

Strategy for the management of Naturally Occurring Radioactive Material (NORM) waste in the United Kingdom



Department
of Energy &
Climate Change



Llywodraeth Cymru
Welsh Government



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Riaghaltas na h-Alba

The UK NORM Waste Strategy

Executive summary

This strategy was subject to a public consultation exercise from February-May 2014 and has been updated after consideration of consultation responses. A summary of responses is published alongside the strategy. A consultation response will be published shortly after this strategy by Scottish Government.

This strategy for the management of Naturally Occurring Radioactive Material (NORM) waste in the UK has been jointly adopted by DECC, the Scottish Government, the Welsh Government and the Northern Ireland Department of the Environment.

Our joint policy is to facilitate the sustainable and efficient management of Low Level Radioactive Waste in line with the 'waste hierarchy' principle. This requires a policy framework which enables and encourages waste producers to avoid the production of unnecessary waste, and to manage arisings in the most environmentally appropriate way. This is important to prevent unnecessary costs and delays to decommissioning of North Sea oil infrastructure and the environmental permitting of new unconventional oil and gas developments. It is also crucial to enable the radioactive waste management supply chain to invest appropriately in order to avoid a capacity shortfall.

Our strategy for achieving this in respect of the NORM sector is based on stimulating investment in the waste management supply chain. It will do this principally through (i) reforming the regulatory framework to ensure it is clear, coherent and effective; (ii) removing policy barriers to the development of a robust and efficient market for NORM waste management; and (iii) supporting efforts by waste producers and the waste management supply chain to generate better data and information about current and future NORM waste arisings.

NORM waste is produced by many sectors with importance to the strength of the economy. We want to see these sectors thrive, as well as encourage growth in the waste management sector. We need to promote effective regulation that ensures the protection of the environment and human health, while enabling more efficient waste management practices.

The existing regulatory systems are effective in delivering protection of human health and the environment. However, we believe that regulatory and industry practices could be improved to manage waste more effectively. This will create business opportunities and lead to greater resource efficiency. We are also concerned that the current reliance on a small number of treatment and disposal routes creates risks of interruptions to availability.

Government and environmental regulators have important roles to play in improving legislation and regulatory practice. The planning system has responsibility for providing the framework to ensure that waste needs are planned for and that there are sufficient facilities in the right locations and of the right type to meet those needs. However, investment decisions over provision of facilities and disposal routes are ultimately for the market. Waste producers are responsible for their wastes, and should be planning for the effective management of waste as a part of good business practice. Effective implementation of this strategy will lead better information and data availability leading to a stronger market for NORM waste management services, better able to deal with changes to the volumes of wastes produced.

The UK NORM Waste Strategy

Contents

1. Introduction	4
2. The UK NORM Waste Strategy	8
3. NORM Waste Management Issues	12
4. Future Development of this Strategy	28
Annex A: The Regulatory Framework	34
Annex B: NORM Waste Arisings and Treatment Routes	47
Glossary	62

Introduction

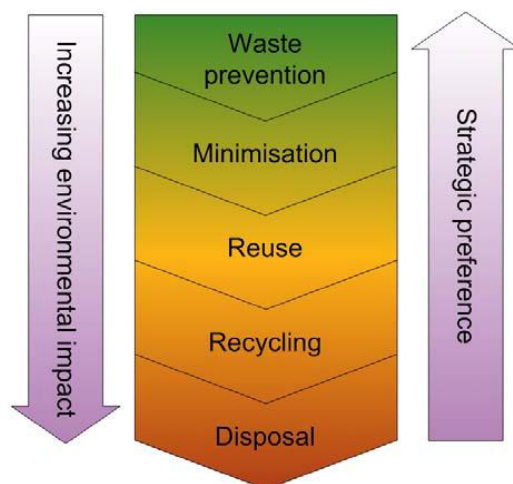
1.1 This strategy has been jointly adopted by DECC, the Scottish Government, the Welsh Government and the Northern Ireland Department of the Environment (hereafter referred to collectively as “Government”). It sets out how we will manage Naturally Occurring Radioactive Materials (NORM) waste in the UK.

1.2 A Strategic Environmental Assessment (SEA) has been carried out in support of the development of this strategy. A Post Adoption Report will be published shortly after this strategy.

Background: policy on low level radioactive waste

1.3 Our joint policy is to facilitate the sustainable and efficient management of Low Level Radioactive Waste in line with the ‘waste hierarchy’ principle (Figure 1). This requires a policy framework which enables and encourages waste producers to avoid the production of unnecessary waste, and to manage actual arisings in the most environmentally appropriate way. It also requires action to enable the waste management supply chain to develop a range of management options appropriate to the diversity of wastes produced. Finally, it requires that other actors with a role to play, including local planning authorities, environmental regulators and the Nuclear Decommissioning Authority, understand their role in removing barriers to the development of a robust and efficient UK market for waste management.

Figure 1: The waste hierarchy



1.4 Our policy on LLW requires all waste producers to plan for their waste arisings. These plans must satisfy the regulators that the appropriate steps have been followed. The ‘waste hierarchy’ concept is central to the

development of plans. It requires waste producers to consider in order of strategic preference the various waste management options, starting with waste prevention and with disposal as the option of last resort:

- Waste prevention: this is a fundamental principle for the management of all waste including NORM waste. Waste minimisation can be achieved using various approaches, including:-
 - Separating out wastes where they are mixed or before they can become mixed.
 - Reducing the activity levels of waste through decontamination.
 - Characterising waste such that it can be exempted from regulatory control, if below certain concentration thresholds.
- Waste minimisation: realises environmental, financial and economic cost benefits in minimising the amount of NORM waste to be managed, for example through better design of processes.
- Waste re-use: this defers waste production and extends the life of resources. Consideration can be given to recovery of wastes through use in industrial process – mainly through an exemption¹.
- Waste recycling: this is the preferred way forward for the treatment of some LLW, although this is not an option for all NORM wastes.
- Volume reduction: this ensures best use of disposal capacity.
- Waste disposal: waste disposal capacity is a precious resource and it must be used sparingly and as a last resort. An important consideration for LLW is to ensure that waste is consigned to the most appropriate facility. For example, wastes that are only slightly contaminated should not be sent to a disposal facility designed and engineered to accommodate contaminated material at the higher end of the LLW range.

1.5 Government published a joint policy statement² in 2007 which set out a high level framework for implementation of the policy. It also recognised that the different LLW-producing industries face different challenges, and committed government to working with those industries on effective implementation of the policy.

¹ Exempt – still regarded as radioactive material/waste but reduces/removes regulatory controls where risks have been assessed and activity is low to disapply some or all aspects of regulation. In some instances, conditions are applied to manage these substances.

²https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/254393/Low_level_waste_policy.pdf

Strategies for nuclear and non-nuclear low level waste

1.6 Government mandated the NDA to develop a strategy for the UK nuclear industry and this was published³ in 2010. The first part of the joint UK strategy for the non-nuclear industry (covering anthropogenic waste, for example from hospitals and universities) was published by DECC in 2012⁴.

1.7 This strategy is part two of the joint UK strategy for the non-nuclear industry, covering NORM waste.

Scope of this strategy

1.8 The scope of the 2007 policy statement and the strategy documents referred to in paragraph 1.6 was limited to solid low level radioactive waste. This UK strategy for NORM covers all NORM waste, regardless of activity level, including liquid and gaseous NORM wastes as well as solid wastes.

1.9 This strategy covers the whole of the UK, reflecting government's joint policy in this area. We share a commitment to achieving the same strategic and regulatory outcomes for NORM waste across the whole of the UK. Similarly, the continued close cooperation of the four territorial environmental regulators will ensure effective implementation.

What is NORM and NORM waste?

