

Implementation strategy for Scotland's policy on higher activity radioactive waste

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Executive Summary

- i. This Strategy has been prepared to support Scotland's Higher Activity Radioactive Waste Policy published in 2011 (the '2011 Policy'). The 2011 Policy is that long-term management of higher activity radioactive waste should be in near-surface facilities. Facilities should be located as near to the site where the waste is produced as possible. For safety reasons, developers will need to demonstrate how the facilities will be monitored and how waste packages, or waste could be retrieved. All long-term waste management options will be subject to robust regulatory control.
- ii. The aim of this Strategy is to expand on the framework provided by the 2011 Policy to allow waste management decisions to be taken to ensure the Policy is implemented in a safe, environmentally-acceptable and cost-effective manner.
- iii. The Strategy does not address site-specific issues. It is recognised that appropriate waste management solutions at one site may be different from those at another site. The Strategy is not prescriptive about which management solutions should be used in specific circumstances.
- iv. The Strategy sets out three key phases of work for the effective implementation of the 2011 Policy and outlines actions that are required during each phase. Setting out clear timescales towards a long-term solution for the final disposition of waste is important to avoid unnecessarily passing the radioactive waste burden onto future generations and to help protect the environment. The dates may be subject to change to reflect new developments. There may be opportunities to reduce storage periods by establishing management routes earlier which could allow decommissioning timescales to be shortened saving time and costs. Early opportunities to develop near surface disposal technologies will be pursued if possible.
- v. Phase 1 (2016-2030) will include a review of the higher activity waste that is expected to arise in Scotland. The suitability of disposal as a waste management option for these wastes under current technologies will also be reviewed. Initial results have shown that a proportion of wastes may be suitable for emerging near-surface disposal concepts. During this phase, new waste management baselines will be implemented by waste owners and producers. The Letter of Compliance process will be reviewed, recognising that some wastes are destined for near-surface disposal. The Nuclear Decommissioning Authority (NDA) and other waste producers and owners will need to review the baseline plans and planning assumptions that are currently in place for the waste in light of the 2011 Policy.
- vi. In Phase 2 (2030-2070) the Scottish Government will work with the NDA, radioactive waste producers and regulators to help develop a near-surface disposal concept for waste suitable for this management route under current technologies. Plans for the design, siting and construction of second generation of replacement long term storage facilities and near-surface disposal facilities will be developed.

- vii. In Phase 3 (2070 onwards) the Scottish Government anticipates that replacement near-surface storage facilities will be constructed. Disposal technologies will be further developed and new near-surface disposal facilities will be constructed.
- viii. The Committee on Radioactive Waste Management will continue to provide independent scrutiny and advice to the Scottish Ministers on the work of the Scottish Government and the NDA in relation to the Strategy and implementation of the 2011 Policy in Scotland.
- ix. Research will be undertaken to support nuclear decommissioning and radioactive waste management in Scotland. Research aims and potential research projects are highlighted in the Strategy. In Phases 1 and 2 programmes to identify credible waste management options for wastes currently understood as suitable for near-surface disposal will be undertaken. From Phase 2 a further research and development work stream will be initiated to investigate potential technical solutions for higher activity wastes which, under current technology and regulation, are understood to be unsuitable for near-surface disposal. These projects will include not only methods that are currently available, but also explore practices that could become viable in the future.
- x. The radioactive waste management decision-making process will be reviewed to ensure that communities are informed and engaged so that they can express their views. Stakeholder and community engagement plans will be developed and research will be undertaken to help develop an effective communication methodology.

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1 Background to the Implementation Strategy

1.1 The Policy, a Summary

1.1.1 The Scottish Government published its Policy Statement for Higher Activity Radioactive Waste in January 2011 (“the 2011 Policy”)¹.

1.1.2 The Scottish Government Policy is that long-term management of Higher Activity Radioactive Waste (HAW) should be in near-surface facilities. Facilities should be located as near to the site where the waste is produced as possible. Developers will need to demonstrate how the facilities will be monitored and how waste packages, or waste could be retrieved. All long-term waste management options will be subject to robust regulatory control.

1.1.3 The Scottish Government’s Policy is set in the context of the latest European Directive on Radioactive Waste (2011/70/Euratom) which states that the typical disposal concept for low and intermediate-level waste is near-surface disposal².

1.1.4 The Directive also calls for the planning and implementation of disposal options as a part of national policies for all radioactive wastes, while recognising that plans need to remain flexible in the light of developing knowledge.

1.1.5 The 2011 Policy provides the framework for the long-term management of higher activity radioactive waste arising in Scotland. The aim of the Policy is to ensure that all activities for the long-term management of the waste are made in a way that protects the health and interests of people and the integrity of the environment now and in the future. The Policy stated that:

a) The Policy is not prescriptive in its approach, recognising that it will be applicable to waste:

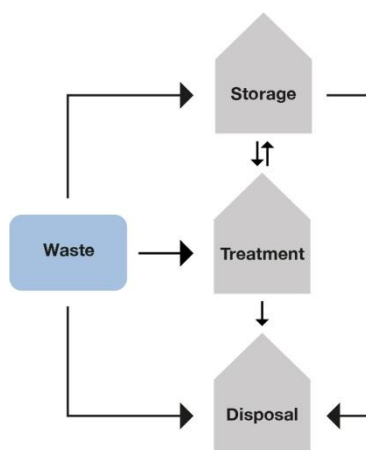
- which may not be produced for decades; and*
- for which long-term management options may not be feasible at present or have yet to be developed.*

b) The Policy provides the framework within which regulators, facility operators, waste producers and owners and the NDA will take decisions on the long-term management of the waste and undertake the work, and duties, for which they are responsible. The Policy enables options to be considered which may require research or development, recognising that advances may be made over time to manage waste for which long-term options are not current feasible.

c) The Policy allows waste producers and owners to consider long-term management options for:

- waste treatment, including sending it to another location for treatment, either in Scotland or elsewhere including overseas, subject to any requirements by the relevant regulators in the UK and overseas for the return of the waste;*
- storage in near-surface facilities which are near to the site where waste is produced; or*
- disposal in near-surface facilities which are near to the site where the waste is produced.*

Figure 1: waste management options



1.1.6 For the purposes of the Policy and Strategy, disposal is defined as placing waste in a suitable specialised land-based facility without the intent to retrieve it at a later time. Although there is no intention to retrieve the waste, any proposed disposal facilities in Scotland will have to demonstrate 'retrievability'. Retrievability means that, if necessary, waste could be removed from the facility at a later time.

1.1.7 The 2011 Policy will be subject to regular review at intervals of no more than 10 years. The Strategy will be reviewed at the same time as the Policy. This recognises that some long-term management options may require extensive research or development, and that new scientific advances and technological developments are likely to occur over time. It is important to ensure that Scotland is able to consider such innovations in future, to assess whether they provide new and better methods of managing radioactive waste than are available at present. The process to develop the Implementation Strategy has in practice reviewed the 2011 Policy, updating information on the inventory, available technologies and changing site plans. For this reason, the next review of the Policy and Strategy will take place no more than 10 years from the publication of this Strategy.

1.1.8 The terms used in this Strategy document have the same definition and meaning as those used in the 2011 Policy. Key definitions are set out in **Annex A**, including a definition of higher activity waste. A fuller glossary of terms was provided as a supplementary document to the 2011 Policy³.

1.1.9 The HAW covered by the 2011 Policy and this Strategy is summarised in **Annex B**. The Policy does not apply to waste from MoD sites that are exempt from regulation under the Radioactive Substances Act 1993.

1.2 Roles and Responsibilities

1.2.1 The Scottish Government is responsible for the implementation of policy and legislation on devolved matters, including the protection of the environment, and radioactive waste management in Scotland. The Scottish Government makes proposals to the Scottish Parliament for changes to the law and regulation covering these policy responsibilities.

1.2.2 The Nuclear Decommissioning Authority (NDA) is a non-departmental public body established by the Energy Act 2004. The NDA is responsible for implementing

government policy on the long-term management of radioactive waste. The NDA is additionally responsible for the decommissioning and clean-up of existing publicly owned civil nuclear sites, including three in Scotland (Dounreay, Chapelcross and Hunterston A). The NDA operates in similar terms to a cross-border authority under the Scotland Act 1998 and is accountable to both the UK and Scottish Ministers for its activities and performance with regards to Scotland. The NDA is also responsible for developing a strategic research and development programme.

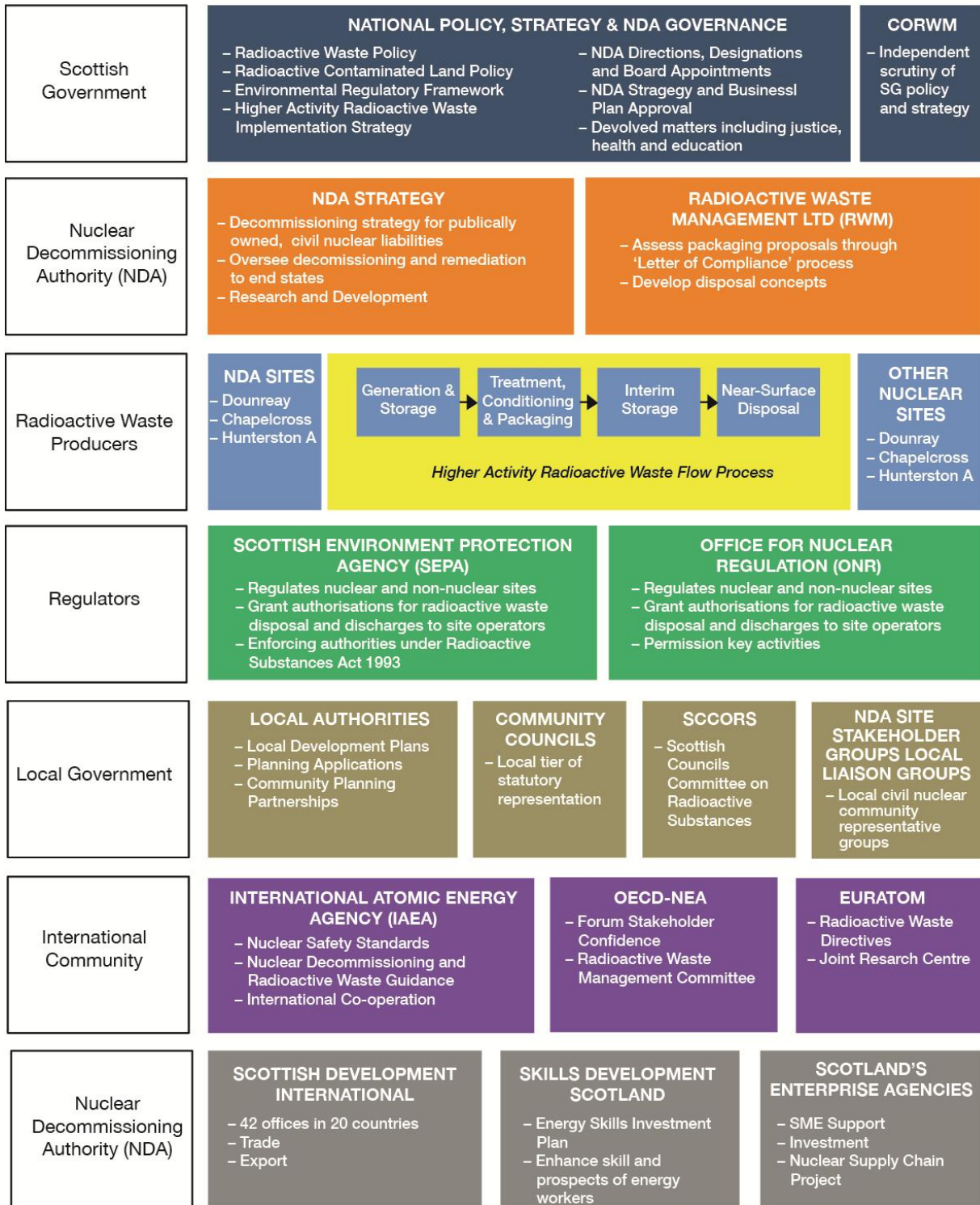
1.2.3 The Scottish Environment Protection Agency (SEPA) is Scotland's environmental regulator responsible for regulating the disposal of radioactive waste and discharges from nuclear and non-nuclear sites in Scotland. In addition, for non-nuclear sites, SEPA regulates the keeping and use of radioactive substances and the accumulation of radioactive waste.

