboration between LLW Repository Ltd and Magnox Ltd, established that the LLW FED could be disposed of to the LLWR. The FED is packaged in 200L drums and compacted at Tradebe Inutec’s facility at Winfrith. The compacted drums are packed in a HHISO before being transported to the LLWR for grouting and disposal in the LLWR vaults.

Significant programme benefits should be realised, with schedule savings of around 12 months and associated cost savings in the order of millions of pounds. The success of this project may provide an opportunity for FED from other Magnox sites to be disposed of as LLW; Magnox Ltd is currently exploring this opportunity.
**BENEFIT 3: IMPROVED LLW MANAGEMENT ENABLES EFFECTIVE HAZARD REDUCTION AND DECOMMISSIONING**

How has improved LLW management enabled LLW managers to do things better on their sites?

During FY16/17, a questionnaire was distributed to waste producers to give them the opportunity to comment on the realisation of this benefit within their organisations. A selection of their responses is presented here.

### Improvements / transformations since 2013

**DSRL:**
- A revised Site Radioactive Substances Act (RSA) Authorisation and a separate Authorisation for disposal to the LLW vaults have been granted.

**EDF Energy:**
- Introduction of the Radioactive Waste Focus Index, a composite metric with the focus on demonstration of radioactive waste avoidance / minimisation, timely disposals and through-life strategies for all waste streams, has enabled a better understanding of the opportunities for implementing the UK LLW Strategy.
- Introduction of a High Resolution Gamma Spectrometry (HRGS) call-off contract and improved fingerprint management have enabled greater confidence in waste characterisation and, in turn, better application of the Waste Hierarchy.
- Development and use of clearance approaches has realised cost efficiencies.
- Establishing a dedicated waste management team has enabled resolution of a number of legacy waste issues.

**Magnox Ltd:**
- The VLLW disposal route has been opened at a further four sites (Berkeley, Hinkley Point, Oldbury and Dungeness), resulting in ten of the 12 sites now actively using this route.
- Characterisation and self-performance decontamination techniques have allowed wastes to be reclassified and managed as out of scope.
- A dedicated Lower Active Waste disposability and characterisation team was formed in 2016. This team has an increased focus on forward planning of characterisation (to inform permissioning and waste sentencing on a timely basis) and on the management, of the more problematic/opportunity wastes.

**Sellafield Ltd:**
- All permit restrictions on the transfer of waste for treatment or landfill disposal have been removed.
- A facility for the marshalling and control of excavated material and a centralised oil storage facility have been developed and implemented to support onward dispatch.
- The waste forecasting process has been further enhanced and the arrangements to introduce a waste recharging approach for the larger site projects have been developed.

**UKAEA:**
- Wastes have been diverted to incineration and VLLW disposal where possible/feasible.
- There has been a reduction in the stored radioactive waste inventory.
- Improvements have enabled the disposal of challenging wastes, including low volume, higher activity tritiated oils and sludges. As a relatively low volume waste generator, co-disposal of wastes through third parties provides a flexible means of disposal and minimises on-site storage requirements.
- Improved processes have delivered operational improvements including more space to enable continued decommissioning operations.
- Removal of legacy wastes has resulted in effective hazard reduction.

**LLW Repository Ltd:**
- Development and use of clearance approaches has realised cost efficiencies.
- Establishing a dedicated waste management team has enabled resolution of a number of legacy waste issues.

**Magnox Ltd:**
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- Wastes have been diverted to incineration and VLLW disposal where possible/feasible.

## Enabling improvements on onsite programme delivery

**DSRL:**
- There has been a reduction in the stored radioactive waste inventory.

**EDF Energy:**
- Improvements have enabled the disposal of challenging wastes, including low volume, higher activity tritiated oils and sludges. As a relatively low volume waste generator, co-disposal of wastes through third parties provides a flexible means of disposal and minimises on-site storage requirements.

**LLW Repository Ltd:**
- Improved processes have delivered operational improvements including more space to enable continued decommissioning operations.
- Removal of legacy wastes has resulted in effective hazard reduction.

**Magnox Ltd:**
- Restructuring has provided an increased focus on waste informed decommissioning and standardised approaches to waste management across all sites, where practicable. The Waste Strategy & Permissioning Programme works closely with the Decommissioning Programme to develop and optimise the overall decommissioning strategy across all Magnox sites.

**Sellafield Ltd:**
- A wide range of diversion capabilities are now in place which can be more efficiently deployed. All site personnel have been trained in requirements for managing LLW and detailed guidance and support is available to all waste generators.

**UKAEA:**
- Waste strategy on site directs activities to targeting specific waste types to ensure that there is zero end of operations liability. This is becoming a reality with the operation of the water detritiation facility and the materials detritiation facility.

## Strategy implementation: challenges to hazard reduction and decommissioning

**LLW Repository Ltd:**
- The strategy to divert waste from LLWR has uniquely challenged waste managers at the LLWR site because the infrastructure for LLWR disposal was already in place on the site, therefore diversion is viewed as ‘more difficult’.