1.10 Naturally Occurring Radioactive Materials arise naturally in the Earth's crust as a result of radioactive elements created through cosmic processes, and radionuclides created through radioactive decay of these elements. NORM wastes arise when these materials are concentrated through industrial activities, for example mining and mineral processing. NORM wastes are distinct from anthropogenic radioactive wastes, which arise as a result of activities that deliberately process and use materials for their radioactive, fissile or fertile properties. NORM wastes may also arise from the remediation of contaminated land where the radioactivity is associated with natural radionuclides, such as those generated during radium luminising or from manufacturing thorium gas mantles.

1.11 NORM waste can also present significant chemotoxic hazards comparable in level to the radiotoxic hazard. This is because the same processes that cause the natural radioactivity to be concentrated often also cause concentration of other pollutants e.g. heavy metals or organic

³ <http://www.nda.gov.uk/publication/uk-strategy-for-the-management-of-solid-low-level-radioactive-waste-from-the-nuclear-industry-august-2010/>

⁴ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/48291/4616-strategy-low-level-radioactive-waste.pdf

compounds. Environmental legislation across the UK is designed to ensure that these hazards are controlled to the same environmental quality standard regardless of whether the waste stream is regulated principally for its radiotoxic properties or for other hazardous or non-hazardous properties.

Development of the strategy

1.12 The development of this strategy was guided by a Project Board comprising representatives from industry, local government, as well as DECC, the Scottish Government, the Welsh Government and the Northern Ireland Department of the Environment and environmental regulators. A consultation exercise was carried out on a draft strategy⁵, and industry representatives also contributed towards the development of the strategy through a workshop during the consultation period.

1.13 The development of the strategy was supported by an independent review⁶ of the legislation and regulation in the UK as it applies to NORM waste management. A summary of the regulatory environment for NORM wastes is set out in **Annex A: The Regulatory Framework**. In addition, a data collection exercise was undertaken during 2013, led by SEPA, which gathered information from the NORM waste producing industries, and also collected views on industry experiences with the regulation, treatment and disposal of NORM wastes. The analysis of the data and information collected in this exercise is summarised in Chapter 2 and in greater detail in **Annex B: NORM Waste Arisings and Treatment Routes**.

1.14 A Strategic Environmental Assessment (SEA) was completed for this strategy in accordance with the Environmental Assessment of Plans and Programmes Regulations 2004, and led by the Environmental Assessment Team in the Scottish Government. The iterative SEA process was undertaken in parallel with the development of the Strategy, with a Scoping Report prepared in early Autumn 2013 and publication of an SEA Environmental Report⁷ for consultation alongside the Draft Strategy in early 2014. An SEA Post-Adoption Statement will be published upon adoption of the Final Strategy.

⁵ [Strategy for the Management of Naturally Occurring Radioactive Material \(NORM\) Waste in the United Kingdom: A Consultation.](#)

⁶ [A Review of UK Legislation and Policy Relating to NORM Waste Management.](#)

⁷ [Scottish Government Strategic Environmental Assessment \(SEA\) Database](#)

2 The UK NORM Waste Strategy

2.1 Our overall aims for LLW management in the UK are to embed the ‘waste hierarchy’ into LLW management in order to minimise its environmental impact and ensure that infrastructure is used appropriately and efficiently.

Objective

2.2 The objective of this strategy is to ensure that secure, sustainable and resilient NORM waste management options are available in the UK. In this context secure, sustainable, and resilient mean:

Secure – waste management options are available, will continue to be available in the medium term (at least 5 years) and will be able to cope with all predicted operational and decommissioning NORM waste arisings.

Sustainable – the waste management options are safe, in that they do not pose unacceptable risks or hazards to current or future generations, or to the environment; make good use of resources; and deliver the waste management hierarchy. It also means enabling and driving economic growth.

Resilient – NORM waste producers have access to a range of management options, which should be able to cope with the uncertainties associated with the characteristics and volumes of NORM waste arisings.

Key Themes

2.3 The key themes for this strategy are:

- **Clarity of regulatory regimes.** Various points have been highlighted where the regulatory regime appears to include anomalies, uncertainties and potentially contradictory limits and thresholds. We will increase the clarity of the regulatory regime, and ensure that there is an effective regulatory environment for all legitimate treatment and disposal options.
- **Identifying and removing policy barriers to the development of waste treatment and disposal facilities.** The number of treatment and disposal facilities in use for NORM waste is very low. These facilities are also remote from the point of creation of much of the waste. A greater number of available treatment and disposal routes would deliver greater resilience in the UK for

NORM waste management, increase the options for moving up the waste hierarchy and help reduce distances that waste has to travel. To achieve this we need to ensure that there are no blockages to responsible development of such facilities.

Government has a role through the planning system to provide the framework to ensure that waste infrastructure needs are properly planned for and are met. However, investment decisions about waste infrastructure facilities are for the private sector.

- **A robust and efficient market requires good data and information about current and future waste arisings.** The information presented in this strategy is the most comprehensive view of NORM waste arisings, treatment and disposal that has been presented to date. However, even this improved information has wide ranges of uncertainty. Reliable data, accessible to all, will bring many advantages to all players in the NORM waste sector. It will help the market to function effectively, and enable firms to take rational investment decisions based on future demand for waste treatment and disposal services.

NORM Waste Arisings and Treatment Routes

2.4 An extensive data collection exercise was carried out during 2013 in support of the development of this strategy. The results of this exercise were reported in the consultation paper and in an accompanying Data Collection Report. A summary of this information is presented in **Annex B: NORM Waste Arisings and Treatment Routes**.

2.5 NORM industrial activities can be separated into three groups:

- Those that use radioactive substances for their chemical or physical properties (use of uranium and thorium compounds).
- Those that generate radioactive waste as a by-product of extracting wanted substances from natural minerals and ores (iron or titanium dioxide production).
- Those that result in radioactive substances being moved from one part of the environment (generally deep underground) into parts of the environment where they would not normally be found. (extraction of oil and gas, coal mine de-watering).

2.6 Gaseous NORM wastes generated and released to the environment must comply with conditions and limits included in environmental permits⁸ issued by the environmental regulators. The only industrial sector identified as generating gaseous wastes that require permitting is the iron and steel sector. There are no concerns with respect to the regulation of gaseous NORM waste.

2.7 Three industry sectors have been identified that generate liquid NORM wastes. The most significant of these is the oil and gas industry, which generates in excess of 200 million cubic metres of produced water every year. The majority of this waste stream arises offshore and installations are permitted to discharge their produced water directly to sea or re-inject it back into the seabed or hydrocarbon bearing formation where suitable facilities exist.

2.8 The sectors producing the largest quantities of solid NORM waste in terms of mass generated per year are the titanium dioxide industry (~ 200 000 tonnes), the steel industry (~ 10 000 tonnes) and the oil and gas industry (~ 800 tonnes). These mass estimates are far higher than the quantities of waste that are sent to specialist facilities that are permitted to manage radioactive waste. The largest volumes of solid NORM waste are disposed of to landfill as exempt waste. The steel industry does not dispose of its NORM waste arisings as they are in demand as inputs to other industrial processes. More than half of the solid NORM waste generated by the oil and gas sector is disposed of to sea in line with domestic and international best practice.

2.9 Much smaller volumes of NORM waste are sent for specialist treatment and disposal each year. In total, the estimated annual volume is less than 300 tonnes, with half of that total coming from the offshore oil and gas industry. Some of the significant possible changes to the future volumes of NORM wastes are discussed in chapter 4.

2.10 Comparison of the information on estimated NORM waste arisings and current landfill capacity suggests that there is no immediate disposal capacity problem for solid, non-hazardous NORM containing waste. The same can be said for NORM waste that also has hazardous properties. However, there is only one landfill site in the UK that can take hazardous NORM waste, making this disposal route fragile.