1.2.4 The Office for Nuclear Regulation (ONR) is the body responsible for regulating the safety and security of the UK's civil nuclear industry. ONR issues nuclear site licences to site operators under the Nuclear Installations Act 1965. Additional responsibilities include the regulation of the management of radioactive waste under site licence conditions and regulating the safety of transport of radioactive materials.

1.2.5 The Committee on Radioactive Waste Management (CoRWM) provides independent scrutiny and advice to the Scottish Government on the long-term management of higher activity radioactive wastes.

Figure 2: Scotland’s civil nuclear and radioactive waste landscape

RADIOACTIVE WASTE DELIVERY BODY LANDSCAPE



1.2.6 Waste owners are responsible for safely storing higher activity wastes during decommissioning processes and for making provision, including financial provision, in their plans for long-term management of the waste they produce. It is for individual organisations to consider how they apply the 2011 Policy in their forward planning assumptions. Waste owners include:

- (i) the NDA and their Site Licence Companies (SLC);
- (ii) EDF Energy;
- (iii) Ministry of Defence; and
- (iv) Non-nuclear sector organisations.

1.2.7 EDF Energy makes financial provision for waste management and decommissioning of sites via the Nuclear Liabilities Fund. The NDA is directly funded by the UK Government as all existing public sector nuclear sites are public liabilities. Therefore the costs of decommissioning these sites will be met in full by the UK Government.

1.2.8 The Scottish Government will work with the NDA, EDF Energy and the Nuclear Liabilities Fund to ensure that consideration of costs for the implementation of this Strategy, including near-surface disposal options, form a part of the assessment of the adequacy of the Fund.

1.2.9 Waste producers are nuclear and non-nuclear organisations who produce higher activity radioactive wastes. These companies may or may not be the same as waste owners. Nuclear waste producers in the nuclear sector are typically nuclear site operators.

1.2.10 **Annex B** contains further information about the NDA owned sites and the other main waste owners in Scotland.

1.3 Regulatory Framework

1.3.1 There is already a comprehensive and well-established legislative, regulatory and planning framework in place in Scotland for the management of higher activity radioactive waste and the development of waste management facilities. Robust, effective and independent regulation is vital to ensure public confidence in the management of higher activity radioactive waste to meet high safety, security and environmental standards based on comprehensive risk assessment and management. The legislative framework is described in a supplementary document to the 2011 Policy⁴.

1.3.2 The Regulatory Reform (Scotland) Act 2014 enables provision to be made in relation to primary authorities and for the purposes of promoting regulatory consistency. In addition, it enables provision to be made, and to make provision, as respects regulatory activities, and offences, relating to the environment. The Scottish Environment Protection Agency (SEPA) was given a new statutory purpose under this Act and new enforcement measures to ensure continued protection for the environment and human health.

1.3.3 The Better Environmental Regulation Programme is currently underway between the Scottish Government and SEPA. This aims to provide a simpler legislative framework so that SEPA can be more transparent, accountable, proportionate, consistent and targeted in carrying out its regulatory functions. This

will enable SEPA to better identify, and focus most effort on, the most important environmental risks and harms. This will ensure more effective and efficient protection of the environment, reduce the regulatory burden on business and allow regulators to take opportunities to improve the environment.

1.3.4 The Scottish Government is committed to strong and effective control and regulation of the management of higher activity radioactive waste in Scotland. Regulators, waste producers, waste owners and others involved in the management of higher activity radioactive waste in Scotland are expected to take account of Scottish Government Policy.

1.4 Strategic Environmental Assessment

1.4.1 The 2011 Policy stated that the Strategy developed to implement the Policy would be subject to a Strategic Environmental Assessment (SEA). At the time the Policy was published, it was predicted that the Strategy would develop further spatial components than outlined in the Policy, and that there may be the potential for the Strategy to have environmental effects. As the Strategy has evolved, however, it has become clear that while it sets out the strategic path for delivering the Policy and the nature and timing of key decisions, it does not further develop the spatial aspects of HAW management. As a consequence, this Strategy is not considered likely to generate significant environmental effects, beyond those already considered and assessed by the SEA of the 2011 Policy.

1.4.2 A Screening Report was issued to this effect⁵, and the Consultation Authorities agreed that significant environmental effects were unlikely. However, the requirement for SEA of the Strategy continued to be reviewed as the Strategy developed, in case this situation changed.

1.4.3 No changes to the Strategy have been made that could result in such effects. As such, a Screening Determination for the Strategy was issued in May 2014 confirming that the Strategy is not likely to have significant environmental effects when considered in relation to the criteria set out in Schedule 2 of the Environmental Assessment (Scotland) Act 2005. As a consequence, it was determined that a SEA is not required.

1.4.4 As in the development of the Strategy, the requirement for SEA will be considered in further stages of work to implement the Policy, including future iterations of the Strategy.

2 The Implementation Strategy

2.1.1 The 2011 Policy proposed that a Strategy be developed to help implement the Policy. As a result, the Scottish Government developed this Strategy, with guidance from a Project Board comprising the NDA, waste producers and owners, local government, SEPA and ONR. CoRWM, representatives of the local Site Stakeholder Groups, and the Nuclear Free Local Authorities (NFLA) were observers on the Board and actively participated in discussions.

2.2 Aim/Scope

2.2.1 The overarching aim of this Strategy is to expand on the framework provided by the 2011 Policy, to allow waste management decisions to be taken to ensure that the Policy is implemented in a safe, environmentally acceptable and cost-effective manner. The Strategy sets out key future milestones for the implementation of the Policy.

2.2.2 The Strategy does not address site-specific issues. It is recognised that appropriate waste management solutions at one site may be different from those at another site. The Strategy is not prescriptive about which management solutions should be used in specific circumstances.

2.2.3 The Strategy addresses all the issues that are considered to be necessary at this time to provide clarity for the implementation of the Policy. During the formation of the Strategy, some of the issues which the 2011 Policy considered as relevant for inclusion in the Strategy were reviewed. It was decided that some issues were no longer relevant and others will be addressed in the future.

2.2.4 The Strategy recognises that there are a number of additional considerations that could impact on how management options are taken forward in the future, in particular:

- The emergence of new technologies that might allow for more rapid and effective long-term management of waste;
- The demonstration of the safety and effectiveness of management options currently being explored; and
- Evaluation of ethical and societal attitudes to waste management options, especially with respect to the issue of intergenerational equity.

2.2.5 The Strategy describes the three phases of work and key higher activity waste milestones from 2016 to post 2070. Setting out clear timescales towards disposal solutions is important to develop suitable waste management options to minimise the burden for future generations.

2.2.6 The Strategy recognises that a significant proportion of HAW in Scotland will not arise for many years under current planning assumptions. This is mainly due to current site plans for Magnox reactors and AGRs (Advanced Gas-Cooled Reactors) to be left in safe and quiescent state for several decades until reactor dismantling commences. It also recognises that some HAW in Scotland will require the development of new long-term waste management options.

2.3 Assumptions

2.3.1 The Strategy sets out the key stages for the effective implementation of the 2011 Policy. It is important to note, however, that given the very long timescales involved over which this Strategy is likely to cover, there is a degree of uncertainty about the exact timing of future events and decisions. It is important that decisions are taken in the light of the best information available at the time they need to be made. Making decisions ahead of time misses the opportunity to take account of new information, and risks the decision being reopened before it takes effect.

2.3.2 **Annex B** sets out an overview of the HAW that has arisen or is expected to arise in Scotland and the current management arrangements for the waste.

2.3.3 The assumptions made when considering waste management options allowed by the 2011 Policy include, but are not limited to, the following;

- Radioactive waste management cases are required to support waste management plans and particularly packaging proposals. An important input to this document is the Letter of Compliance process. The Scottish Government recognises the important role of the Letter of Compliance (LoC) process in assuring the quality and safety of packaged HAW (see Paras 2.6.24-2.6.26 for further details). The LoC process is scrutinised by ONR and SEPA to ensure that it is fit for purpose with respect to the potential for long-term storage of waste packages in Scotland.
- In the event of a continuing need for storage of waste beyond the lifetime of the current storage plans, stores could be replaced periodically as required. Packages will be monitored and inspected periodically during storage, in line with regulatory requirements and guidance.
- The current regulatory arrangements to ensure that packaged waste is adequately monitored and inspected during any periods of storage are fit for purpose.
- Developers will need to demonstrate how disposal facilities will be monitored and how waste packages, or waste could be retrieved if necessary.