**Magnox Ltd:**
- The continued application of the UK’s definition of LLW (i.e. 4GBq/te alpha, 12GBq/te beta-gamma) is hindering the opportunity to dispose of some ILW/LLW boundary wastes, which would otherwise be acceptable according to LLWR’s risk-based Environmental Safety Case (ESC). Current permits and planning consents are acting as a constraint as they make reference to the definition.
- Until recently, LLW Repository Ltd were set up to provide treatment and disposal services for straightforward, routine wastes. This meant that requests for support on more challenging wastenmagers at the LLWR would otherwise be acceptable according to LLWR’s risk-based Environmental Safety Case (ESC). Current permits and planning consents are acting as a constraint as they make reference to the definition.
- The LLW Strategy has driven a move away from a disposal culture to one fully aligned with the Waste Hierarchy. This has moved LLW management from a single operational route to multiple routes, adding to the consideration and work required to progress operations and hazard reduction and decommissioning. This includes requires for upfront review of options for managing any materials generated and additional constraints for segregation, monitoring, packaging and consignment of these materials.
BENEFIT 3: IMPROVED LLW MANAGEMENT ENABLES EFFECTIVE HAZARD REDUCTION AND DECOMMISSIONING

National Programme Office Activities

The Programme Office leads a number of activities to facilitate the sharing of good practice to support waste producers in their implementation of the strategy. It also produces guidance in the form of documents and templates that are developed through consultation with relevant stakeholders, including waste producing and supply chain organisations and regulators. These documents are available to all stakeholders. A summary is provided here:

Waste practitioner support and guidance

The National Waste Programme produces and disseminates a range of supporting material and guidance relating to the management of LLW. This includes guidance documents, templates, planning tools and models as well as reports and assessments, which are applicable to a range of waste producing sites at different phases of their lifecycle. These can be found on the NWP website at: http://llwrsite.com/national-waste-programme/waste-practitioner-support-guidance/

Training

The National Programme maintains a framework of training materials, to support upskilling and transfer of knowledge to waste practitioners and managers. The training covers a range of subjects related to the management of LLW, including characterisation, transport, and the use of the LLW Repository Ltd waste services processes. Further information can be found at http://llwrsite.com/national-waste-programme/lw-training-modules/ and the training modules are available to access at: https://www.nucleartrainingnetwork.com/

Training includes:
- e-learning
- self-guided workbooks
- classroom-based learning.

Strategic BAT assessments

An important component of the National Programme is the identification of optimised national strategic Best Available Techniques (BAT) assessments for the management of key LLW categories, through strategic or generic options studies. The intention is that organisations that produce or handle wastes can use these documents to inform their own BAT assessments.

PWMP guidance

A Project Waste Management Plan (PWMP) is a tool to aid planning and communications between the waste generators and waste management personnel. Projects and waste teams use a PWMP to define, for a particular project, expected waste volumes, classifications, routes, practical requirements and (where necessary) the “handshake” between the different teams. Guidance and a PWMP template have been produced to share good practice.

Waste informed decommissioning model

The waste informed decommissioning paper aims to provide a model and the principles governing how waste informed decommissioning can be planned and executed in the nuclear industry. Waste informed decommissioning is a method of delivering decommissioning to ensure that optimum decommissioning and waste management outcomes are achieved.

Peer Reviews and Peer Assists

The National Waste Programme has developed models for both Peer Review (PR) and Peer Assist (PA) activities. The aim of these activities is to encourage the sharing of best practice across waste producing organisations. Peer reviews provide a tool for waste producers to measure their LLW management performance against a model of best practice. Peer assists are a tool to support identification of specific improvements for specific waste management issues. Both activities involve LLW practitioners from one or more external organisations collaborating with another organisation; identifying and sharing areas of good practice, and making recommendations for improvement.

Since 2013, 12 Peer Reviews and Peer Assists have been carried out. A summary is provided below:

<table>
<thead>
<tr>
<th>Programme</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>FY 13/14:</td>
<td>Magnox Ltd—PR: First Generation Magnox Storage Pond (FGMSP), with a focus on upstream waste management operations</td>
</tr>
<tr>
<td>RSRL (now Magnox Ltd) – PR: Winfrith site</td>
<td></td>
</tr>
<tr>
<td>Magnox Ltd—PR: Chapelcross site, waste team managed areas</td>
<td></td>
</tr>
<tr>
<td>Sellafield Ltd—PA: LLW forecasting</td>
<td></td>
</tr>
<tr>
<td>FY 14/15:</td>
<td>LLW Repository Ltd—PA: On-site LLW management</td>
</tr>
<tr>
<td>RSRL (now Magnox Ltd) —PA: Waste forecasting: project waste management plans</td>
<td></td>
</tr>
<tr>
<td>Capenhurst Nuclear Services—PR: Capenhurst</td>
<td></td>
</tr>
<tr>
<td>DSRAL—PA: Predictive waste inventory and forecasting</td>
<td></td>
</tr>
<tr>
<td>FY 15/16:</td>
<td>Magnox Ltd—PA: Berkeley site waste consignment process</td>
</tr>
<tr>
<td>LLW Repository Ltd—PA: Characterisation guidance</td>
<td></td>
</tr>
<tr>
<td>FY 16/17:</td>
<td>DSRAL—PA: Follow up to 2015/16 Peer Assist</td>
</tr>
</tbody>
</table>
BENEFIT 3: IMPROVED LLW MANAGEMENT ENABLES EFFECTIVE HAZARD REDUCTION AND DECOMMISSIONING

Innovation

Continuous innovation in the field of LLW management leads to improvements in processes and approaches, providing significant benefits for waste producing sites. NDA estate organisations set out transformational activities in their Joint Waste Management Plans (JWMP). Many organisations have undertaken, or are undertaking, Research & Development (R&D) in order to make progress on LLW management issues, with a focus on technology transfer. This includes work on problematic waste, transport, and treatment options, as well as the management of waste at the boundary between LLW and Higher Activity Waste (HAW).

Transformational activities identified in 2016/17 JWMPs

- Increase capability within internal processes for use of the combustible route, to allow increase in waste diversion.
- Enhance capability to treat metal (on and off-site).
- Investigate and implement short term opportunities for decontamination.
- Enhance the site process for managing re-use of assets.
- Develop and implement a process solution to permit disposal or recycling of mercury.
- Consign LLW oils and solvents for thermal treatment.
- Project to review the waste led decommissioning model and determine which projects to implement.
- Project to identify wastes which fall outside the ESC/WAC for waste routes.
- Project to understand borderline waste inventory.
- Project to identify and implement routes for identified problematic wastes.
- Project to open metallic treatment waste route for the LLWR site.
- Develop material specifications for capping layers and ascertain availability of VLLW.