⁸ The term permit is used here to refer to either a permit granted by the Environment Agency or NRW under the Environmental Permitting Regulations 2010, or an authorisation granted by SEPA or NI Environment Agency under the Radioactive Substances Act 1993

Responsibility for NORM wastes

2.11 While there are important roles for government and regulators, the ultimate solutions to NORM waste management problems lie with the market. Government and regulators are there to create an effective regulatory and planning environment, in which the market can provide waste producers with the necessary management solutions. Through an effective and transparent regulatory system government, environmental regulators and industry can work together to ensure that the public are confident that any risks from waste management are sufficiently controlled. The regulatory framework, including the role of planning authorities, is described in **Annex A: The Regulatory Framework**.

2.12 Companies that operate NORM treatment or disposal facilities are responsible for operating within the terms of their environmental permits, and in accordance with other relevant legislation and planning conditions. Decisions about investment in new facilities, or changes to the operation of existing facilities, are commercial decisions for the operators. These decisions will be influenced by information on likely future waste arisings, and by the regulatory environment.

2.13 The Low Level Waste Repository in Cumbria was historically the main repository for LLW from around the UK. It is owned by managed on behalf of the Nuclear Decommissioning Authority, the body with responsibility for decommissioning civil nuclear liabilities in Britain. The Repository will potentially take much of the LLW from the decommissioning of nuclear installations, but has limited capacity for LLW from other sources. Following a recent review of the Environmental Safety Case by the Environment Agency, the operators of the Repository have submitted an application for a variation to its current permit in order to continue disposing of LLW. At the time of writing the outcome of the Environment Agency's determination is not yet known, and may result in constraints on the disposal of specific radionuclides (including long-lived radionuclides such as radium which is a common constituents of many NORM wastes).

2.14 Responsibility for NORM waste rests ultimately with the producers of that waste. First and foremost, it is important that waste producers minimise the waste they generate, and ensure that the storage, treatment and disposal of NORM waste should be carried out without significant risk to the environment or human health. Waste producers should seek appropriate guidance and regulatory permissions from regulators before taking decisions on NORM waste management.

2.15 The 2007 LLW policy states that plans for the management of all radioactive waste must be developed by waste managers. LLW management

plans must take into account all current and anticipated future arisings of LLW, and their radiological and non-radiological properties also taking account of Directive waste. This may necessitate additional characterisation work. Such plans must be developed with appropriate regulatory and stakeholder involvement and should take into account current best practice. As a general principle, such plans should be developed and agreed with the regulatory bodies in advance of the production of any new LLW streams. Regarding the non-nuclear industry, the 2007 LLW policy stated that waste management plans should be proportionate to the scale of waste production and holdings, as agreed with the regulator.

3. NORM Waste Management Issues

3.1 This chapter sets out the main NORM waste management issues that are a priority for Government. These are arranged according to the three key themes of the strategy, set out at paragraph 2.3.

Key Theme: Clarity of regulatory regimes

3.2 Government policy is to facilitate the sustainable and efficient management of LLW in line with the 'waste hierarchy' principle. This requires a policy framework which enables and encourages waste producers to avoid the production of unnecessary solid, liquid and gaseous wastes, and to manage waste arisings in the most environmentally appropriate way.

3.3 The policy framework for radioactive wastes applies to all NORM waste (solid, liquid and gaseous NORM wastes) unless otherwise explicitly stated. Consequently, statements such as those in the 2007 LLW Policy on the import/export of solid NORM waste and the requirement for waste managers to compile waste management plans apply, as do other Policy statements.

3.4 The radiation protection framework in the UK will continue to be based on optimisation of the radiation exposure and inclusion of public dose limits. Government requires the environmental regulators to continue to implement the parts of the Euratom BSS Directive (BSSD) relating to optimisation and dose limitation and has, previously, directed the environmental regulators to:

- (1) ensure that exposures to ionising radiation of any members of the public and the population as a whole resulting, from the disposal of radioactive waste are kept as low as reasonably achievable with economic and social factors being taken into account, and
- (2) when carrying out their regulatory duties under RSA 93 and EPR 10, ensure that exposures to the public do not exceed dose limits specified in UK legislation.

Revised Euratom Basic Safety Standards Directive

3.5 The radiation protection framework for NORM waste regulation in the UK will have to comply with the new requirements in the revised Euratom Basic Safety Standards Directive (BSSD) which was adopted in January 2014 and is binding on all Member States, including the UK. The revised BSSD must be transposed into UK law by February 2018.

3.6 The new BSSD is more explicit regarding when NORM waste may be exempted from regulatory control (which has the same effect as “out of scope” in the UK regulatory structure). To provide the necessary clarity, government will review the appropriateness, applicability and consistency of the various criteria, constraints and dose limits that apply to NORM Industrial Activities and to the disposal of NORM waste prior to the implementation of the new BSSD. This review will include consideration of the 1.0 Bq/g out of scope level for NORM that is contained in the new BSSD against the current out of scope limits in the UK, including the impacts of adopting this limit. Government believes that it is desirable to make the changes to NORM regulatory limits in a single revision of the regulatory regime at the point of implementation of the BSSD, rather than piecemeal over the coming years.

3.7 The definition of what constitutes a ‘practice’ has been changed in the new BSSD. It now includes all human activity that can increase the exposure of individuals to radiation from a radiation source during planned exposure situations. Hence it does not now distinguish between the sources giving rise to the radiation exposure.

Dose limits, dose constraints and other dose criteria.

3.8 The review of NORM policy and legislation undertaken to inform the consultation process highlighted the potential for confusion when referring to dose criteria, dose limits or dose constraints and how these terms are interpreted. This will be particularly so where the same numerical values are used to refer to radiation dose, but their meaning is fundamentally different. For example, the value 300 μSv per year is used in the UK as a dose constraint to the public. However, the same 300 μSv per year value is also used as the basis for judging whether NORM waste falls out of scope of regulation. Similarly, 1000 μSv per year is used in the UK as the public dose limit, but it is also used as the criterion where exposure of workers from NORM is considered out of scope of regulation in the new BSSD. These concepts are different but share the same numerical value. Similarly, there is often confusion in the use of terms such as exemption, exclusion, clearance, out-of scope etc. and indeed to the meaning of ‘NORM’ which itself is used variably according to the a particular context.

3.9 To minimise any confusion ahead of the review discussed in 3.6, the current criteria, constraints and dose limits that apply to NORM Industrial Activities and to the disposal of NORM waste in the environmental regulation regime are as follows:

- out of scope of regulation for NORM Industrial Activities is underpinned by a dose criterion of 300 μSv per year or less to a member of the public. For artificial radionuclides it is 10 μSv per year;
- the exemptions that apply to NORM waste disposal from NORM Industrial Activities are by a dose criterion of 300 μSv per year or less to a member of the public and 1000 μSv per year to landfill workers;
- the environmental regulators are required by government to ensure that the public dose from all disposal of radioactive waste is kept as low as reasonably achievable and does not exceed 1000 μSv in a year – i.e. the BSSD dose limit; this is often referred to as optimisation of radiation protection;
- when determining permit applications, the environmental regulators are required to have regard to the following maximum doses (dose constraints) which may result from a defined source, for use at the planning stage in radiation protection:
 - 300 μSv per year from any single source (meaning a single installation) from which radioactive discharges are first made
 - 500 μSv per year from the discharges from any single site (where they are multiple installations on the same site)
- the environmental regulators must have regard to the “threshold for optimisation” which, dependent on geographical administration, has been set at either 10 or 20 μSv per year.

Offshore disposal options

3.10 Offshore operators have enquired whether or not it is acceptable to transfer NORM wastes between offshore installations for the purpose of treatment and subsequent disposal. Government believes that the current policy on what is often termed inter-field transfer of waste needs clarification. Clarity regarding whether NORM wastes can be transferred between installations operating in the same field, often termed intra-field waste transfer, is also needed.