2.4 Key Principles

2.4.1 The Strategy is based around the overarching principles set out in the 2011 Policy (Section 2.01):

- The level of protection provided to people and the environment against radiological and any other hazards of the treatment or storage or disposal of the waste at the time decisions are taken, now and in the future will be consistent with the standards in place at the time;
- Developers and operators of facilities will engage with stakeholders, including local communities where any facility may be located, throughout the process of managing the waste;
- The waste hierarchy should always be considered in managing wastes to ensure that wastes are not unnecessarily created and that all other options are adequately considered before a decision to dispose is taken;

- The proximity principle should be taken into account for all long-term management options; and
- Management of HAW must be undertaken in compliance with all legal and regulatory requirements;

2.4.2 This Strategy also recognises that:

- planning for HAW management throughout its lifecycle, including appropriate characterisation and segregation of wastes is critical to flexible management of HAW;
- integration of strategies for all wastes (HAW, low level radioactive waste and non-radioactive waste) is important nationally and for individual waste producers;
- the development of adequate skills and knowledge resources is important for the effective management of HAW; and
- there is a need to respond and adapt to future technologies by not foreclosing long-term management options.

2.5 Key Phases and Actions

2.5.1 Three phases of work have been developed, each with specific milestones to direct implementation of the Policy. Timescales have been chosen to reflect current plans for the decommissioning of the nuclear licensed sites in Scotland. Figure 3 illustrates the current nuclear sites decommissioning targets against the milestones for each phase of work. Dates are accurate at the publication date of this document.

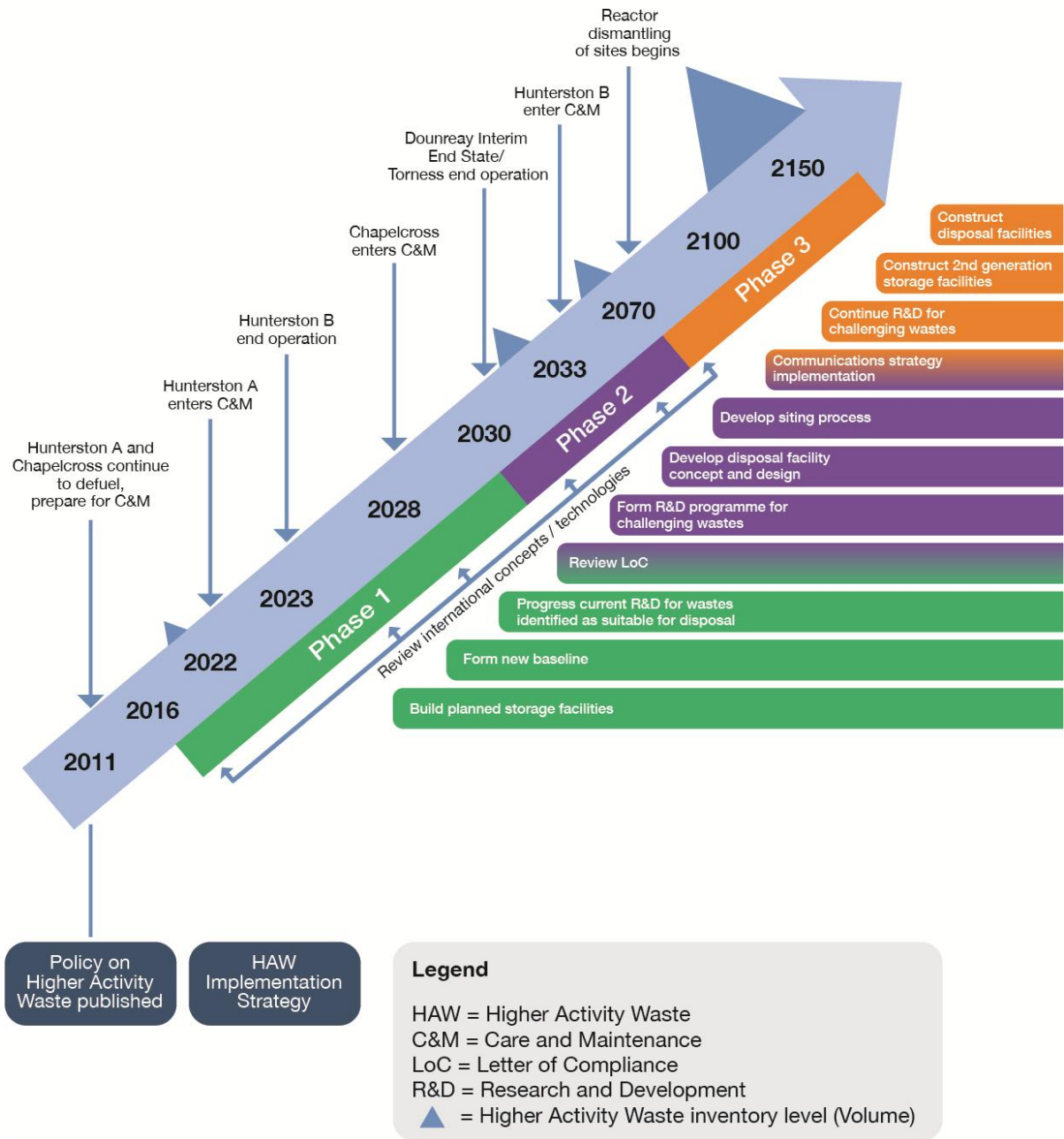
2.5.2 The dates for each activity are approximate and may be subject to change to reflect new developments and Policy reviews. There may be opportunities to reduce storage periods by establishing management routes earlier which could allow decommissioning timescales to be shortened saving time and costs. Early opportunities to develop near surface disposal technologies will be pursued if possible.

2.5.3 Due consideration must be given to the timescales involved in implementing a final disposal route for wastes. The milestones in each phase have been chosen to prioritise decision making for siting and planning of facilities in Phase 2 to enable construction of facilities at the latest in Phase 3. It is important that the waste burden should not be passed unnecessarily to future generations and that we deal safely and responsibly with our nuclear waste legacy.

2.5.4 In Figure 3 the shorthand term ‘challenging waste’ refers to HAW which is currently understood, under current technologies, to be unsuitable for near-surface disposal, for instance due to the presence of long lived alpha-emitting radionuclides.

Figure 3: Implementation Strategy Timeline

Illustrative HAW Strategy Timeline



2.6 Phase 1: 2016-2030

Site status

Under current plans:

- **Hunterston A/Chapelcross:** Will continue with preparations for entering the Care and Maintenance phase of decommissioning in 2022 and 2028 respectively. Some HAW will be placed in storage facilities during this phase.
- **Dounreay:** Subject to funding, Dounreay is expected to reach its proposed Interim End State by 2030-2033, by which point all the HAW is expected to be packaged into two storage facilities on the site.
- **Hunterston B:** Will continue operating until 2023 and will subsequently begin work to prepare for the Care and Maintenance phase. **Torness** will continue operating until 2030 and will subsequently begin work to prepare for the Care and Maintenance phase

2.6.1 The development of storage methodologies and facilities across Scottish sites for waste arising in the period up until 2030 is currently at an advanced stage. In addition, all sites have worked effectively to develop good relationships with their stakeholders, represented by the respective Site Stakeholder Groups. These groups have developed a good level of understanding of the process of decommissioning on their site, and a mature appreciation of the risks and safety procedures involved in handling and storing nuclear wastes.

2.6.2 During Phase 1, current plans for the construction of first generation interim storage facilities will progress. Storage facilities will be constructed at Dounreay, and at each of the Magnox decommissioning sites, to provide storage capabilities for HAW arising during preparation for Care and Maintenance. At the date of publication, the first of this suite of storage facilities was already operating at Hunterston A, accepting Intermediate Level Waste (ILW). An ILW store is also operating at Dounreay.

Establishing a new baseline in Phase 1

2.6.3 A baseline provides a basis for the assessment of future innovative proposals for waste management and can be used to monitor progress.

2.6.4 Prior to the publication of the 2011 Policy, the baseline for Higher Activity Waste management in the UK was founded on site specific retrieval, treatment, conditioning and packaging, almost exclusively through grouting. The assumption was that this would be followed by a period of interim storage until a geological disposal facility became available for final disposal of the waste. The existing baseline is therefore incompatible with the 2011 Policy.

2.6.5 A baseline which is compatible with the 2011 Policy will be established in Phase 1.

2.6.6 For the Magnox and EDF Energy sites, the current plans are that there will be deferred reactor dismantling. During Phase 1, the Scottish Government expects

all waste owners to review these current baseline assumptions, taking account of all relevant factors including the availability of suitable disposal routes and maintenance of skills and expertise.

2.6.7 The NDA is establishing a new baseline for HAW for its sites in Scotland, which assumes that it will be stored on the site at which it arises for a period of up to 300 years, with stores being maintained, refurbished or replaced as appropriate throughout the storage period. This new baseline will use an initial set of assumptions for the way in which waste covered by the 2011 Policy will be managed in the future and provide a comparison for alternative management options as they develop.

Understanding the inventory

2.6.8 The 2011 Policy recognised that further work was needed to define the waste to be managed in the long-term, both in terms of radionuclides, material type (for example, graphite metal etc.) and volume. This is important data to allow exploration of alternative treatment methods to reduce the volumes of the waste.

2.6.9 NDA prepares the UK Inventory of Radioactive Waste and Materials⁶ on behalf of the UK Government. This is reviewed periodically with data being supplied by the individual waste producers. The continued development and improvement of the inventory will need to take into account the impact of a different Policy position in Scotland to ensure that data are provided to aid decision making across the whole of the UK.

2.6.10 As part of the work to develop the Strategy, the Scottish Government asked the NDA and the Scottish sites to consider the waste that will arise at their sites and begin to identify which wastes may or may not be suitable for final disposition in near-surface disposal facilities. This programme of work will continue during Phase 1.

2.6.11 Initial results from Magnox and EDF Energy indicate that there may be a range of waste management and near-surface disposal opportunities that could be technically suitable for a good proportion of the HAW streams arising at the Chapelcross, Hunterston A, Hunterston B and Torness sites. A significant future work programme will be required before a fully underpinned near-surface disposal solution is deemed viable.

2.6.12 Given the different type of reactors that existed at Dounreay initial studies suggest that 60% of the higher activity waste arising at the site would not be suitable for near-surface disposal due to relatively high concentrations of long lived alpha-emitting radionuclides. This type of ILW waste will need to be stored until alternative waste management solutions are developed. A research programme to investigate alternative management options for these types of wastes will begin by Phase 2.

2.6.13 During this phase, an important aspect of the work will be to provide information to support decision making regarding the need for near-surface disposal facilities suitable for the proportion of the HAW that can be managed via this route.