Waste producer R&D activities

**LLW Repository Ltd: superplasticisers**

LLW Repository Ltd has recently conducted research into the use of superplasticisers in the grout used to infill the voidage in LLW containers disposed of at the Repository.

**LLW Repository Ltd: mercury stabilisation**

A process for stabilisation of radioactively contaminated mercury using a sulphur stabilisation process has been identified by DSRL. The disposability of the resultant solid waste (mercury sulphide) product was unknown. LLW Repository Ltd has commissioned research to determine whether the product is disposable at the LLWR, to support the possibility of using this technology. The project comprises a series of leach tests to determine the effectiveness of the stabilisation process.

**Sellafield Ltd: robotics**

Sellafield Ltd has recently undertaken a research project to determine the use of robotics for sorting and segregating waste in complex environments.

**Magnox Ltd: Fuel Element Debris hydrogen evolution**

Magnox Ltd has undertaken extensive research and development in order to support the packing, transport and disposal of FED; including studies on the behaviour of grouted and ungrouted FED in terms of hydrogen evolution.

Hazard reduction & decommissioning case study: LLWR

The lack of availability of a suitable Type B package for transporting Plutonium Contaminated Material (PCM) waste from the LLWR to Sellafield for storage had the potential to severely impact the PCM decommissioning programme at LLWR. This was due to the lack of available storage space at LLWR for operational PCM waste. LLW Repository Ltd installed new assay equipment which enabled better characterisation of the waste, allowing some waste to be confirmed as LLW instead of PCM. This waste could be consigned to the appropriate treatment or disposal routes, substantially reducing the number of PCM drums to be stored on site and alleviating space restrictions.

Problematic Waste

Problematic radioactive waste, in the nuclear industry, describes any waste for which no defined waste management route is either available or currently planned in detail, or for which the existing solution is significantly sub-optimal. These are wastes from across the radiological spectrum including lower and higher activity waste. In order to support the NDA strategy, an Integrated Project Team (IPT) on problematic radioactive waste, was established in May 2016; this is being led by Radioactive Waste Management Ltd (RWML) and LLW Repository Ltd on behalf of the NDA. The objective of the IPT is to develop a co-ordinated and improved approach to the industry-wide management of problematic radioactive waste. The IPT will act as a focal point and, through ongoing engagement with stakeholders, has established a Community of Practice (CoP) to enable solutions to be developed and delivered. The CoP includes waste producers and helps to shape direction and priorities for the IPT.

Near Surface Disposal

In 2016, NDA established an integrated project team on Near Surface Disposal. It is being led by RWML with support from LLW Repository Ltd. The aim of the IPT is to determine if there is a strategic case for a near surface disposal route for some of the HAW inventory. If there is, the IPT will identify credible options, followed by preferred options, for the approach to implementing near surface disposal. All HAW generated on UK nuclear sites is currently either stored in its raw state or packaged into a form suitable for on-site interim storage pending availability of the final management solution. It is recognised that a Geological Disposal Facility for England and Wales would still be required for some HAW and spent fuel.

Thermal Treatment

The objectives of the Thermal IPT are threefold: to investigate the appropriateness of thermally treating radioactive waste; to increase technical maturity of thermal processing; and to demonstrate thermal treatment of NDA radioactive waste, on the Sellafield site, under site licence conditions. The IPT is being delivered by Sellafield Ltd with NNL, and includes the involvement of other waste producers.
BENEFIT 4: CONTINUED APPLICATION OF THE WASTE HIERARCHY

Application of the Waste Hierarchy is central to the implementation of the Strategy. This page describes the Waste Hierarchy and the progress that has been made in its application across the industry since the Strategy was published. Recognising that access to suitably flexible waste management infrastructure is integral to application of the Waste Hierarchy, this page also provides a summary of the infrastructure available to the nuclear industry in 2016.

The Waste Hierarchy defines a list of waste management options ranked according to their environmental impact. By moving up the hierarchy waste producers reduce overall environmental impact, save money, minimise raw material consumption and divert waste away from the LLWR (preserving disposal capacity for those wastes that require an engineered disposal solution). UK Government Policy and Strategy require waste producers to manage their LLW in accordance with the Waste Hierarchy.

Implementation of the national strategy has transformed waste management practices and behaviour across the industry. Prior to the publication of the Strategy, waste management was dominated by LLW disposal (in 2009 95% of waste was managed by disposal to the LLWR). Through application of the Waste Hierarchy, adoption of different waste management practices by waste producers, easier access to alternative waste management capabilities and the work of the National Waste Programme, waste diversion has become business as usual (in 2015/16, 88% of waste was diverted away from disposal at the LLWR).