3.11 Government will work with the environmental regulators and the international community to seek greater clarity on the acceptability of transfers of NORM waste between offshore installations. This work will take due

account of and satisfy our international obligations such as the OSPAR Convention and the related discharges strategy.

Averaging and characterisation of NORM wastes

3.12 Government supports the use of approaches to the averaging and characterisation of NORM wastes that enable the application of the waste management hierarchy, while ensuring proper protection of people and the environment. To ensure proper protection, there is a need for waste producers to provide suitable and sufficient information, as may be required by consignees, to enable the safe treatment and disposal of NORM wastes. In addition, all parties must demonstrate compliance with regulatory requirements.

3.13 Consignors of NORM waste will continue to be required to use best available techniques/practicable means to characterise, sort, and segregate their wastes to facilitate their disposal by optimised routes, and to provide the consignee with sufficient information needed to allow them to consider the acceptance or otherwise of their wastes. In achieving this, we expect NORM waste producers to engage early and proactively with potential consignees. This ensures a sufficient common understanding of: the treatment or disposal technique that may be available, the nature of the wastes likely to require treatment or disposal, and what information will be needed by consignees to facilitate their ability to receive and manage such wastes in accordance with their own constraints (including any Environmental Safety Case (ESC) for disposal).

3.14 Early engagement between waste producers and disposal providers will allow better understanding of the benefits, including environmental, of particular options and the constraints on disposal routes. Additionally, disposal providers may complete necessary waste characterisation to optimise disposal.

3.15 There may be occasions where a NORM waste challenges the existing constraints on a disposal route. Where anyone wishes to consider disposal of any existing wastes that challenges an existing ESC, the regulators would expect the potential consignee to review and revise the ESC. Consignors may only accept the disposal of such wastes once it has been demonstrated as environmentally safe and consistent with legal targets and criteria.

3.16 The environmental regulators will continue to work with the industry to ensure that the expectations for such 'handshakes' between consignors and consignees are understood. They will also encourage the sharing of best practice between industry sectors where relevant, including for example best

practices identified in the Nuclear Industry Code of Practice⁹. The regulators will also consider the applicability of existing regulatory guidance to NORM waste management and planning and, where appropriate, enable this to be shared.. For example, guidance on the ‘mixing’ of wastes set out in the Joint Guidance on the Management of Higher Activity Radioactive Wastes states that:

“Mixing of wastes need not be precluded where this can be shown to provide net benefits in terms of health, safety and environment. Dilution solely for the purposes of re-categorisation to a lower category, however, should be avoided (e.g. deliberate mixing of ILW with inactive or lower activity waste to yield a larger volume of LLW).”

3.17 Regulators will also facilitate the sharing of best practice and lessons learnt in the development and implementation of ESCs for waste disposal. This includes the use of robust assessment techniques for understanding the fate of radioactive wastes in the environment (including their non-radiological hazardous properties) and the use of Waste Acceptance Criteria to safeguard the ESC.

Conditioning to facilitate disposal

3.18 Government accepts that some wastes must be conditioned to facilitate their future management; be this through burial or another waste management technique. Conditioning may involve the addition of non-waste materials, such as cement or grout, to facilitate the handling and safe transport of waste. In carrying out such conditioning, government accepts that the concentration of NORM in the waste along with any other hazardous component may be diluted. Such dilution is acceptable providing that the operator can demonstrate that the conditioning is necessary, this does not compromise future management and the waste producer has used best available techniques/best practicable means to minimise the amount of material used to condition the waste.

3.19 The deliberate and inappropriate dilution of waste is unacceptable. This may needlessly use raw materials, take up additional unnecessary capacity by sending additional waste to landfill and avoid appropriate regulatory controls. In addition, such practices may put compliant businesses at a commercial disadvantage. Government expects the environmental regulators to clearly communicate their expectations from waste producers when conditioning to facilitate disposal. Government should also review current

9

http://www.nuclearinst.com/write/MediaUploads/SDF%20documents/Best_Available_Techniques_for_the_Management_of_the_Generation_and_Disposal_of_Radioactive_Wastes_-_NICoP.pdf

arrangements to ensure unnecessary dilution is avoided. This may include the regulators working with industry to develop common guidance on this conditioning for disposal.

3.20 Government believes that adequate controls already exist under the radioactive waste legislation to allow the regulators to prevent inappropriate conditioning. Where it is apparent that an operator is carrying out a process with the main purpose of diluting the radioactive waste to avoid regulatory controls, we would expect the environmental regulator to take appropriate action to stop the process. Government expects the environmental regulators to ensure requirements for conditioning NORM waste are complied with as part of their routine permitting and inspection regime.

Conditioning to facilitate re-use and recovery

3.21 Government is of the view that whilst it is desirable and acceptable to treat all radioactive wastes to facilitate recovery or re-use, the mixing of NORM wastes with other wastes is a special case.

3.22 Government believes that conditioning of NORM waste, including mixing with non-radioactive waste, to facilitate a further 'use' or 'recovery' can be an effective means of moving up the waste hierarchy and reducing the amount of wastes going for disposal. It can help wider efficiency in the economy by reducing the use of newly extracted materials.

3.23 Government also recognises the legitimate concerns that such conditioning could be used as a way to avoid regulatory controls. In addition, depending on the use, this may result in additional radiation exposure to the public. For example, if residues are used in road building or as feedstock in the manufacture of building materials. Therefore, when waste managers are making decisions about waste re-use, we expect those decisions to be based on a legitimate use and demand for the conditioned material. In addition, we expect conditioning to be carried out such that it is not an operation simply to dilute the NORM waste and so to avoid regulation relating to its disposal (see above).

3.24 Government expects the environmental regulators to consider any such proposals against the following criteria when considering whether conditioning for re-use/recovery is acceptable:

- A legitimate use for the conditioned materials has been identified.
- There is demand for the conditioned material.
- Public radiation exposure from use of the conditioned material should not differ significantly from the exposure that would result if the conditioned material was not used.
- Overall the use of the conditioned waste will result in less waste disposal or reduced use of other resources.

3.25 It is not acceptable in any circumstances to mix wastes containing anthropogenic radionuclides with non-radioactive waste.

Regulatory mechanisms to facilitate recovery

3.26 Recovery and use of NORM wastes is an effective means of moving up the waste hierarchy. However, potential users of NORM waste do not want to be associated with dealing with radioactive wastes that require an environmental permit. This concern about a material being labelled as radioactive waste, which can give rise to negative perceptions among

customers and stakeholders, can stand in the way of otherwise viable and safe recovery options.

3.27 Government considers that the criteria set out above in paragraph 3.24 for conditioning for recovery may help to remove this problem as waste producers will be able to condition their own wastes in order to facilitate re-use. However this is only possible where the waste producer has the capability and other material available to condition their own wastes. It does not help with situations in which a transfer of waste from one waste producer to another potential 'user' exists.

3.28 Government will continue to consider the possibility of a new exemption or exemptions to accommodate particular 'uses' of NORM wastes. In the short term, government expects the environmental regulators to make use of regulatory position statements to enable them to set out the case for any specific circumstances, on the basis of proposals from industry. Government expects that the regulatory position statements will set out how the relevant criteria for allowing re-use/recovery have been fulfilled, and how the regulator intends to regulate a particular activity for a set period of time. Such statements should enable operators to receive specific NORM waste(s) from a particular waste producer or producers, for re-use/recovery, without the need to have an environmental permit for the receipt of radioactive waste; providing that they adhere to the position's rules and do not cause harm to the environment or human health (and providing that a radioactive waste permit is not already required).

3.29 Over time, government will assess if the use of regulatory position statements to facilitate recovery is effective and if the statements reflect a pattern of activities suitable for inclusion in one or more exemptions. Government could consider creating an exemption similar to the assessed landfill exemption, i.e. it would be for operators to submit an assessment to the regulators, showing that predefined criteria have been met. The operator will then be exempt unless the regulator informs them otherwise.