Research and development

2.6.14 Research and development (R&D) will be required to help develop solutions for the radioactive waste management challenges in Scotland. It is anticipated that, through R&D over the coming phases, further technical solutions will be discovered

which could lead to significant opportunities for cost reduction and schedule acceleration. This will enable an informed decision to be made on how to best manage the HAW in Scotland.

2.6.15 R&D is primarily undertaken by the Site Licence Companies and their supply chain partners in line with what is required to deliver their decommissioning plans and management of HAW in line with the 2011 Policy. In addition, the NDA directly maintains a strategic UK wide R&D programme which includes a Direct Research Portfolio that supports strategy development, maintenance of skills and innovation.

2.6.16 Many of Scotland's key R&D topics will support the 2011 Policy and Strategy will match those set out in the NDA's 5 year R&D Plan⁷. Topics which align with Scotland's Policy include:

- Application of the Waste Hierarchy
- Alternative waste treatment, with a particular focus on volume reduction
- Underpinning of interim storage
- Alternative disposal approaches (e.g. decay storage, near-surface)
- Improved decommissioning
- Improved characterisation of the waste
- In situ disposal of structures and waste

2.6.17 The Scottish Government will work with the NDA to develop R&D aims for Scotland's Higher Activity Waste Policy and Strategy and ensure no duplication of work. This will include reviewing research under development, prioritising research areas and proposing new projects for areas which are not yet covered by Site Licence Companies, their supply chain or NDA R&D programmes. The Chief Scientific Adviser for Scotland will help the Scottish Government and support NDA R&D projects that address the needs of Scotland's HAW Policy and explore opportunities for collaboration and consolidated learning.

2.6.18 The Scottish Government expects waste owners and producers, as appropriate, to carry out cost analysis for a variety of potential strategic and technical options in order to better inform their decisions and ensure cost effective R&D.

2.6.19 The Scottish Government and the NDA will monitor emerging technologies and communication methodologies from waste management programmes around the world throughout Phases 1, 2 and 3.

2.6.20 The Scottish Government will consider funding and supporting research proposals which support Scottish Government objectives and compliments (and not duplicate) NDA led research on radioactive waste management and environmental remediation via the Contract Research Fund. The Scottish Government will focus this research on environmental remediation, building stakeholder and public confidence, enhancing Scotland's civil nuclear decommissioning capabilities, radioactive waste management options and societal concerns on radioactive waste management.

2.6.21 The Scottish Government, with advice from the Chief Scientific Adviser for Scotland and CoRWM, will work to develop a long-term plan to:

- raise awareness of the radioactive waste challenge in Scotland;

- support opportunities to enhance and promote Scotland’s radioactive waste management capabilities internationally; and
- ensure that Scotland is effectively represented within the nuclear decommissioning and radioactive waste management R&D landscape

2.6.22 A list of potential research projects to support this Strategy can be found in **Annex C**. This list will be reviewed and updated periodically as events develop and the Strategy matures.

2.6.23 In Phase 1 R&D will focus on helping to underpin suitable options for the waste management of HAW for which, under current understanding of technologies and regulation, the prospect of near-surface disposal solutions is closest. The Scottish Government will work with the NDA to establish a timeline for bringing forward credible strategic options for the management of the waste beyond Phase 1.

Letter of Compliance (LoC) process

2.6.24 Before site operators commit to retrieval and packaging of waste, regulators require them to produce a Radioactive Waste Management Case (RWMC). This is a summary document which provides a transparent demonstration of how the waste will be managed throughout its lifecycle, its compatibility with existing and future planned management and disposal options and how the key elements of long-term safety and environmental performance will be delivered.

2.6.25 An important input into the RWMC is the Letter of Compliance (LoC). LoC’s are obtained through applying the Disposability Assessment Process in which the waste packaging plans are assessed against the RWM generic waste packaging specifications, the safety case and compatibility with disposing in a deep geological disposal facility. Although this disposal route will not be used for Scotland’s waste this process has remained the basis for assessments in Scotland, as there is a consensus in the industry and from regulators that this will also measure the suitability of waste packages for extended periods of storage⁸.

2.6.26 The overall objective of the LoC assessment process is to give confidence to all stakeholders that the future management of waste packages has been taken into account as an integral part of their development and manufacture. The LoC process is kept under review which will allow consideration of whether there needs to be further changes to the process to recognise that some wastes are destined for near-surface disposal.



Intermediate Level Waste Storage Facility at Hunterston A

Summary of Phase 1

During Phase 1:

- First generation storage facilities will be built and operated, to store waste at Dounreay and at each of the Magnox sites.
- The Scottish Government will continue to support the on-going NDA initiatives to reduce HAW volumes from decommissioning sites.
- R&D will be undertaken by SLCs/Supply Chain/NDA to help the further development of credible options for the management of radioactive waste.
- The NDA and the Scottish sites will continue to evaluate the waste that will arise at their sites and identify which wastes may or may not be suitable for disposal using emerging near-surface disposal technologies.
- RWM will review its current LoC process in support of the development of near surface disposal concepts for wastes arising in Scotland.
- A new baseline will be implemented.



Intermediate Level Waste Storage Facility at Hunterston A

2.7 Phase 2: 2030-2070

Site status

Under current plans:

- **Chapelcross/Hunterston A:** *Will be in Care and Maintenance with some HAW in storage. Only HAW associated with the dismantling of the reactors yet to be retrieved.*
- **Dounreay:** *All HAW will be in storage.*
- **Torness/Hunterston B:** *Will enter Care and Maintenance early in phase 2.*

During this phase little HAW is expected to arise from the sites. The ILW stores built in Phase 1 will be under management by the responsible site managers.

2.7.1 During Phase 2, all HAW will either be in safe and secure storage in the first generation of storage facilities or still within the reactors. This arrangement will provide a suitable amount of time for the implementation of plans from Phase 1.

2.7.2 In Phase 2 there will be a requirement to plan for the construction of second generation storage facilities to replace stores built prior to or during Phase 1. This will ensure continued safe management of waste generated during site Care and Maintenance phases in the period before a final disposal route is selected and implemented. The 2011 Policy requires that decisions to construct new storage facilities should be based on compliance with a period of stability and capability of at least 100 years.

2.7.3 The Scottish Government anticipate that towards the end of Phase 1, there will be sufficient information to inform decision making regarding the need for one or more near-surface disposal facilities.

2.7.4 In Phase 2 the design of a disposal facility will be developed and a detailed programme to select a site or sites, including comprehensive stakeholder engagement, will be carried out. This will enable completion of the planning process and construction of a disposal facility early in Phase 3. There are significant operational and financial benefits in having a disposal facility available to accept waste from reactor dismantlement at the two Magnox sites (and ultimately, the two EDF Energy sites), without the need for a storage phase. This would remove the requirement to build storage facilities for this major element of the waste inventory. A major consideration in the planning of disposal facilities will be to coordinate with developing plans for the Care and Maintenance phases in order to allow for direct disposal of these wastes, and the timing of the construction of the disposal facility will be kept under review.

Research and development in Phase 2

2.7.5 There are two R&D work streams to be undertaken in Phase 2:

- i. Where appropriate, R&D to support the long-term management of HAW, for which under current technology and regulation the prospect of near-surface disposal is closest. This research will continue from Phase 1.
- ii. R&D into credible options for waste management of HAW currently understood to be unsuitable for near-surface disposal. An example of these types of wastes is raffinate waste at Dounreay.

2.7.6 The second work stream (ii) will involve the Scottish Government working with the NDA to develop a R&D programme to look into credible options for the management of these wastes currently understood as unsuitable for near-surface disposal.

Siting of facilities

2.7.7 Under current plans the first generation of stores built for storing HAW at Dounreay and Magnox sites during their Care and Maintenance phase will be on the site where the waste arises.

2.7.8 The 2011 Policy states that there will not be a prescriptive definition of 'near to the site' for disposal or storage facilities but it does presume that waste will be dealt with as close as is possible to the site where it was produced, thus minimising the need to transport the waste over long distances. The 2011 Policy recognises that where the waste is produced and where it can be stored or disposed of may be in different locations, particularly for non-nuclear industry waste producers. Decisions will be taken on a case by case basis and will be subject to robust regulatory requirements and the principles underlying the Policy.

2.7.9 The Scottish Government and the NDA agree that waste consolidation as a radioactive waste management option has the potential to deliver business benefits. Any decision to consolidate waste will have to be consistent with the national policy and the proximity principles.

2.7.10 Waste producers and owners will need to take account of the Policy aims and principles in making their future planning assumptions. The Scottish

Government expects these groups to work closely with planning authorities and regulators in the design and siting of storage and disposal facilities for radioactive waste.

2.7.11 Engagement with local communities and stakeholders throughout the process of developing a near-surface disposal facility will be a critical part of this process. The Scottish Government will work with COSLA, the Forum on Stakeholder Confidence and other independent experts to develop and implement community and stakeholder engagement plans in Phase 2. These plans will include an open, fair and public participation type methodology, to help ensure sites selected are both technically and politically acceptable. Section 3.2 gives further information on stakeholder and community engagement.

2.7.12 The Scottish Government will develop a detailed siting strategy during Phase 2 that takes due account of the wider stakeholder community and the national interest. This will be developed in line with international best practice and guidance. The siting strategy will address various topics including:

- a methodology for the decision on whether to build one or more disposal or storage facilities.
- the reuse of brownfield or derelict or contaminated land
- consideration of transport

Design and planning of a disposal site

2.7.13 Under the current regulatory regime, waste can only be disposed of at a facility which is acceptable to the regulators. Such near-surface facilities designed to accept higher activity waste have not yet been built in Scotland.

2.7.14 Disposal facilities need to be capable of existing for much longer time periods than storage facilities. The construction of any new near-surface disposal facility or radioactive waste store will require a developer to seek planning permission and have the requisite safety cases in place. Safety cases are required by ONR under a nuclear site's license conditions.

2.7.15 Proposed disposal facilities will need to comply with the comprehensive guidance document "Near-surface Disposal Facilities on Land for Solid Radioactive Waste: Guidance on Requirements for Authorisation (GRA) produced by the UK Environmental Regulators"⁹. The GRA uses a risk based approach to regulation and sets out a number of requirements that a developer must meet to obtain an authorisation for a disposal facility.