Waste treatment infrastructure available in 2016

<table>
<thead>
<tr>
<th>Waste treatment</th>
<th>Description</th>
<th>Waste Hierarchy Benefits</th>
<th>Suppliers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decontamination/Sort &amp; Segregation</td>
<td>Many UK nuclear sites have their own infrastructure providing some capability for waste segregation, size reduction and decontamination. Such infrastructure is also available within the supply chain. Cutting devices are often used to size reduce items to allow more effective packaging. A range of characterisation, assay and measurement equipment allows sites to sort and segregate their waste in order to utilise the many different waste treatment routes now available. Decontamination methods such as scabbling, high pressure water jetting and shot blasting are used to enable waste to be managed as out-of-scope waste or to enable access to other waste management routes.</td>
<td>• Minimises volumes of radioactive waste&lt;br&gt;• Allows use of other waste management routes</td>
<td>• On-site infrastructure&lt;br&gt;• Cyclife UK&lt;br&gt;• Tradebe Inutec&lt;br&gt;• Doosan Babcock</td>
</tr>
<tr>
<td>Metallic</td>
<td>Metal melting is a mature technology that is a business-as-usual waste management route for the UK nuclear industry. Metal is melted in an induction or electric arc furnace where the majority of the radioisotopes concentrate into the floating slag layer. This is collected, returned to the UK and disposed of as LLW or VLLW. The bulk metal can then be recycled for further use. Metallic treatment can also involve decontamination through shot-blasting or other physical and chemical techniques.</td>
<td>• 95% of the original material recycled</td>
<td>• Cyclife UK&lt;br&gt;• Tradebe Inutec&lt;br&gt;• Doosan Babcock&lt;br&gt;• Sellafied Ltd and Magnox Ltd also have on-site metallic treatment capabilities</td>
</tr>
<tr>
<td>Incineration</td>
<td>Incineration is a widely and well developed waste treatment technology; used both internationally and within the UK for management of radioactive and non-radioactive wastes. Incineration reduces waste volumes by burning combustible solid and liquid wastes and breaking down the reactive compounds and organics to create a stable homogenous waste form (ash) for disposal. The product is typically disposed of as VLLW to appropriately permitted landfill sites (except for any UK waste incinerated in Sweden, which is typically subject to LLW disposal).</td>
<td>• Reduces volumes of waste by up to 98%</td>
<td>• Augeon (East Kent Facility)&lt;br&gt;• Grundons (Coínbrook)&lt;br&gt;• Tradebe (Fawley)&lt;br&gt;• Veolia (Ellesmere Port)&lt;br&gt;• Cyclife (Sweden)</td>
</tr>
<tr>
<td>Compaction</td>
<td>Supercompaction has historically been the main volume reduction technology used for LLW in the UK. Low force compaction is used for the compression of bags of waste and high force compaction or “super-compaction” compresses drums and boxes using a hydraulic ram. Both methods allow a reduction in the volume of waste which can then be packaged and transported to waste disposal facilities.</td>
<td>• Reduces volume of waste to be disposed of or treated.</td>
<td>• Sellafied Ltd (WAMAC)&lt;br&gt;• Tradebe Inutec&lt;br&gt;• Downeay Site Restoration Ltd (DSRL and MOD Vulcan waste only)</td>
</tr>
<tr>
<td>VLLW Disposal</td>
<td>2007 UK Policy introduced a new waste classification — VLLW. This is waste which does not require disposal in highly engineered facilities (typically soil, spoil, rubble etc.) and which can be disposed of at appropriately permitted commercial landfill sites.</td>
<td>• Reduces volume of waste to be disposed of at LLWR</td>
<td>• Suez (Clifton Marsh)&lt;br&gt;• Augeon (East Northants Resource Management Facility)&lt;br&gt;• FCC (Lillyhall)&lt;br&gt;• Sellafied Ltd on-site VLLW disposal, CLESA</td>
</tr>
<tr>
<td>LLW Disposal</td>
<td>Disposal of LLW that is unsuitable for reuse or recycling, or cannot otherwise be diverted and requires an engineered disposal facility. Wastes are containerised in metal ISO freight containers, grouted and emplaced in concrete vaults.</td>
<td>• Disposal of waste in engineered vaults</td>
<td>• LLW Repository Ltd&lt;br&gt;• Downeay Site Restoration Ltd (DSRL LLW and MOD Vulcan disposals only)</td>
</tr>
</tbody>
</table>

* Whilst volume reduction is not formally a step in the Waste Hierarchy, it has an important role in the provision of optimised disposal.
### BENEFIT 4: CONTINUED APPLICATION OF THE WASTE HIERARCHY

This page provides an overview of the waste management infrastructure currently available to the UK nuclear industry and an overview of the sustainability of the supply chain; illustrating the changes in status from the 2013 Strategic Review.

#### Waste management infrastructure in 2016

The sustainability of the supply chain is an important factor in allowing the industry to continue diverting waste by accessing alternative waste treatments. This table provides an overview of supply chain health since the last review and into the future.