Waste management companies' access to information about exempt radioactive waste

3.30 One of the conditions of the radioactive substances exemption regime, in relation to disposals of exempt waste, is that waste producers, where practicable to do so, must remove labelling that indicates the waste is radioactive. There is no legal requirement to inform the next recipient that the waste contains radioactivity.

3.31 Some waste management companies have expressed concerns that they may not know when they are receiving exempt radioactive wastes,

including NORM wastes. There are two main concerns, one relates to ability to comply with their permits and the other is worker safety.

3.32 Government has created the exemption regime to minimise the regulatory burden in relation to radioactive waste where the risks are such that no special controls are required. This was underpinned by radiological impact assessments that take into account exposure to waste management workers including those on waste sorting lines.

3.33 The environmental regulators already require operators to have arrangements in place to ensure compliance with their permits, which may include waste acceptance criteria. On this basis, government considers that the regulatory framework is robust and does address the provision of information relating to handling of exempt NORM wastes. Waste companies are able to request confirmation of the presence or otherwise of exempt NORM waste as part of their waste acceptance criteria, if they need this information for operational purposes or to comply with regulatory limits.

Key Theme: Identifying and removing policy barriers to the development of waste treatment and disposal facilities.

Obligations to other EU Member States

3.34 Article 37 of the Euratom Treaty requires that each Member State provides the Commission with general data relating to any plan for the disposal of radioactive waste. This will make it possible to determine whether the implementation of the plan is liable to result in the radioactive contamination of the water, soil or airspace of another Member State. Upon receipt of general data, the Commission delivers its Opinion within 6 months. Guidance defining the information that the Member State has to submit in order to allow the Commission to come to a well-founded Opinion is given through Commission Recommendations on the application of Article 37 of the Euratom Treaty. The most recent such recommendation is 2010/635/Euratom of 11 October 2010.¹⁰

3.35 Recommendation 2010/635/Euratom lists the types of operation for which a submission is required; this includes “the industrial processing of naturally occurring radioactive materials subject to a discharge authorisation”. There is a concern that NORM waste management companies that carry out activities falling within this specified operation could find the requirement to make a submission disproportionate when compared to the risk. In some cases this may entail disproportionate costs in terms of the effort required to prepare a submission and would cause an inadvertent delay associated with preparing the submission and waiting for an Opinion from the Commission.

¹⁰ <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:279:0036:0067:EN:PDF>

Ultimately, if the requirement was disproportionate, it could be an impediment to the development of necessary waste management infrastructure.

3.36 Submissions are only required where a radioactive substances discharge authorisation or permit is necessary. The Article 37 Recommendation states that in most cases submissions for NORM operations would not need to include information on unplanned releases or emergency plans. Operators should make best use of existing information (for example some of the information for an Article 37 submission will also be required in permit or authorisation applications) and the detail should be commensurate to the level of risk. In many cases, this will mean that the information on local effects prepared for the permit or authorisation application can be expected to be sufficient for the Article 37 submission.

3.37 The new Basic Safety Standards Directive (BSSD) contains new provisions related to the regulation of NORM which are intended to apply minimum standards across the EU. We will keep under review the interpretation of the requirements of the Article 37 in conjunction with the new provisions of the BSSD to ensure that the UK is not making submissions that are disproportionate, while ensuring that we remain within the spirit of Article 37.

Import and export of NORM waste

3.38 Trade is a reserved policy area, which means that policy is determined at the UK level. Government recognises that like other types of radioactive waste there may be NORM waste streams for which there is an insufficient quantity for the best waste management option to be commercially viable in the country that generated that waste. Therefore it is beneficial for industry to have access to facilities in other countries, or for facilities developed in the UK to be able to offer treatment services for similar wastes from abroad. Additionally, both the Scottish and UK oil and gas industry strategies^{11,12} aim to promote use of domestic skills and expertise in international markets.

3.39 Government supports the import and export of NORM waste where it contributes to the objectives of the industry strategies and this NORM waste strategy, providing that it is undertaken in accord with all relevant legislation and policy. Government will ensure that the UK's implementation of international conventions and EU legislation enables import and export of

¹¹ Oil & Gas Strategy 2012-2020: Maximising our Future <http://www.scottish-enterprise.com/~media/SE/Resources/Documents/MNO/Oil-and-Gas-strategy-2012-2020.pdf>

¹² UK Oil and Gas | Industrial strategy: government and industry in partnership https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/175480/bis-13-748-uk-oil-and-gas-industrial-strategy.pdf

NORM waste where it is practical and appropriate to do so and contributes to the overall objectives of this NORM waste strategy.

3.40 Government accept that there is some confusion associated with the legislative framework accompanying import and export of NORM waste and to help resolve these issues will do the following:

- Clarify the UK policy and legislative framework for import and export of NORM waste (set out below)
- Engage with international partners to share best practice and increase harmonisation where appropriate

UK policy on import and export of NORM waste

3.41 In the UK, NORM waste is regulated as radioactive waste and all government policy relating to radioactive waste applies. Government's general policy is that radioactive waste should not be imported to or exported from the UK except:¹³

- in light of an assessment of all practicable options, and should not be permitted except:
 - for the recovery of re-useable materials; or
 - for treatment that will make its subsequent storage and disposal more manageable.

3.42 In all cases where such processes would add materially to the wastes needing to be disposed of in the country of destination, the presumption should be that they will be returned to the country of origin to a timescale agreed by the competent authorities in the countries of destination origin. Government recognises that the main difficulty in applying such a policy is in defining the detail, such as what "add materially" means in practice.

UK legislative framework on import and export of NORM waste

3.43 The import and export of conventional and radioactive waste is subject to various international conventions, EU and domestic legislation depending on the exact nature of the waste, including:

- NORM wastes arising from NORM industrial activities, irrespective of their concentration or treatment, are **excluded** from radioactive waste Transfrontier Shipment controls through the Directive on the supervision and control of shipments of radioactive waste and spent fuel (Council Directive [2006/117/Euratom](#))

¹³ Cm 2919 Review of Radioactive Waste Management Policy; the Transfrontier Shipment of Radioactive Waste and Spent Fuel Regulations 2008 <http://bit.ly/17ZHUym>

- The Waste Shipments Regulation (EC Regulation [1013/2006](#)) applies if NORM waste is exported.¹⁴ However, NORM waste is not explicitly mentioned, and the general principle in the UK (as set out in the UK Plan for Shipments of Waste¹⁵) is not to export waste for disposal. Furthermore, the UK Plan currently does not foresee or facilitate the treatment of NORM wastes abroad, or the facility to return the treated waste. Conventional wastes are not exported for treatment with a view to repatriation.
- An export of NORM waste from the UK is classed as a disposal under domestic radioactive waste legislation (EPR 10 and RSA 93). Therefore, such shipments should have been made in accordance with an appropriate permit. When the relevant environment agency issues this permit we expect them to have due regard to government policy and liaise with the competent authority in the country of destination to determine if it is necessary for any resulting NORM waste to be repatriated.
- Imports of NORM waste into the UK cannot be regulated in the same way as exports (as an import is not a disposal). However, management of radioactive waste (receipt, accumulation, and disposal) cannot be undertaken without an appropriate permit. We expect the environment agencies ensure to that such permits include appropriate controls regarding imports of NORM waste.

3.44 Government note that there is little consistency or harmonisation in the approaches that different countries take to the import and export of NORM wastes. This has also been identified by the European Commission¹⁶ which has advised that an advisory group will investigate and address the issue of transboundary shipments of NORM not arising from authorised practices which are excluded from Directive 2006/117/Euratom. The UK will engage with this advisory committee and other international partners where it is appropriate to do so.

Key Theme: A robust and efficient market requires good data and information about current and future waste arisings.