2.7.16 For a developer to operate a radioactive waste disposal facility, an environmental safety case will be required in order to obtain an authorisation from SEPA. Information on the regulatory and safety case process for higher activity waste can be obtained from ONR and SEPA. The case must demonstrate how the disposal of a specific radioactive waste inventory (the radionuclides in the waste, the total activity, activity concentrations, and physical and chemical forms) for a proposed facility design and location can meet all of the requirements in the GRA. The environmental safety case must demonstrate, amongst other things, that the facility can meet regulatory requirements regarding radiological risks to people and the environment.

2.7.17 The Scottish Government expects developers to work closely with planning authorities and regulators in both the design and siting of disposal facilities for radioactive waste.

2.7.18 In Phase 2 options for the design of a near-surface disposal facility will be ready. The design will need to identify clearly how monitoring will be undertaken and how waste packages will be retrieved, in line with requirements of the 2011 Policy. The developer will have to satisfy regulators as to their ability to meet health, safety, security and environmental requirements.

2.7.19 The Scottish Government will monitor international progress in planning and developing near-surface facilities to learn from the experience of these programmes.

Summary of Phase 2

During Phase 2:

- The Scottish Government will develop and implement a community and stakeholder engagement plan and siting strategy to ensure effective and robust public engagement on the matter of HAW management.
- The Scottish Government will work with the NDA, other waste owners, suitable waste management organisations and regulators to help develop near-surface disposal concepts for waste suitable for this management route.
- Plans for the design, siting and construction of second generation storage facilities will be developed. Second generation stores are required for the safe and secure storage of HAW prior to future disposal facilities being commissioned.
- Plans for the design, siting and construction of near-surface disposal facilities will be developed. These facilities will be suitable for the disposal of a significant portion of HAW in Scotland.
- The NDA and the Scottish Government will devise a strategy for management options for HAW currently not understood as suitable for near-surface disposal.



Chapelcross

2.8 Phase 3: 2070 Onwards

Site status

Under current plans:

- ***Chapelcross/Hunterston A/Torness/Hunterston B: Will enter final decommissioning phases. Over 60% of the HAW in Scotland is expected to arise in this period. Actions will include safely dismantling the reactor vessels contained within the remaining reactor safestores, and ensuring safe and secure long term storage of disposal of the resulting waste. The estimated completion date for decommissioning all nuclear sites in Scotland is 2120.***

2.8.1 In Phase 3 second generation storage facilities planned during Phase 2 will be constructed for the storage of HAW prior to final disposal routes being available.

2.8.2 Following the research and development programmes and the siting and design processes in Phases 1 and 2, it is anticipated that in Phase 3 construction of near-surface disposal facilities will begin. In Phase 3, the availability of disposal facilities will allow the disposal of reactor dismantlement waste without the need for a storage phase. The timely development of disposal facilities will also reduce the need for second generation storage facilities, that should only be needed for those wastes for which a near-surface disposal technology has not yet been identified.

2.8.3 Wastes that are understood to be unsuitable for near-surface disposal, under available technologies, will still require on-going storage prior to a suitable waste disposal solution being selected in Phase 3. While this is an acceptable part of waste management, long-term storage does not mean indefinite storage but it may mean waste stored for many decades. It is anticipated that facilities for the management of these wastes will be constructed in Phase 3 upon review of the R&D programmes undertaken in the previous phases. It remains the objective of the Policy to ultimately identify disposal routes for all the wastes.

Research and development in Phase 3

2.8.4 In Phase 3 the R&D programmes for the management of HAW currently understood to be unsuitable for near-surface disposal may continue on from Phase 2. It can be expected that the disposal technologies developed in Phase 2 for the wastes with greater potential for near-surface disposal under current understanding, and further experience in disposal methods around the world, will assist in the development of disposal options for the more challenging classes of waste.

2.8.5 A final disposal route for these wastes will be selected during Phase 3 after careful analysis of R&D programme results and other factors including safety and environmental impacts.

Summary of Phase 3

During Phase 3:

- If applicable, R&D is undertaken in support of programmes to find waste management options for HAW, currently not understood as suitable for near-surface disposal, will continue.
- Second generation storage facilities will be constructed.
- Near-surface disposal facilities will be constructed.
- Final disposal routes for all HAW will be selected and implemented.



Artists Impression of the End State of the Dounreay Site

3 Strategy Elements

3.1.1 The ethos of the Scottish Government HAW Policy is that radioactive waste should not be considered “out of sight, out of mind” and that there needs to be a continued oversight of the waste whether it is in storage or in a disposal facility.

3.1.2 Underpinning this ethos will be a need to ensure that storage and disposal concepts are both publically and technically acceptable. This section sets out the approach the Scottish Government will begin to take to help build stakeholder and public confidence and the regulatory requirements for future facilities.

3.1 Regulation

3.1.1 The concepts of monitoring and retrievability are a fundamental part of the 2011 Policy which states that “*Developers will need to demonstrate how the facilities will be monitored and how waste packages, or waste could be retrieved.*” As storage and disposal concepts are progressed in Phase 2 monitoring and retrievability arrangements will be developed and reviewed.

Monitoring - Storage

3.1.2 The fundamental regulatory requirement is that there should be safe and secure interim storage arrangements, for the anticipated storage period, that ensure the protection of people and the environment. Such arrangements may assume a single store to cover the entire period, or may provide for replacement or refurbishment of stores at appropriate intervals. The adequacy of the storage arrangements needs to be justified in the safety case.

3.1.3 Details of ONR’s monitoring/inspection requirements for radioactive waste and interim storage facilities are set out in a number of documents. The Scottish Government is of the view that monitoring of storage facilities is sufficiently well regulated.

Monitoring - Disposal

3.1.4 The presumption in the Policy is that, whilst no specific period is prescribed, current practice in the management of radioactive waste facilities reflects that up to 300 years is an acceptable period for institutional control and monitoring in a disposal facility.

3.1.5 The Policy sets out that a baseline would be required for monitoring to allow for future assessments to clearly identify the impact of a future disposal facility and its performance. Monitoring of non-radiological matter may also be required.

3.1.6 The Policy also sets out that monitoring should set thresholds for specific contaminants, which trigger action if they are exceeded. As required by the GRA in the interests of avoiding placing an unreasonable emphasis on current or long-term future action, the safety of any future facility should not be reliant on post-authorisation period monitoring.

3.1.7 The Scottish Government expects monitoring to be delivered in an open and participative manner, involving stakeholders and communities. Monitoring processes will have to be developed as the design of a near surface facility progresses.

Retrievability - Storage

3.1.8 When waste is managed in a store it is always on the basis that it will have to be retrieved. Current storage facilities therefore have retrievability and must demonstrate the continued ability to retrieve waste during the storage period to the satisfaction of the regulator, ONR.

Retrievability – Disposal

3.1.9 When waste is managed in a disposal facility it is on the basis that there is no intention to retrieve it. However, the concept of retrievability is an important issue for stakeholders and international experience demonstrates that it is now being considered in designing disposal facilities around the world.

3.1.10 The 2011 Policy does not specify how retrievability will be demonstrated, but states that it will be for developers and operators to include retrievability in the design and management plan for any storage or disposal facility to the satisfaction of the regulators.

3.1.11 As the design of a near-surface disposal facility is progressed further work will be required during the planning phase to ensure that retrievability is appropriately addressed.

Packaging of HAW

3.1.12 All radioactive waste will need to be in a form suitable for its long-term management. Although waste packaging is the responsibility of the individual waste producers in Scotland it is subject to a robust regulatory assessment process.

3.1.13 Waste producers and owners should continue to promote the importance of waste characterisation, improved waste information and waste segregation to facilitate planning. Characterisation at all stages of the waste management cycle is important. It can yield most benefit before materials become waste, which supports good decision making so as not to foreclose options.

3.1.14 Scottish Government expects RWM to continue to work with waste producers to help ensure packages remain in a suitable form for long-term management and as appropriate, update guidance to support the development of near-surface disposal concepts.

Information and knowledge management

3.1.15 The 2011 Policy recognises that there is a clear need for information and knowledge to be maintained within Scotland in the long-term to manage the waste. The preservation of records, knowledge and memory is an integral part of radioactive waste management.

3.1.16 There is a need to consider how information and knowledge should be maintained so that it is accessible now and to future generations. Effective knowledge management allows individuals to capture, prioritise and further disseminate current and legacy knowledge, experience and expertise.

3.1.17 To ensure effective knowledge and information management across the NDA estate, the NDA published an Information Governance Strategy in 2013¹⁰. In 2014 the NDA and all NDA SLCs and subsidiaries assessed the risks and opportunities associated with the information created, managed and processed within their respective organisations and relevant supply chains in relation to the

strategy. The NDA have now incorporated the findings from these and other reviews into an overarching NDA national programme.

3.1.18 For longer term information management the NDA is currently proceeding with the next phase of the Nuclear Archive project which will see a new purpose built facility constructed at Wick to provide long-term management and storage of records and other archive material from civil nuclear sites in the UK. 'Nucleus – the Nuclear and Caithness Archive' is intended to be a centre of excellence in terms of information governance and addresses a number of mandated obligations required of the NDA.

3.2 Stakeholder Engagement

3.2.1 One of the fundamental principles of the 2011 Policy is that waste producers and owners, developers and operators of facilities must engage with stakeholders, and in particular local communities where any facilities may be located, at an early stage. The need for public confidence in the development and operation of new waste management facilities is an integral part of the Strategy.

3.2.2 UK and international research and experience has shown that building stakeholder confidence is key to making progress with implementing projects. Active engagement of stakeholders, especially in the early stages of a project, increases the chances of success and can create significant savings in the long-term.

3.2.3 The Scottish Government will participate in regular industry and government networks including NDA National Stakeholder Events. The Scottish Government will also continue to run Scottish Nuclear Sites meetings. Attendees include the NDA, CoRWM, SCCORS, Site Licence Companies, EDF Energy, NDA Site Stakeholder Groups and the regulators.

3.2.4 The NDA sponsors Site Stakeholder Groups (SSGs) at existing sites, whose overarching purpose is to be the prime interface between the community, the nuclear site operator, and the NDA. It is recognised that the role and remit of the SSGs may change over the years, particularly when sites go into a Care and Maintenance phase. However, it will still be important during this stage of the work to ensure that there is an effective on-going line of communication between the site and the community.

3.2.5 The Scottish Government will continue to work closely with stakeholders, the NDA and other waste producers and owners to ensure there are effective dialogue mechanisms and to strengthen stakeholder confidence and inform policy development.

3.2.6 The Scottish Government will work with the NDA to review stakeholder engagement processes and methodologies to help significantly increase public participation as the strategy evolves and during the next Policy review. The Scottish Government expects the NDA, in consultation with SCCORS and COSLA, to review the local government participation process in Scotland to ensure that views on the nuclear legacy in Scotland from member local authorities and community councils are properly considered.