<table>
<thead>
<tr>
<th>Waste route</th>
<th>Status 2013</th>
<th>Status 2016</th>
<th>Status Future (beyond 2016)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Metallic</strong></td>
<td>In October 2013, a delivery and storage capacity shortfall occurred at the Studsvik UK facility. The impact was mitigated for consignors using the LLWR waste services framework through the diversion of waste to different suppliers.</td>
<td>New metallic framework launched April 2016 with new entrants. Infrastructure available at Tradebe Inutec, Cyclife, Siempelkamp and Bear Creek. Capability sufficient for current arisings of waste and current diversion rates.</td>
<td>No significant changes in supply chain capability expected. If diversion rates increase, some possibility that melt capability may be insufficient. Uncertain impacts from Brexit and competition from European decommissioning programmes.</td>
</tr>
<tr>
<td><strong>Combustible</strong></td>
<td>Capacity supply issues were experienced towards the end of financial year 2012/13 owing to activity limits being reached at some commercial incinerator sites.</td>
<td>Route functioning well. Five incinerators available (Veolia, Trabe, Grundons, Augean and Cyclife in Sweden) with Augean at East Kent a new entrant since 2013. Radiological permission has changed to enable incineration of a wider range of LLW. Capability sufficient for current arisings of waste and current diversion rates.</td>
<td>No significant changes in supply chain capability expected. Wide range of facilities in UK that are not dependant on business from the nuclear industry. Route expected to meet future capability challenges.</td>
</tr>
<tr>
<td><strong>Supercompaction</strong></td>
<td>Availability of two commercial compaction facilities at Sellafield Ltd and Tradebe Inutec.</td>
<td>Availability of two commercial compaction facilities at Sellafield Ltd and Tradebe Inutec. WAVAMC facility at the Sellafield Site currently unavailable for external consignors owing to challenges with information flow needed to meet the LLWR WAC.</td>
<td>No significant changes expected in supply chain. Increasing diversion rates may contribute to over-capacity. Challenges with acceptance of externally consigned waste to WAVAMC is likely to continue but this is not expected to have a significant impact on producers.</td>
</tr>
<tr>
<td><strong>Very Low Level Waste disposal</strong></td>
<td>Availability of three commercial landfill sites operated by Augean, SITA (now Suez) and FCC.</td>
<td>Strongly competitive. Three commercial sites available operated by Augean, Suez and FCC. In 2015, the planning permission for the Suez site was extended to 2035 allowing continued disposal. Augean have planning permission for use of a different cell at their site for disposal of VLLW.</td>
<td>At current and projected diversion rates, potential for over-capacity in supply chain which may lead to supply chain withdrawal. Uncertainty over legislation changes (e.g. Paris-Brussels and the Basic Safety Standards Directive (BSSD)), changing site waste strategies (e.g. increased use of in-situ disposal) and potential for overall national reduction in landfill capacity.</td>
</tr>
<tr>
<td><strong>Low Level Waste disposal</strong></td>
<td>LLWR site unable to dispose of waste until permit and planning permission approved. Short-term storage available. DSRL facility not available and wastes being stored on the Dounreay site.</td>
<td>LLWR permit and planning permission approved enabling disposal of waste. Dounreay LLWR disposal facility constructed and in operation.</td>
<td>No significant changes in supply chain expected. Capacity expected to meet demand.</td>
</tr>
</tbody>
</table>

#### Summary of changes since 2013 Strategic Review

- Additional Augean incinerator available at East Kent.
- EDF EGI Hartlepool on-site incinerator removed from service.
- Studsvik UK acquired by EDF(SA) and rebranded as Cyclife.
- Increased sort and segregation services available from the supply chain.
- All waste management routes become business-as-usual across most nuclear industry sites.

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**Note:** Details from the table are shown in the diagram as well. The diagram includes a map of the UK with waste management facilities marked and a key indicating 'no issues with health of supply chain,' 'potential threats/challenges to health,' and 'significant issues with health of supply chain.'
BENEFIT 5: STAKEHOLDERS TO THE STRATEGY ARE INCREASINGLY ENGAGED IN ITS DELIVERY

This page provides information on the principal stakeholders engaged in delivery of the UK LLW Strategy and describes how they are engaged through the National Waste Programme.

Stakeholders interested in strategy implementation

There is a diverse range of stakeholders who have interest in the success of strategy implementation; they range from those directly involved in the management of LLW (waste producers, the supply chain, LLW Repository Ltd) to those who are less involved on a day-to-day basis who have an interest in or wish to be kept informed of strategy implementation activities and outcomes. The roles of each stakeholder group are summarised in the diagram.

The National Waste Programme plays a key role in ensuring stakeholders remain engaged with the progress being made on strategy implementation.

National Waste Programme stakeholder engagement

The National Waste Programme engages stakeholders in five main ways; through:

- Reporting and publication of metrics and key performance indicators; including information made available to stakeholders via the LLW Repository Ltd website (www.llwrsite.com).
- Delivery of National Waste Programme governance arrangements; the neighbouring table shows the key meetings that collaboratively determine the direction of the programme and help deliver the agreed outcomes.
- Collaboration on projects and resources to support the wider industry in implementing the Strategy
- The sharing of learning and good practice; including material made available to all stakeholders via www.llwrsite.com.
- Engagement between LLW Repository Ltd Waste Management Services, the supply chain and waste producers on wastes to be treated and/or disposed, as part of waste producers’ day-to-day waste management activities.

Key meetings that underpin National Waste Programme governance arrangements

<table>
<thead>
<tr>
<th>Key Programme stakeholder meetings</th>
<th>Purpose</th>
<th>NWP Stakeholders</th>
<th>Meeting Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Programme Board</td>
<td>Strategic oversight of LLW management across the programme.</td>
<td>Programme Office</td>
<td>✓</td>
</tr>
<tr>
<td>Monthly Programme Managers Meeting</td>
<td>Monthly review of progress against programme activities and to share learning / good practice.</td>
<td>Waste producers</td>
<td>✓</td>
</tr>
<tr>
<td>Delivery Overview Group</td>
<td>Six-monthly update of progress against programme activities and to share learning / good practice with the wider stakeholder group.</td>
<td>Supply chain</td>
<td>✓</td>
</tr>
<tr>
<td>Regulatory Liaison Meeting</td>
<td>Review progress and identify / assess regulatory constraints and policy issues impacting the programme.</td>
<td>NDA</td>
<td>✓</td>
</tr>
<tr>
<td>LLW Repository Ltd Customer Meetings</td>
<td>Review / enhance consignor progress against their waste programme and mitigate threats.</td>
<td>UK Government</td>
<td>✓</td>
</tr>
<tr>
<td>LLW Practitioners Forum</td>
<td>Share learning and good practice across the practitioner community.</td>
<td>Regulators</td>
<td>✓</td>
</tr>
</tbody>
</table>

More detailed information on the National Waste Programme governance structure is available on the following Benefit 5 sheet and in the National Waste Programme Manual available via www.llwrsite.com.
BENEFIT 5: STAKEHOLDERS TO THE STRATEGY ARE INCREASINGLY ENGAGED IN ITS DELIVERY

This page describes the governance arrangements for the National Waste Programme and how its stakeholders are engaged with the governance processes to enable the delivery of the Strategy.