Compilation of Data on NORM Waste Arisings

¹⁴ Further information about the Waste Shipment Regulation and how it applies to those shipping wastes (in each of the Administrations) is available at:

- <https://www.gov.uk/importing-and-exporting-waste#page-navigation>
- http://www.sepa.org.uk/waste/waste_regulation/transfrontier_shipment/regulations_and_guidance.aspx
- http://www.doeni.gov.uk/niea/waste-home/regulation/transfrontier_shipment_of_waste.htm

¹⁵ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69546/pb13770-waste-shipments.pdf

¹⁶ [European Commission Report 9016/13](#)

3.45 The data gathered for this Strategy and presented in the NORM Data Collection Report is probably the most comprehensive picture of the NORM sector in the UK that has been assembled. However, it is based on voluntary returns from only a proportion of firms approached, although there is a good coverage across sectors. This has allowed a view to be taken of the overall balance of demand for and supply of treatment and disposal both now and in future years.

3.46 Taken in isolation, the findings in the data report suggest that there is sufficient disposal capacity for solid NORM wastes for the immediate future. However, this projection is based on a relatively small number of disposal sites and is, therefore, a potentially vulnerable equilibrium. There is a need for government to take an overall view on the volumes of other LLW and VLLW arisings from the nuclear industry, and from the non-nuclear industry for a complete picture. These wastes share many parts of the supply chain for treatment and disposal services. Government will look to the NDA to ensure that it makes nuclear LLW facilities available to non-nuclear consigners as stipulated in the Nuclear LLW strategy.

3.47 There is also a need for more comprehensive data on likely volumes of waste that may arise through the management of land contamination, including from MoD sites and former military sites, and as a result of decommissioning nuclear sites and facilities to service offshore installations.

3.48 Reliable data accessible to all would bring many advantages to all players in the NORM waste sector. It would help the market to function effectively, allowing firms to plan for suitable/sufficient radioactive waste management capacity and would encourage supply chain consideration/investment decisions. This should allow more efficient management of throughput in some key treatment facilities and open up opportunities for wider integration of radioactive waste issues such as development of relevant skills and research and development.

3.49 Government believes that it is necessary to continue collecting data on both operational and decommissioning NORM waste arisings, now and in the future, as a means of assessing the availability and capacity of NORM waste management facilities. This will ensure that any potential constraints on NORM waste disposal are identified as soon as possible prior to a problem arising.

3.50 In order to inform implementation and further development of the Strategy, it will be necessary to collect information on (i) the amount (i.e. volumes and activities) of NORM wastes that are being generated and (ii) predicted arisings of NORM waste that will require treatment and disposal in the future. Some information is already collected by the environment agencies

or other Government departments (e.g. DECC); especially for offshore oil and gas production. However, NORM data is usually aggregated with other LLW data and is usually reported in terms of its total alpha concentrations, and more NORM radionuclide specific data is needed (such as activity concentrations of radium, polonium, and lead). As a result, there is a lack of available data on the amount of NORM waste produced, treated and disposed of.

3.51 Government will, where appropriate, request the environmental regulators to work with NDA and the Energy Unit in DECC, to determine how best to assess and identify any “gaps” in NORM data collection and improve future data collection. Options for improving data on current and future NORM waste data will be discussed in the implementation of this strategy with business representatives and other stakeholders. Options identified for improving NORM waste data include:

- extending DECC’s Environmental Emissions Monitoring System (EEMS) database (for offshore only) to compile information on NORM waste arisings from the operation and decommissioning of oil and gas installations.
- aggregating the information in EEMS with the environment agencies’ pollution inventories databases for routine onshore disposals of NORM waste
- including information in the Radioactive Waste Inventory (RWI) for those NORM waste producers who declare that they have a NORM waste liability that they will need to manage
- assessing whether the RWI should include estimates how much NORM waste will arise as result of contamination decommissioning from the likes of oil and gas production and NORM contaminated land remediation
- extending data collection further such that information currently compiled in the UK RWI and EEMS can be aggregated.
- requesting the environmental regulators to assess how their existing databases on annual mass releases of specified pollutants to air, water and land from regulated industrial sites can include NORM wastes.
- requesting the environmental regulators to assess how NORM waste management data can be included in the annual Radioactivity in Food and the Environment (RIFE) report, which already includes a section on landfills and non-nuclear discharges (section 7).
- requesting the environmental regulators to put in place arrangements to obtain information about future NORM waste arisings compiled in NORM waste managers plans

Waste Management Plans

3.52 The 2007 LLW Policy says that plans for the management of all radioactive waste, including LLW, must be developed by waste managers. These plans must be prepared in a form, and to a level of detail, suitable for consideration by the relevant environmental regulator.

3.53 Although not specifically expressed in the 2007 Policy, LLW includes NORM waste. Therefore, when government says that LLW managers should plan to manage their waste in accordance with the waste management hierarchy principles set out in UK waste strategy documents, this includes NORM waste and is to ensure that the requirements for NORM disposal are minimised. Also, government expects that the preparation of waste management plans for the NORM industry should take into account all current and anticipated future NORM arisings and set out plans for their management.

3.54 Waste management plans, and the effort which is devoted to collating them, should be proportionate to the facility. For a non-nuclear operator, with only small volumes of NORM waste to deal with, such plans would simply have to demonstrate to the regulator that they have considered all possible waste routes and have applied the waste management hierarchy. This could be done as part of the existing application and inspection process under radioactive substances legislation. The 2007 policy statement sets out the factors that should be considered within a waste management plan and says that an options assessment study should be conducted that explicitly considers the environmental impacts of “transporting” radioactive waste over long distances.

3.55 It is in the collective interest of NORM waste producers to compile waste management plans to ensure there is robust and reliable data on historic and future NORM waste arisings. The information in such plans should ensure that the market is able to respond to problems with NORM treatment and disposal capacity.

3.56 Government reiterates the position in the 2007 policy statement that NORM waste managers should compile waste management plans. This compilation should occur in a form and to a level of detail suitable for consideration by the relevant regulatory bodies, as proportionate to the scale of their waste production and holdings, as agreed with the relevant environment agency.

Exempt Wastes

3.57 Government reviewed the practicalities of obtaining data on the volumes and activities of exempt NORM radioactive waste disposed of in the UK to landfill and concluded that this was not practicable. Therefore, government will look to the UK environment agencies to take due account of exempt waste arisings and disposals as part of their normal regulatory duties.

3.58 The radioactive substances exemption regime places certain conditions (legal requirements) on the waste producer to keep a record of the solid waste disposed of and allow regulators access to the records. This is on the basis that conditions regarding waste disposability are then needed at the disposal site. If the waste producer cannot meet the exemption order regime conditions, the NORM waste disposed is not exempt and needs to be permitted by the relevant environment agency. Government is of the view that such records can be included in the waste management plans referred to in the previous section.

4. Future Development of this Strategy

Implementation

4.1 Implementation of this strategy will be led by government, working closely with the environmental regulators. Overall progress with the strategy will be monitored through the liaison arrangements between the administrations, currently the UK Radioactive Substances Policy Group.

4.2 This strategy benefited, in its development, from input from industry representatives, both on a project board and in a consultative workshop. Government is keen to maintain this input during the implementation and further development of the strategy. Government and the environmental regulators will consult, as appropriate, on changes to regulations and guidance. The views of industry will also be sought through existing groups, such as the Small Users Liaison Group and the Scottish Non-Nuclear Industries Liaison Group.

4.3 Government proposes to hold periodic open forums for industry, where the overall progress with implementation of the strategy and its future development can be discussed. We expect to hold these biennially.

4.4 The issues covered in this strategy are long term in nature, and the strategy is intended to set out a clear policy direction for many years. Government intends the strategy to endure for a minimum of five years, and will consider when to review the strategy in light of developments in NORM waste arisings and disposal practices.