Community Engagement

3.2.7 There are around 1200 community councils in Scotland, all of which are composed of elected volunteers from the community. Local authorities and other

bodies consult with community councils on issues affecting the community. These issues depend to a large extent on what is important to each community, however, local authorities are required to consult community councils on planning applications and many choose to involve them in the community planning process.

3.2.8 It is critical that communities in Scotland are informed at an early stage and engaged throughout the waste management decision making process. A near-surface facility is likely to bring significant economic benefits to a host community. These community benefits and the process for determining the appropriate level of community benefits will be developed during Phase 2.

3.2.9 It is one of the key principles set out in the GRA (guidance on requirements for authorisation of near-surface disposal facilities) that the developer should engage in dialogue with the planning authority, local community, other interested parties and the general public when developing an environmental safety case. Flexible approaches for engaging in discussions will be required that adapt to meet a community's needs and expectations.

3.2.10 The developer will need to consider, in discussion with the relevant local authorities, how to define "local community" for any specific proposal, taking into account the nature, size and location of the proposed facility.

3.2.11 Both the developer and the regulator should aim to work together to make sure that discussions with the planning authority and local community are open, inclusive and constructive. Technical, social or economic issues that might affect development of a disposal facility should be discussed openly with explanations of what the developer or regulator is doing to deal with these issues. Local communities and others should also be able to challenge the views of the developer and/or regulator on technical and other issues. Developers and operators should ensure transparency by providing opportunities for all stakeholders to participate in the decision making processes in accordance with national and international obligations.

3.2.12 To support the establishment of a disposal facility concept the Scottish Government will work with COSLA, the Forum on Stakeholder Confidence and other independent experts to review existing community and stakeholder engagement processes and develop and implement a community and stakeholder engagement plan in Phase 2.

3.3 Skills and Supply Chain

3.3.1 Decommissioning in Scotland will be spread over many years resulting in a life cycle in excess of 100 years. In this time period, under current plans, operation of remaining reactors will cease, sites will enter Care and Maintenance phases of quiescence and final site clearance will begin with reactor dismantlement and waste disposal. Skills, supply chain and staffing requirements required in each stage of decommissioning will be very different.

3.3.2 The future need for a decommissioning workforce gives rise to a number of challenges:

- Retention of skills due to retirement of workforce. Over the next 15 years, at least 34% of the UK's nuclear workforce will reach retirement age¹¹.
- Transfer of existing skill and competencies for a period of over 60 years whilst the sites are in Care and Maintenance under current planning assumption.

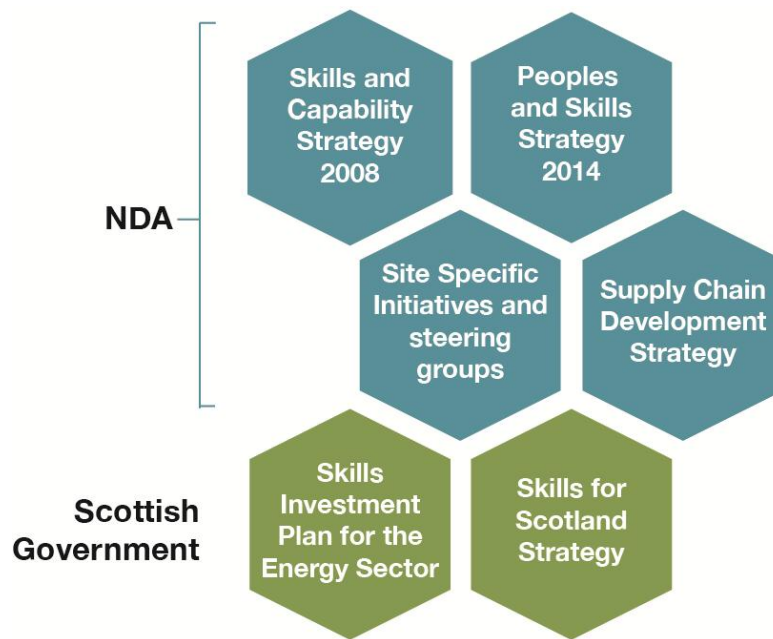
- Development of new skills and competencies in the area of decommissioning and radioactive waste management.

3.3.3 The Scottish Government's skills strategy "Skills for Scotland: Accelerating the Recovery and Increasing Sustainable Economic Growth"¹² makes clear the Scottish Government's commitment to training and skills and sets out a flexible, responsive, partnership approach to meeting Scotland's skills needs. The NDA's People Strategy directly supports this and has demonstrated positive commitment to achieving those expectations. Apprenticeships, bursaries, engineering skills and infrastructure joint investments all are good examples of working together to a common aim.

3.3.4 The Scottish Government is committed to working with industry to ensure that Scotland has the skilled workforce required for decommissioning. Launched in May 2013, through Scotland's skills body, 'Skills Development Scotland', with a budget of £6.5m (2012-13/2013-14), Energy Skills Scotland is working with industry to ensure that Scotland has the skilled workforce required to strengthen its overall ambition as a major centre for energy activity. In March 2015, Skills Development Scotland published a new Skills Investment Plan for the Energy Sector¹³. This refreshed plan was developed in partnership with the National Skills Academy for Nuclear and sets out key actions over 5 themes:

1. Inspiring and preparing young people to engage in the range of opportunities provided by the energy sectors
2. Developing pathways to enable more people to enter the sector
3. Ensuring content and mode of delivery of education and training provision meets the needs of industry
4. Upskilling to develop the existing workforce
5. Tackling the gender balance
6. Planning and coordination informed by good labour market intelligence

Figure 4: Strategies and actions plans for skills and knowledge retention



3.3.5 The NDA recognises people with appropriate skills and capabilities are essential for delivering its Mission successfully. It is not only an obligation within the Energy Act 2004 to ensure that there is a skilled workforce available to undertake the work of decommissioning, but a fundamental principle to the success of the organisation, the SLCs and a responsive supply chain. The NDA have launched a variety of initiatives to ensure skill retention:

- The Skills and Capability Strategy (2008)¹⁴ outlines the continued commitment to work with its contractors, supply chain and stakeholders to deliver its Mission through a focussed Action Plan.
- The People’s Strategy (2010)¹⁵ broadens its scope to encompass a more joined up approach to resource planning across the NDA estate with a view to explore the barriers to mobility of the workforce; identify and share good practice; and, produce a common approach within the NDA and SLCs of human resource related issues. The Strategy also focuses strongly on apprenticeships, and encouraging young people to consider a career in the industry. Almost 400 apprentices are now in place across the NDA and SLCs. The Strategy also covers the development and support for regional training centres, including the Engineering and Skills Centre at North Highland College.
- The People and Skills Strategy (2014)¹⁶ updates the above 2008 and 2010 strategies to place a greater focus on collaboration and focus on the following areas:
 - Retraining and redeployment
 - Efficiency and effectiveness improvements
 - Resource/Infrastructure
 - Resource Planning
 - People Relations

3.3.6 The NDA recognises the key role the supply chain plays in delivering its mission, with circa £135m spent in the supply chain at Dounreay in 2013/14¹⁷, and 24% of this spent directly with Small and Medium Enterprises (SMEs). In support of the supply chain/SLCs the NDA:

- Produced a Supply Chain Development Strategy (2010)¹⁸ that aims to ensure the optimum use of the Supply Chain available to the NDA estate to enable a safe, affordable, cost effective, innovative and dynamic market for clean-up and decommissioning. It is broken down into four key areas and each area has a set of detailed principles supporting it: open, transparent, timely and consistent communications at all levels (including those that assist Tier 2/4 and SMEs); optimised supply chain processes; optimised supply chain relationships; and exploring synergies with other nuclear clients and industries.
- Established a SME steering group for Scotland, to help with some of the current issues facing this critical group of suppliers. The NDA steering group provides a forum to discuss improving the attractiveness and health of the market that supports the NDA sites, with particular focus on SMEs in Scotland. The group consists of five to six SMEs with one or two representatives from the Scottish Government, NDA, SLCs and business support groups such as Scottish Enterprise and Highlands and Islands Enterprise. The chair of the group is an SME based in Scotland. The Scottish SME group also seeks to make links with the Oil and Gas industry decommissioning activities.
- Scottish Development International will work with the NDA to identify nuclear decommissioning and radioactive waste management investment, trade or international collaboration opportunities that benefit Scotland.

3.3.7 As appropriate, the Scottish Government will monitor and help co-ordinate work being undertaken by Skills Development Scotland, Scottish Enterprise, Highlands & Islands Enterprise and Scottish Development International to:

- review and enhance the Skills Investment Plan for the energy sector, to take account of skills shortages in the nuclear decommissioning sector in Scotland; and
- support initiatives such as the Nuclear Supply Chain¹⁹ Project and participate in the NDA SME Steering Group

3.3.8 During Phase 1 of the Strategy consideration will need to be given to the work and retention of skilled people in particular SEPA/ONR regulators. The Scottish Government will carefully plan for skill and knowledge retention over future decades including during periods of lower activity on sites.

4 Conclusion

4.1.1 The Implementation Strategy sets out three phases of work to ensure that Scotland's nuclear radioactive waste legacy is dealt with safely and responsibly to ensure protection of the environment and avoid unnecessarily passing the waste burden onto future generations.

4.1.2 A research and development programme will be undertaken to support the implementation strategy for the long term management of HAW and the Scottish Government will work with NDA, suitable waste management organisations and regulators to help develop near-surface disposal concepts

4.1.3 There are a proportion of wastes which, under current technology and regulation, are understood to be unsuitable for near-surface disposal. A programme will be devised by the Scottish Government and NDA to identify credible options for the long-term management of these wastes. HAW will continue to be safely stored on site prior to depositing in a future disposal facility or identification of a suitable waste management option.

4.1.4 The Scottish Government expects waste producers and owners in Scotland to continue to make use of the Letter of Compliance process in developing their radioactive waste management cases. The process will be reviewed during Phase 1 of the Strategy to ensure it is appropriate for use in Scotland in light of the 2011 Policy and future decisions on disposal facilities.

4.1.5 A siting strategy for near-surface disposal facilities will be established by the Scottish Government that takes due account of the wider stakeholder community and national interest. In addition a community and stakeholder engagement plan will be formed to ensure transparency throughout the planning and decision making processes and to maximise opportunities for community engagement.

4.1.6 The 2011 Policy and Strategy will be subject to regular review at intervals of no more than 10 years. This recognises that some long-term management options may require extensive research or development, and that new scientific advances and technological developments are likely to occur over time.