Governance of the National Waste Programme

The Programme Office ensures effective and efficient direction and implementation of the Programme and its reporting by having a strong set of governance arrangements agreed with and between relevant stakeholders. This commitment provides assurance that there is proper and coherent disclosure and reporting. Programme governance is overseen by the Board and is undertaken through:

- A series of stakeholder meetings that enable participants to share with each other and the wider stakeholder community information on progress, successes, issues, good practice, learning and risks.
- The development of a series of publically available reports and plans such as waste producer Joint Waste Management Plans and the National Programme Quarterly Report.
- The maintenance of a strategic threat / opportunity register.

Changes to Programme governance structures since 2013

The governance structures of the National Waste Programme have matured over the period since the 2013 Strategic Review with the following changes:

- The Programme Board, introduced in 2013, is now well established. It involves the participation of executive-level personnel from waste producing organisations (including a non-NDA organisation, Capenhurst Nuclear Services) and the NDA. The Programme Board is responsible for overseeing the strategic direction of the programme.
- The non-NDA estate has played an increasing role in governance arrangements with regular participation at face-to-face Monthly Programme Manager Meetings, routine participation in the Delivery Overview Group, representation at the Programme Board and greater participation in the LLW Practitioners Forum.
- Responsibility for organisation and logistics for the Practitioners Forum has transferred from Magnox Ltd to the National Programme Office. The agenda for the meeting is developed by a steering group, which includes representatives from a range of waste producing organisations (including the non-NDA estate); the role of chairperson rotates between organisations.
- The National Programme Quarterly Progress report, introduced in 2016, is available to all stakeholders via: www.llwrsite.com. The report provides updates on progress, successes, issues and risks relating to the programme; data on key performance indicators compiled by the National Programme Office; and quarterly updates from waste producers and (where relevant) the regulators.

Stakeholders at an NWP Delivery Overview Group meeting, 2016

Stakeholder interactions
CHALLENGES TO STRATEGY IMPLEMENTATION—CURRENT AND FUTURE

This page provides a summary of the current and future challenges for strategy implementation within the nuclear industry, providing a picture of the issues of particular concern to the wider stakeholder group engaged in delivering the Strategy. These have been collated from stakeholder perspectives expressed during stakeholder engagements during 2016 and from the 2016 iteration of the National Waste Programme Strategic Risk Register.

Complex waste management

**Future challenges** — as waste producer site programmes accelerate, more complex wastes and problematic wastes will be generated. There are uncertainties as to whether optimised waste management routes will be available for these wastes. The absence of such routes may lead to increased cost and waste accumulation; and may slow delivery of programmes at sites.

Interim and final end-states

**Future challenges** — the strategy for site interim and final end-states may mean that large volumes of waste are generated from excavation of contaminated land resulting in inadequate capacity at management facilities, need for additional storage and potentially the need for a new repository.

Waste mis-consignment

**Current and future challenges** — mis-consignment (the transfer of the wrong waste to the wrong site) has the potential to limit access to or close certain waste routes, which could have an impact on supply chain sustainability, adversely impact on stakeholder confidence in the industry and increase cost for waste producers.

LLWR WAC and ESC

**Current challenges** — the revised Waste Acceptance Criteria (WAC) for the LLWR which implement the 2011 Environmental Safety Case (ESC), have impacted on waste producers in terms of effort, time and cost. Revised waste acceptance procedures have created a step change in the amount of information required from waste producers to enable access to the LLW disposal route. In addition, these WAC changes have introduced restrictions on some of the wastes that can be disposed of in the LLWR; resulting in some wastes becoming problematic wastes or else needing to be managed via HAW management routes.

Legislative and regulatory changes

**Current and future challenges** — some legislative and regulatory changes have occurred that are having an adverse impact on the ability for the waste management community to deliver optimised LLW management. For example, changes to the fissile exemption limit in the transport regulations in 2015 have caused practical challenges for some waste producers with regards to waste transport; resulting in use of sub-optimal arrangements (such as an increased number of transports of smaller volumes of waste). There are a number of legislative and regulatory changes on the near term horizon (such as implementation of the Paris-Brussels Convention and revised Basic Safety Standards Directive) which have the potential to impact LLW management by impacting the sustainability of the supply chain or significantly changing the volume of waste requiring management as radioactive waste. There are also significant uncertainties as to the impact of Brexit, which may have impacts such as challenging access to European supply chain facilities.

Packaging and transport

**Current and future challenges** — the range of waste packages available to the waste management community, whilst broadly suitable for management of standard LLW, are not sufficiently flexible to support more complex wastes (such as larger items, those with more complex geometries, higher levels of radioactivity or more complex chemical properties). The complexity of wastes requiring management is likely to increase as decommissioning progresses across the UK; issues relating to the availability of a flexible packaging fleet may continue to impact waste management in the future. There is limited availability of rail transport for LLW, with the vast majority of transports undertaken by road. This impacts local communities and the environment. As the volume of waste requiring management increases in the future, with accelerated programme delivery across the industry, these adverse consequences will continue unless there is increased use of rail transport.

Supply chain capacity

**Future challenge** — the availability of capacity within the supply chain is integral to the successful delivery of the Strategy. This is threatened in the medium to long term by increased competition for use of the available capacity by other sectors (such as the NORM industry, particularly as decommissioning of the oil and gas industry commences) and the nuclear sector in other countries. The delivery of European nuclear decommissioning programmes may contribute to increased competition for capacity, particularly for the European based treatment capability. This is potentially a significant threat as the available melting capacity for the UK nuclear industry is solely located overseas.
This section provides a summary of the current and future opportunities within the nuclear industry, providing a picture of the potential developments that the stakeholder community believe would support strategy implementation. These have been collated from stakeholder perspectives expressed during stakeholder engagements during 2016 and from the 2016 iteration of the National Waste Programme Strategic Risk Register.