Monitoring processes that produce NORM

4.5 There is expected to be some significant changes in NORM waste producing sectors in the next five to ten years. Government and the environmental regulators will monitor these developments, in order to provide information to waste producers and treatment/disposal providers about emerging volumes of NORM waste needing treatment. We will also keep under review the regulation of these sectors to ensure that there is an effective regime in place that allows for growth with protection of the environment and human health.

Shale Gas

4.6 There is a high level of uncertainty about the pace of development of shale gas extraction activities in the UK. This and the ultimate scale of these activities will depend on what is discovered through drilling and testing. The safe disposal of wastes including any NORM wastes will be the responsibility of the firms extracting the gas. Environmental regulators are putting in place proportionate regulation, and also ensuring that there is an effective

regulatory regime for other industries generating similar wastes. It is likely that NORM waste will arise as a result of these activities, predominantly in liquid form but also some solid and gaseous wastes. The fracturing process potentially involves large volume of fluid, which is predominantly water but also contains sand and chemicals to aid the process. The fluid picks up other material, including NORM during its use in the extraction process.

4.7 The environmental risks arising from the NORM present in flowback water relate principally to the treatment and subsequent disposal of the water, process residues and process equipment. Treatment and disposal may take place by re-injection during subsequent hydraulic fracturing, or it may be carried out at sites remote from the shale gas production facilities, for example sewage or effluent treatment sites and would be expected to remove up to 90% of NORM; only very low levels would still remain. After treatment, the water may still retain some of this natural radioactivity and disposal to rivers, estuaries, sea or groundwater may lead to intakes of radioactivity through consumption of drinking water and contaminated foodstuffs, or by direct exposure pathways. Water supplies in some parts of the country do have detectable levels of radioactivity, because they have passed through, e.g. granite, but this is not a health hazard. Environmental regulators control the treatment, disposal and radiological impact of NORM through environmental permits.

4.8 Based on scenarios for the development of the shale gas industry in the UK, there will be a need for additional NORM waste treatment and disposal capacity in the medium term. Consideration of waste capacity of all kinds, including knowledge, skills and treatment infrastructure, should form an integral part of the plans of business proposing developments in shale gas.

Oil and gas decommissioning

4.9 There is likely to be significant growth in oil and gas decommissioning activity in the coming years. This is largely due to the maturity of the off shore industry, with fields reaching the end of their economic life as the oil and gas resources are exhausted.

4.10 In addition, it is a clear aspiration of the Scottish Government's strategy for the oil and gas sector to build the business of providing decommissioning services to other countries, in order to make good use of the skills and other facilities in the on shore supply chain in the coming decades. For this sector to develop, there needs to be effective capacity for the treatment and disposal of NORM wastes, or this could be a constraint on this sector. There are difficulties in predicting the volumes of waste that will arise until there are a number of examples of decommissioning in practice, particularly as the volumes of NORM waste may vary significantly for different oil and gas fields.

4.11 Consideration of disposal NORM wastes should form a part of the plans of businesses planning to undertake decommissioning business, in particular those planning to attract business from other countries. There are arguments that local capacity for all forms of NORM waste would make the sector more robust, as well as increasing the efficiency and sustainability by reducing the distance waste has to travel.

Possible end to discharge of NORM wastes to sea

4.12 There is a potential for OSPAR to revisit the practice of disposal to sea of solid NORM waste that arises from the maintenance and cleaning of offshore equipment in the oil and gas sector. This would lead to significant additional volumes of solid NORM waste being brought ashore needing a disposal route.

Changes in source and nature of ores

4.13 Industrial growth in other countries, especially China, means increased demand for the higher quality ores (those with lower concentrations of impurities). This can lead to the use of lower quality ores in UK industry, which can in turn lead to higher concentrations of NORM and in residues.

4.14 Industry and environmental regulators need to work together to consider potential uses for these residues where there is a potential use that is compatible with ensuring proper protection of people and the environment. These issues are covered in greater detail in paragraphs 3.21-3.24 and the sectors that use ores are likely to be a priority for action in this area.

Identifying medium term capacity issues and development of market

4.15 There is significant uncertainty about the potential volumes of NORM waste that will arise from the management of land contaminated with radioactivity. There is uncertainty over the extent of contamination, the timing of remediation work, and the volumes of NORM waste that may be created through any remediation practices. Factors include the implementation and interpretation of EU legislation such as the Groundwater Directive and the demand for the land for future use. There is particular uncertainty about the level and timing of volumes of NORM waste that could arise from remediation works associated with any contamination on MoD sites, and former MoD sites. The recent report by COMARE into Dalgety Bay¹⁷ included a recommendation to improve the collection of data on radioactive contaminated land.

¹⁷ Committee on Medical Aspects of Radiation in the Environment: 15th Report, Radium Contamination in the area around Dalgety Bay. Available at <http://www.comare.org.uk/documents/COMARE15thReport.pdf>

4.16 In Chapter 1, we discussed the relationship between NORM waste and the volumes of other LLW from the nuclear and non-nuclear industries. These wastes share many parts of the supply chain for LLW treatment and disposal services. Government recognises that supply chain capacity issues therefore need to be considered in light of developments across each of the NORM waste producing sectors, taking account of the widest possible picture on likely future arisings. This will be helped by improving and integration of data, as discussed in paragraph 3.51.

Market Development

4.17 We hope that the additional information on arisings provided to support this strategy, and further planned efforts to improve future data availability, will support market development. However, we expect the market to remain concentrated, with a small number of treatment and disposal operators. This is driven by the underlying economics, in particular the large fixed cost in engineering a LLW facility and achieving regulatory approval. As is discussed in **Annex B: NORM Waste Arisings and Treatment Routes**, some disposal sites have struggled to attract sufficient volumes of NORM to justify this fixed cost.

4.18 As a simple step to improving the functioning of the market, the environmental agencies are considering providing better and easier access to reference lists of permitted NORM waste treatment and disposal facilities.

Risks to implementation

4.19 There are three main risks to the implementation of this strategy that are briefly considered below.

Risk: Lack of capacity in government and regulators to address the complex issues

Likelihood: moderate – there are budgetary pressures across all government and public bodies. Much of this work will not be funded by specific income from permits.

Impact: moderate – the improvements sought would be slow in appearing

Measures to reduce risk: government will seek to ensure that the implementation of this strategy is highlighted as a priority for environmental regulators. We will seek an implementation process that uses effort wisely, focused on the improvements rather than on process.

Risk: Shocks to the provision of NORM treatment and disposal facilities

Likelihood: moderate – there are a small number of sites that are permitted for types of NORM. Each of these businesses is free to take commercial decisions about the future provision of these services. However, where the investment has been made in developing and permitting a facility, it is likely that it will be operated for much of its planned life and capacity.

Impact: moderate/high – it is possible that there could be a hiatus in the provision of some disposal services, which would lead to NORM wastes being stored at their place of origin. The development and permitting of alternative facilities would not be an easy thing to achieve quickly.

Measures to reduce risk: We are confident that the data provided in this strategy, and other proposals to improve the functioning of the market, will provide greater certainty to the providers of treatment and disposal capacity.

Risk: Unexpected growth in NORM arisings

Likelihood: low/moderate – We set out in paragraphs 4.5-4.14 our current understanding of the sectors most likely to give rise to increasing volumes of NORM.

Impact: moderate – for solid wastes the likely impact is that available capacity would be used up more quickly. For liquid wastes, there might be a need for storage of the wastes for a period. An ending of disposal to sea would have a significant impact on how many years capacity are available for NORM waste.

Measures to reduce risk: We are confident that the data provided in this strategy, and other proposals to improve the functioning of the market, will reduce the risk of surprises. The strategy also sets out the need for businesses to plan for their NORM wastes as an integral part of business development. This risk will be easier to manage if industry fully engages with this strategy.