ANNEX A Definitions

A.1) This glossary has been included for the convenience of the reader to provide definitions and an explanation of some of the key terms used in this document. The definitions are the same as those used in the 2011 Policy.

Higher Activity Waste

A.2) For the purposes of the Policy and Strategy the term higher activity radioactive waste means:

- Radioactive waste defined in current UK categorisations as Intermediate Level Waste (see definition below)
- Waste for which the most appropriate long-term management option may be the same as that for higher activity radioactive waste. This includes:
 - Low Level Waste (see definition below)
 - certain wastes categorised as Low Level Waste, which by their nature are not currently suitable for disposal in existing Low Level Waste facilities as, for example, they may be longer-lived waste.

Intermediate Level Waste

A.3) Intermediate Level Waste is waste which has radioactivity levels exceeding the upper boundaries for Low Level Waste and which does not generate enough heat for this to need to be taken into account in the design of treatment or storage or disposal facilities¹⁹.

Low Level Waste

A.4) Low Level Waste is radioactive waste having a radioactive content not exceeding four gigabecquerels per tonne (GBq/te) of alpha or 12 GBq/te of beta/gamma activity²⁰.

Near-surface

A.5) For the purposes of the Policy and Strategy near-surface for storage and disposal facilities means:

- Facilities located at the surface of the ground or at depths down to several tens of metres below the surface.
- Near-surface facilities may use the geology (rock structure) to provide an environmental safety function, but some may rely solely on engineered barriers.
- Near-surface facilities may use existing structures if an acceptable safety case is made.

Disposal

A.6) For the purposes of the Policy and Strategy 'disposal' is placing the waste in a suitable specialised land-based facility without the intent to retrieve it at a later time. When waste is managed in a disposal facility it is on the basis that there is no intention to retrieve it. It is not that the waste cannot be retrieved, if that proved to be necessary, rather that there is no intention to retrieve it.

Storage

- A.7) For the purposes of the Policy and Strategy storage is placing the waste in a suitable facility with the intent to retrieve it at a later time. When waste is managed in a store it is always on the basis that it will have to be retrieved.

Near Site

- A.8) The 2011 Policy does not give a prescriptive definition of near to the site for storage or disposal facilities. However, the presumption will be that disposal facilities will be as near to the site where waste is produced as possible. Decisions will be made on a case by case basis and will be subject to robust regulatory requirements and the principles underlying the Policy.

Waste Owners

- A.9) Waste owners include:
- (i) the NDA
 - (ii) organisations which produce higher activity waste, including both the nuclear and non-nuclear sectors

Waste Producers

- A.10) The organisation that produced radioactive waste in the first instance. The waste producer may or may not equate to the current waste owner, as responsibility for the waste may have been passed to another organisation in the interim.

Developer (of a disposal facility)

- A.11) The organisation responsible for developing a disposal facility before waste disposal begins.

ANNEX B Current Management of Higher Activity Waste in Scotland

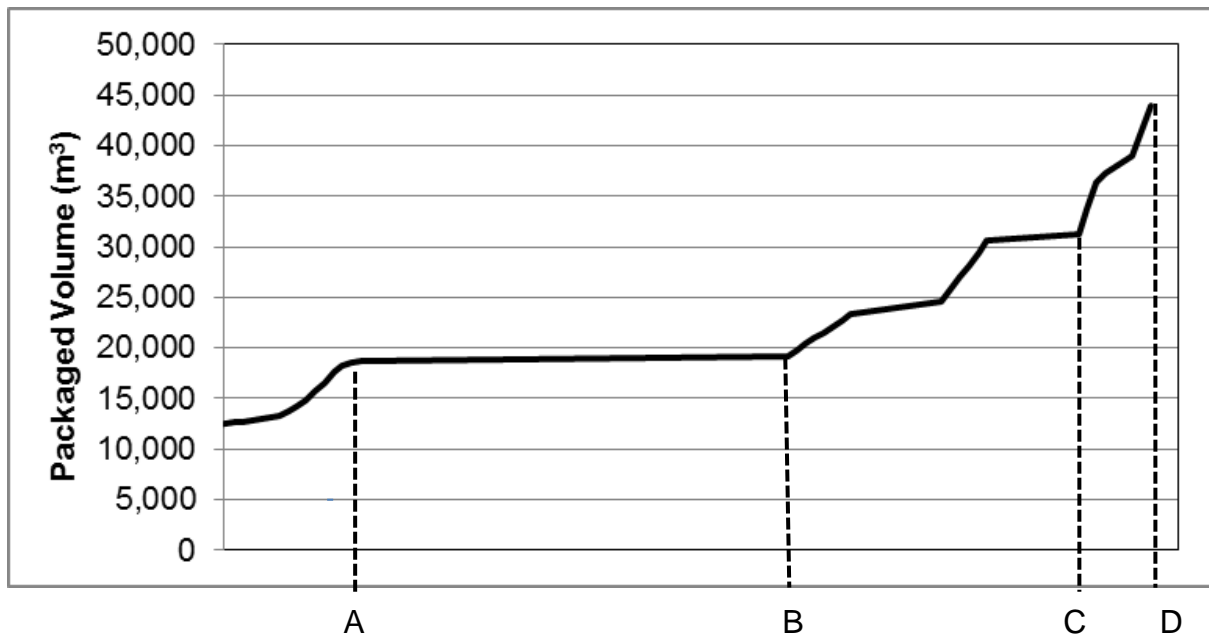
Summary of wastes covered by the Policy/Strategy

- A.12) Higher activity waste produced in Scotland arises from operations in the nuclear and non-nuclear industries as well as from defence establishments.
- A.13) The Policy and Strategy apply to the operational and decommissioning waste generated at nuclear sites and from non-nuclear industry activities throughout Scotland. The waste from these nuclear sites and from non-nuclear industry sectors is regulated under the Radioactive Substances Act 1993 (RSA93).
- A.14) The Policy and Strategy do not apply to radioactive waste from those defence establishments which are not subject to regulation under RSA93. This includes waste arising from the operational nuclear submarine bases on the Clyde and Vulcan and from the decommissioning and dismantling of redundant nuclear submarines including those berthed at the former defence establishment at Rosyth.
- A.15) The Policy and Strategy also do not apply to radioactive waste which has already been dealt with under the policies of previous governments. This includes radioactive waste which is the subject of previous or existing contractual arrangements, including waste sent to facilities outside of Scotland, including Sellafield.
- A.16) The Policy and Strategy do not apply to High Level Waste (HLW), as there is no HLW in Scotland, or to radioactive substances and material which are not currently classified as radioactive waste, such as spent nuclear fuel, plutonium, uranium or other such radioactive fuels and materials.
- A.17) If, in the future, HLW arises in Scotland or any of the substances and materials described in A16 were to be classified as waste or were to be classified as HLW, as is probable for such materials, they would not be covered by the 2011 Policy nor this Strategy.

Overview of Scottish Higher Activity Waste

- A.18) It is estimated that once the nuclear licensed sites in Scotland are decommissioned there will be approximately 41,400m³ of packaged waste covered by this Policy to deal with²¹. Under current decommissioning plans this work will not be complete until approximately 2120.
- A.19) Approximately one third of the total volume of HAW in Scotland has already been produced. Of this volume some has been processed, and is being held in stores, but most is contained within existing nuclear facilities, including nuclear reactors, and will not be processed until these are finally dismantled.
- A.20) Approximately two thirds of the radioactive waste total has yet to be produced. This waste is that forecast from the future planned operations of the existing nuclear power industry.

Figure 1: Indicative timeline for packaged waste arising in Scotland showing key milestones based on the current NDA decommissioning strategy and plans for Scottish EDF Energy sites



A.21) Figure 1 above identifies several key features:

- operational and decommissioning waste continues to be produced until around 2030 (A)
- a Care and Maintenance phase until approximately 2070 – 2085 where no active decommissioning work is undertaken at Chapelcross and Hunterston A (B)
- final reactor site decommissioning for Hunterston B and Torness does not take place until around 2115 (C)
- two thirds of the waste is associated with final site clearance and will not arise until after 2070.
- no further arisings of HAW are expected after 2120 when the final decommissioning stage of all nuclear sites and the dismantling of associated plants are assumed to be complete (D)

Figure 2: Estimated volumes of packaged higher activity radioactive waste arising in Scotland (in NDA waste groups)⁶