**Current opportunities** — whilst the revised WAC implementing the 2011 ESC for the LLWR has impacted on waste producers in terms of effort, time and cost, the changes have also included some relaxations in the acceptance criteria which directly support waste producers in the management of their LLW. These include relaxations on certain complexing agents, certain types of asbestos and sources.

**Future opportunities** — the legislative changes on the near-term time horizon may offer opportunities as well as challenges. Implementation of the Paris-Brussels convention, and any future exemption from it, may enable the adoption of different commercial models for accessing the VLLW supply chain; removing the need for liability channelling through LLW Repository Ltd. This may support increased supply chain sustainability for this route and more flexibility for waste generators. Whilst implementation of the Basic Safety Standards Directive may — if the clearance and exemption regime is adversely impacted — cause larger volumes of radioactive waste to be generated, this could further support supply chain sustainability for the wider industry. The impact of Brexit, whilst uncertain, may also bring opportunities for enhanced development of the UK supply chain. For example, the potential for import and treatment of radioactive waste from overseas markets could encourage the provision of new capabilities or facilities. Other legislative developments – such as the introduction of the Guidance for Release of Nuclear Sites from Radioactive Substances Regulation and changes to the system of regulatory control across the site lifecycle — may bring opportunities for the nuclear industry by enabling the potential for in-situ disposal of waste and different de-licensing requirements respectively.

**Future opportunities** — waste management technologies and approaches identified for the management of complex wastes may offer more optimised solutions for certain types of standard LLW. For example, thermal treatment other than high temperature incineration may offer solutions for standard wastes as well as problematic and LLW / ILW boundary wastes.

**Interim and final end-states** — the generation of larger volumes of waste from sites delivering work to achieve interim and final end-states may support the sustainability of the VLLW supply chain. Alternatively, this may support the development of on-site or near-site disposal options which would further support waste diversion efforts.

**Supply chain capacity** — increased competition from other sectors (such as the NORM sector and European decommissioning programmes) may help to stimulate further investment in the UK supply chain, providing additional capacity and infrastructure to support the nuclear industry. For example, if metal melting capacity in Europe becomes overstretched, it may provide an improved business case for investment in a UK based metal melter. The availability of such additional capacity would directly support accelerated programmes on waste producer sites and may offer benefits to other UK industrial sectors.

**Supply chain sustainability** — improved supply chain sustainability (achieved through the introduction of different funding approaches, the adoption of different commercial models, improved quality and accuracy of waste forecasting and / or the smoothing of supply and demand through the successful adoption of buffer storage capability) could provide continued opportunities for cost-effective waste diversion, improved value-for-money and the potential for further investment which may provide treatment opportunities for more complex wastestreams.

**Waste mis-consignment** — the threat of waste mis-consignment may encourage waste producers, and other stakeholders, to support the implementation of additional controls and different approaches to waste management. This may support the business case for local, regional or national buffer storage of waste to enhance additional controls for consignment (supporting supply chain sustainability).

**Packaging and transport** — development and introduction of a more flexible packaging fleet may provide opportunities for more rapid, effective and value-for-money waste management. Strategic development of such a packaging fleet may provide solutions for the packaging (and hence management) of more complex, problematic and LLW / ILW boundary wastes. There are also opportunities to enhance transportation routes — for example, through the use of mixed-load trains — which could provide environmental benefits and more effective transportation of radioactive waste.

**OPPORTUNITIES FOR STRATEGY IMPLEMENTATION—CURRENT AND FUTURE**

**Complex waste management** — waste management technologies and approaches identified for the management of complex wastes may offer more optimised solutions for certain types of standard LLW. For example, thermal treatment other than high temperature incineration may offer solutions for standard wastes as well as problematic and LLW / ILW boundary wastes.

**LLWR WAC and ESC** — whilst the revised WAC implementing the 2011 ESC for the LLWR has impacted on waste producers in terms of effort, time and cost, the changes have also included some relaxations in the acceptance criteria which directly support waste producers in the management of their LLW. These include relaxations on certain complexing agents, certain types of asbestos and sources.

**Legislative and regulatory changes** — the legislative changes on the near-term time horizon may offer opportunities as well as challenges. Implementation of the Paris-Brussels convention, and any future exemption from it, may enable the adoption of different commercial models for accessing the VLLW supply chain; removing the need for liability channelling through LLW Repository Ltd. This may support increased supply chain sustainability for this route and more flexibility for waste generators. Whilst implementation of the Basic Safety Standards Directive may — if the clearance and exemption regime is adversely impacted — cause larger volumes of radioactive waste to be generated, this could further support supply chain sustainability for the wider industry. The impact of Brexit, whilst uncertain, may also bring opportunities for enhanced development of the UK supply chain. For example, the potential for import and treatment of radioactive waste from overseas markets could encourage the provision of new capabilities or facilities. Other legislative developments — such as the introduction of the Guidance for Release of Nuclear Sites from Radioactive Substances Regulation and changes to the system of regulatory control across the site lifecycle — may bring opportunities for the nuclear industry by enabling the potential for in-situ disposal of waste and different de-licensing requirements respectively.
This section provides an overarching summary of work ongoing within the LLW management community within Financial Year 17/18. It describes the strategic direction of work for the community, extracted from the National Waste Programme Blueprint (available via www.llwrsite.com), for the thematic challenge and opportunity areas previously identified. It provides information on the shape of forward work in these areas within the waste management community to 2030.

Supply chain and infrastructure

**Workscope in 2017/18 to support delivery of outcomes**
- Collaborative project to identify credible options for LLW buffer storage for the UK nuclear industry.
- Collaborative project to review potential alternative disposal models for the LLWR.
- Participation in Problematic Waste Integrated Project Team (IPT) and delivery of year 1 projects.
- Development of a packaging and transport strategy.
- Completion of the Type B programme (provision of new Type B packaging capability).
- Re-competition strategy for the combustible route developed and approved.
- Development of supply chain sustainability studies for combustible, VLLW disposal and supercompaction routes.