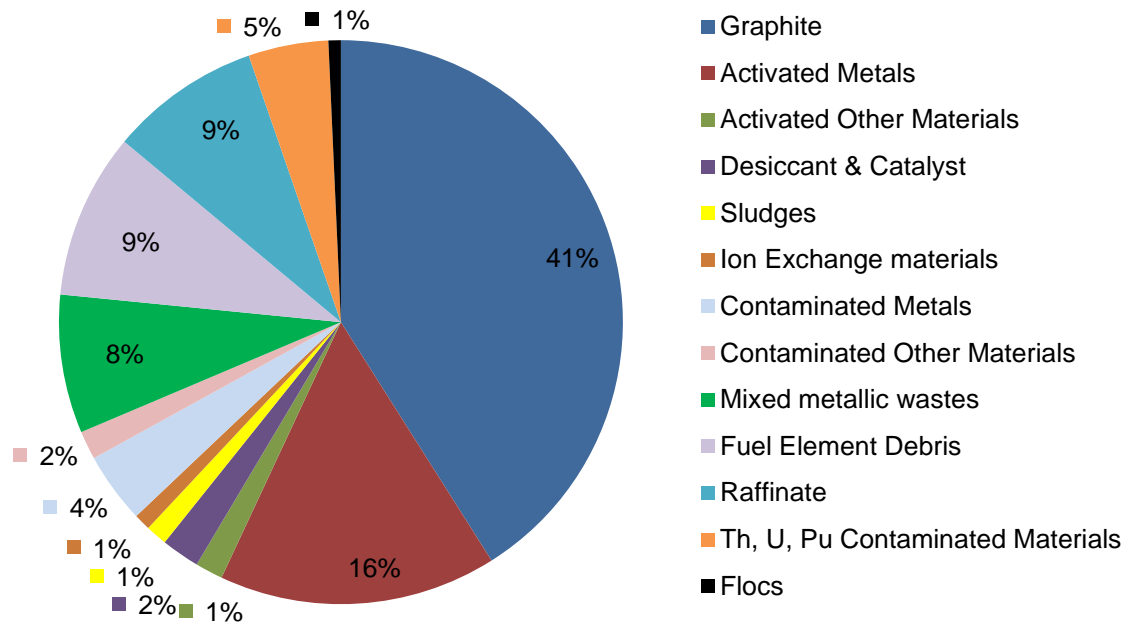
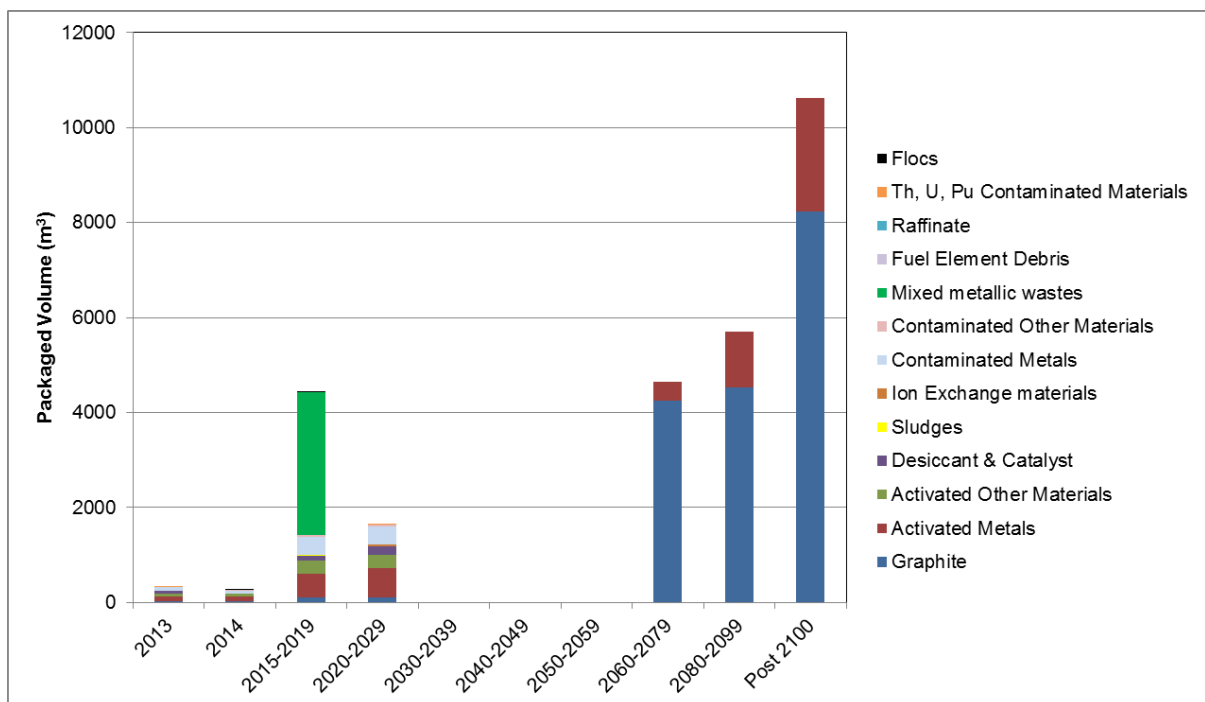


Figure 3: Estimated volumes of packaged higher activity radioactive waste arising in Scotland (in NDA waste groups) as a function of time⁶



A.22) At the point that the reactor buildings at the four civil nuclear power stations at Hunterston (A&B), Chapelcross and Torness are dismantled, the most significant waste group produced from the Scottish sites will be irradiated

graphite. According to current plans, most of this waste will not arise until after 2080.

- A.23) Wastes arising at Dounreay are slightly different from wastes arising from the other civil nuclear sites. Dounreay was primarily a research site although electricity generated from the prototype reactors was dispatched to the Grid. Little graphite waste is present at Dounreay as no graphite moderators were used in any of the reactors here (although small amounts of graphite were used within the reactor's neutron shield or reflector systems). Fuel reprocessing took place on the site producing a raffinate waste stream which is the most significant waste group at the site.
- A.24) It is estimated that around 60% of the HAW at Dounreay is unsuitable for near-surface disposal. This waste contains a high level of long lived alpha-emitting radionuclides which do not fulfil the current guidance requirements for waste entering a disposal facility. The Implementation Strategy involves the production and implementation of a targeted research and development plan for these wastes and other such wastes which are currently understood as unsuitable for near-surface disposal, in order to find a suitable waste management solution.

Current management arrangements by waste owner:

- NDA

- A.25) The NDA owns three sites in Scotland, Chapelcross, Hunterston A and Dounreay. The NDA published its updated Higher Activity Waste Strategy in May 2016. This sets out its plans for implementation of the UK and Scottish Governments radioactive waste policies.
- A.26) The NDA's HAW strategy *is to convert the HAW inventory into a form that can be safely and securely stored for many decades. At the appropriate time the stored waste in England and Wales will be transported to and disposed of in a geological disposal facility (GDF) and the NDA will continue to work with Scottish government to implement its policy for the long-term management of HAW at its sites in Scotland.*
- A.27) Plans for the decommissioning of each site are detailed in Lifetime Plans and are delivered by the Site Licence Companies (SLCs). The scope of work proposed in the Lifetime Plans reflects the prioritisation and includes all activities necessary to secure the optimum route that will lead, ultimately, to final clearance of the sites. The Lifetime Plans will be updated to reflect the new baseline to ensure that they are consistent with Scottish Government Policy.
- A.28) The NDA will continue to review SLCs decommissioning plans to ensure that they remain aligned with its strategy, deliver value for money and do not compromise the ability of future generations to meet their own needs, or other liability holders to deliver their plans, such as Ministry of Defence (MoD) or EDF Energy.

- EDF Energy

- A.29) EDF Energy, formerly British Energy Group plc., operates 2 nuclear power stations in Scotland; Hunterston B on the west coast and Torness on the east. Both stations have 2 AGR (Advanced Gas-Cooled Reactor) units. The proposed operational end date of Hunterston B is 2023 and Torness 2030.
- A.30) Under current plans it is assumed that the sites will enter Care and Maintenance in ten years after closure, and remain in Care and Maintenance until around 2100. It is anticipated that after 2100, when final decommissioning work commences, more than 95% of the waste from the sites will arise.
- A.31) Detailed baseline decommissioning plans for each of the power stations are in place. The plans have been developed over a number of years and have been formally approved by the NDA.

- Ministry of Defence

- A.32) Babcock International Group own and operate the dockyard on the northern shore of the Firth of Forth, near Rosyth. However, under the sale agreement the MoD undertook to retain the liability for decontamination and decommissioning of nuclear areas following the cessation of the submarine refit work. The 2011 Policy and Strategy cover the waste arising as result of the operation or decommissioning of that part of the site which is currently operated as a civil nuclear site.
- A.33) There is approximately 30m³ of waste at the Rosyth Royal Dockyard that is included in the Scottish Policy and Strategy wastes. No future arisings are expected at the site. All of the waste is ion exchange materials. The current baseline position for Policy waste at Rosyth Royal Dockyard is for it to be decay stored until a disposal route becomes available.

ANNEX C

Research and Development Aims

Research Aim	Outcomes	Responsibility	Phase	
Develop an understanding of the UK and European civil nuclear and radioactive waste R&D landscape	<ul style="list-style-type: none"> The Scottish Government and agencies to have access to expert radioactive waste management advice and resources to increase understanding of innovative and emerging technologies Understand and prioritise the development of radioactive waste management research programmes in Scotland Increased co-operation with UK and international partners in the field of radioactive waste management research Help support Scottish academia and SMEs with radioactive waste management capabilities and enhance Scotland's science reputation internationally 	Scottish Government	1	
Identify public attitudes and societal concerns in Scotland on the topic of radioactive waste management	<ul style="list-style-type: none"> Understand societal concerns and issues raised by the Scottish public and local government Help begin process to build trust and strengthen stakeholder confidence Aid preparation work to help inform, engage and empower communities in Scotland Help develop an outline stakeholder engagement plan in preparation for Phase 2 communication engagement activities Understand requirement for investment/benefit packages to attract communities and local government to bid or host a near-surface HAW waste disposal facility 	Scottish Government, CoRWM, NDA		
Develop a basic understanding of international radioactive waste management national programmes that have or are considering developing near-surface disposal.	<ul style="list-style-type: none"> Enable informed analysis of potentially suitable near-surface HAW disposal concepts (either under development, construction or in operation) for use in Scotland Help identify at an early stage technical and social risks and opportunities associated with designing and developing a near-surface disposal facility in Scotland Encourage the use of both innovative and proven HAW disposal solutions Help raise awareness, inform communities, encourage public debate and discussion on radioactive waste management including publically acceptable disposal programmes 	Scottish Government, CoRWM, NDA		
Develop credible options for the management of HAW with focus on: <ul style="list-style-type: none"> - alternative treatment & packaging - storage options (e.g. consolidation, decay storage) - ILW/LLW boundary waste - near-surface disposal concepts 	<ul style="list-style-type: none"> Study into advanced waste management options which may provide better methods of managing radioactive waste than are available at present Increase environmental protection and achieve value for money 3D concepts of near-surface disposal facilities 	NDA		1 & 2
Identifying options for disposal of higher activity wastes in Scotland, currently not understood as suitable for near-surface disposal	<ul style="list-style-type: none"> Demonstrate that Scotland is managing radioactive waste responsibly and in line with EU law and international obligations Allows Scottish Government to assess impacts of disposal solutions in terms of public acceptability, risk to the environment and costs Build on work identifying near-surface disposal for the less challenging cases to identify disposal solutions for the more challenging classes of waste. 	Scottish Government/NDA		2 & 3

ANNEX D Abbreviations

AGR	Advanced Gas-Cooled Reactor
CoRWM	Committee on Radioactive Waste Management
COSLA	Convention of Scottish Local Authorities
DSRL	Dounreay Site Restoration Ltd
GRA	Guidance on Requirements for Authorisation
HAW	Higher Activity Radioactive Waste
HLW	High Level Radioactive Waste
ILW	Intermediate Level Radioactive Waste
LLW	Low Level radioactive Waste
LoC	Letter of Compliance
NDA	Nuclear Decommissioning Authority
NFLA	Nuclear Free Local Authorities
ONR	Office for Nuclear Regulation
R&D	Research and Development
RWM	Radioactive Waste Management Limited
RWMC	Radioactive waste management case
SCCORS	Scottish Councils Committee on Radioactive Substances
SEA	Strategic Environmental Assessment
SEPA	Scottish Environment Protection Agency
SLC	Site Licence Company
SMEs	Small and Medium Enterprises
SSG	Site Stakeholder Group

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