**What does success look like in 2030?**
- There is a flexible, sustainable supply chain infrastructure that includes enhanced options by 2020. This supply chain offers sorting, segregation, pre-treatment and conditioning infrastructure to complement the infrastructure on sites.
- A model has been implemented to enable mixed shipments by rail (LLW, HAW and Special Nuclear Materials).
- A suitable vault design and available capacity to manage the projected inventory within the LLWR ESC are in place by 2020.
- By 2020, there are solutions in place for most problematic LLW, including items that fall outside the LLWR ESC; with solutions for all problematic wastes by 2030.
- Appropriate and flexible packaging and transport assets are available, with increased use of rail and the ability to use mixed loads where appropriate.

Radioactive waste management

**Workscope in 2017/18 to support delivery of outcomes**
- Participation of the wider industry in the Near Surface Disposal IPT and delivery of year 1 projects.
- Collaborative project on the cost-benefit and practical requirements for implementation of alternative management approaches for borderline LLW / ILW.
- Collaborative project on development of principles for decay storage.
- Collaborative project between LLW Repository Ltd and RWM on potential for supply chain to manage HAW.

**What does success look like in 2030?**
- Options for decay storage and management of short-lived ILW are being implemented by 2020; and are in place by 2030. Options for management of borderline LLW / ILW wastes are in place by 2030.
- There is an implemented UK integrated radioactive waste management strategy by 2030.
- Use of risk-based disposability approaches is the norm by 2030.

Regulatory changes and end states

**Workscope in 2017/18 to support delivery of outcomes**
- Completion of the trials on implementation of the Guidance for Release of Nuclear Sites from Radioactive Substances Regulation at Dounreay, Magnox Ltd Trawsfynydd and Magnox Ltd Winfrith sites.
- Watching brief on near-term and medium-term legislative and regulatory changes.

**What does success look like in 2030?**
- By 2030, site end states and/or interim end states have been agreed and are used to inform planning and inventories.
Glossary

**BAT**
Best Available Technique

**BEIS**
Department for Business, Energy and Industrial Strategy

**BSSD**
Basic Safety Standards Directive

**DECC**
Department for Energy and Climate Change (now part of BEIS)

**DNSR**
Defence Nuclear Safety Regulator

**DSRL**
Dounreay Site Restoration Ltd

**EA**
Environment Agency

**EDFE NGL**
EDF Energy - Nuclear Generation Ltd

**ENRMF**
East Northants Resource Management Facility

**EPR10**
Environmental Permitting Regulations 2010

**ESC**
Environmental Safety Case

**FED**
Fuel Element Debris

**GRR**
Guidance on Requirements for Release of Nuclear Sites from Radioactive Substances Regulation

**HAW**
Higher Activity Waste

**HFC**
High Force Compaction

**HHISO**
Half Height Isofreight

**HLW**
High Level Waste

**HSE**
Health & Safety Executive

**ILW**
Intermediate Level Waste

**IPM**
Integrated Project Management

**IWM**
Integrated Waste Management

**JWMP**
Joint Waste Management Plan

**LLW**
Low Level Waste

**LLWR**
Low Level Waste Repository Ltd

**MRF**
Metal Recycling Facility

**NDA**
Nuclear Decommissioning Authority

**NiCoP**
Nuclear Industry Code of Practice

**NORM**
Naturally Occurring Radioactive Waste

**NPPF**
National Planning Policy Framework

**NRW**
Natural Resources Wales

**NWP**
National Waste Programme

**ONR**
Office for Nuclear Regulation

**ONR-RMT**
Office for Nuclear Regulation - Radioactive Materials Transport

**PWP**
Project Waste Management Plan

**PWMP**
Project Waste Management Plan

**R&D**
Research & Development

**RDF**
Radioactive Substances Authorisation

**RSA**
Radioactive Substances Act 1993 (Scotland) [as amended]

**RSA93**
Radioactive Substances Act 1993 (Scotland)

**RWF1**
Radioactive Waste Focus Index

**RWM**
Radioactive Waste Management

**SEPA**
Scottish Environment Protection Agency

**SL**
Site Licence Company

**SLC**
Site Licence Company

**SNM**
Special Nuclear Materials

**TBuRD**
Technical Baseline and Underpinning Research Document

**UKAEA**
United Kingdom Atomic Energy Authority

**UKRwi**
United Kingdom Radioactive Waste Inventory

**VLLW**
Very Low Level Waste

**WAC**
Waste Acceptance Criteria

**WAMAC**
Waste Monitoring and Compaction Plant

**WCH**
Waste Characterisation Form

**WCI**
Waste Consignment Information Form

**WEN**
Waste Enquiry Form

Bibliography and useful sources of information

**Documents**
- Nuclear Decommissioning Authority Strategy, NDA, April 2016.
- Waste Inventory Form 2016.
- Understanding activities that produce radioactive wastes in the UK, NDA, 2015.

**Websites**
- Office for Nuclear Regulation — [www.onr.org.uk](http://www.onr.org.uk)
- SEPA — [www.sepa.org.uk](http://www.sepa.org.uk)
- NRW — [www.naturalresourceswales.wales](http://www.naturalresourceswales.wales)
- HSE — [www.hse.gov.uk](http://www.hse.gov.uk)
- United Kingdom Radioactive Waste Inventory — [www.ukinventory.nda.gov.uk](http://www.ukinventory.nda.gov.uk)
- LLW Repository Ltd — [www.llwsite.com](http://www.llwsite.com)
- National Training Network — [www.nucleartrainingnetwork.com](http://www.nucleartrainingnetwork.com)