Concluding comments

4.20 Effective implementation of this strategy will lead to a stronger market for NORM waste management services, better able to deal with changes to the volumes of wastes produced. The strategy is intended to be dynamic. It will continue to be developed in light of the proposed actions to clarify the regulatory arrangements, improvements in the availability of data on arisings, and the insights and experience gained by those involved in the planning and management of NORM waste across the UK.

Annex A: The Regulatory Framework

A.1 As part of the development for a NORM waste strategy, we commissioned an independent report into the legislative and regulatory framework for NORM waste in the UK. We made this report available to inform the consultation process¹⁸.

A.2 This chapter provides a high level summary of the regulatory framework that applies to the management of NORM wastes. It is not intended to be a detailed or comprehensive description of all the regulatory requirements. We also present information on the planning regime that has a critical role in ensuring availability of waste management infrastructure.

Current Regulatory and legislative framework governing NORM waste management

A.3 Radiation exposure that is imposed on the public over and above natural background is subject to regulation. The regulatory framework in the UK is derived from international standards, some of which are enacted in European and domestic law. This relationship is summarised in the table below (see Glossary for explanation of acronyms).

¹⁸ A Review of UK Legislation and Policy Relating to NORM Waste Management. Available at <http://www.scotland.gov.uk/Resource/0044/00443256.pdf>

Table 1: An illustration of the development of waste regulation from international sources.

	WHO	WHAT	Examples
Expert advisory organisations	ICRP ICRU IAEA	UNSCEAR WHO Others	ICRP 103 International BSS
International organisations	IAEA Euratom Community European Community OECD NEA Others	Instruments that are legally binding on member states + guidance & policy etc	Euratom BSSD Paris and Brussels conventions OSPAR convention Joint convention on safety of spent fuel management & safety of rad waste management
National governments	UK Gov't Devolved Administrations	Domestic legislation and policy	RSA 93 / EPR 10 LLW Policy IRR 99 REPIIR
Regulators	environment agencies HSE ONR (NII, DFT, OCNS, SAFEGUARDS)	Implement the law taking account of relevant policy and standards	Environmental permit/ RSA authorisation and associated conditions Guidance

A.4 NORM waste has not always been considered clearly or comprehensively in international standards and legislation that provides the radiation protection framework for managing radioactive wastes. This lack of uniform standards, prevalent across many EU Member State countries, is probably the main source of the ambiguities in the regulation of NORM wastes that were described in the report commissioned to inform the strategy development. In addition, certain ambiguities were highlighted which, while not causing risk to the environment or human health, create a lack of clarity and prevent the regulatory system from being fully effective in prompting the best outcomes for managing NORM waste. Despite these concerns, the report concluded that the UK has a regulatory system for radioactive waste management that is fit for purpose to protect human health and the environment.

International background to the regulation of NORM waste

A.5 The International Commission on Radiological Protection (ICRP) has worked since 1928 to develop an international system of radiological protection with recommendations and standards to underpin the development of national frameworks.¹⁹ For many years, the focus of these standards was on exposure to anthropogenic radionuclides. In the case of NORM the

¹⁹ <http://www.icrp.org/>

variable background radiation, and the difference in practices and tolerance towards NORM, slowed down the setting of international standards.

A.6 In 1996 the Euratom Community (comprising EU Member States) adopted a revised Basic Safety Standards Directive (Euratom BSS) to update the common legislative platform on radiological protection across the EU. The Euratom BSS provides flexibility for Member States in respect of activities producing NORM wastes. Negotiations on the latest revision of the BSS, which includes its consolidation with other Directives made under the Euratom Treaty relating to radiological protection, was completed in 2013. Member States adopted the revised Euratom BSS in early 2014, and it is discussed in chapter 3.

A.7 Guidance issued by the European Commission²⁰ recommends that a higher level of exposure is acceptable from NORM than for radiation from the use of artificial radioactivity before regulation is necessary. The guidance cites the ubiquity and variability of background radiation as the reason for a higher exposure limit for NORM radiation. The Commission guidance sets a dose increment in addition to background exposure from natural radiation sources of 300 μSv per year as a threshold for regulatory controls and provides concentration limits for NORM in substances that reflect this dose increment. The concentration limits also have regard to the highest concentrations found in raw ores that are subsequently processed. The UK has adopted the Commission guidance in its regulation of NORM wastes). In contrast, in separate guidance²¹, the Commission recommends a dose criterion of 10 μSv per year as the basis for regulating anthropogenic practices, such as those carried out in the nuclear industry.

A.8 Other Euratom requirements impacting on NORM waste management include those imposed by Article 37 of the Euratom Treaty and the Spent Fuel and Radioactive Waste Management Directive

OSPAR Convention and UK Discharge Strategy

A.9 The UK is a signatory of the OSPAR Convention on the protection of the North East Atlantic.

A.10 The UK Strategy for Radioactive Discharges published in 2009²² sets out how the UK implements the agreements reached at the 1998 OSPAR²³

²⁰ [Radiation Protection 122 part 2](#)

²¹ [Radiation Protection 122 part 1](#)

²² UK Strategy for Radioactive Discharges

²³ OSPAR is the mechanism by which fifteen Governments of the western coasts and catchments of Europe, together with the European Community, cooperate to protect the marine environment of

Ministerial meeting and the objectives of the OSPAR Radioactive Substances Strategy (RSS)²⁴. The scope of the discharge strategy includes aerial, as well as liquid discharges, from decommissioning as well as operational activities, and from the non-nuclear as well as the nuclear industry sectors.

A.11 The objectives of the UK Discharge Strategy are:

- progressive and substantial reductions in radioactive discharges;
- progressive reductions in concentrations of radionuclides in the marine environment resulting from radioactive discharges, such that by 2020 they add close to zero to historic levels;
- progressive reductions in human exposures to ionising radiation resulting from radioactive discharges, as a result of planned reductions in discharges.

A.12 Also relevant for the production of this strategy is the OSPAR Offshore Oil and Gas Strategy, which states OSPAR will review the disposal of all naturally occurring radioactive materials in the form of specific activity scales and sludges and, where appropriate, develop management measures to reduce the discharges of radioactive substances from offshore oil and gas activities. This was discussed at the OSPAR Offshore Industry Committee (OIC) 2013 and it was agreed that it was necessary to determine if there is any impact of NORM discharges in the marine environment, before OIC make any decision on whether to develop management measures concerning NORM.

NORM Waste Regulation in the UK

A.13 NORM waste includes wastes from NORM industrial activities and NORM wastes from the remediation of land contaminated with NORM. All of the industrial activities listed in Table 2 in Annex B generate, or have the potential for generating, NORM wastes. Different process steps give rise to different volumes and activity concentrations of NORM waste.

A.14 The main environmental legislation used to control NORM wastes in the UK is the Environmental Permitting (England and Wales) Regulations

the North-East Atlantic. It started in 1972 with the Oslo Convention against dumping. It was broadened to cover land-based sources and the offshore industry by the Paris Convention of 1974. These two conventions were unified, up-dated and extended by the 1992 OSPAR Convention.

²⁴ <http://www.ospar.org>

2010 (EPR 10)²⁵ in England and Wales and the Radioactive Substances Act 1993 (RSA 93)²⁶ in Scotland and Northern Ireland. Although the legislation is different, the regulatory systems are very similar in practice across the UK.

A.15 There is a mature regulatory framework for most NORM industrial activities. However, for some industries, e.g. unconventional gas generation, the regulatory framework is developing in preparation for the potential increase in exploration and production of shale gas. For unconventional gas, the regulatory regime is in place for exploration, and the regulatory regime for production is not expected to vary much, if at all from conventional regulation. This is discussed further in chapter 6.

A.16 The legislation requires that NORM containing wastes originating from specified industries are subject to regulation if the concentration of NORM exceeds specified values. If the concentration of NORM in the waste is less than the specified values in legislation, or the waste arises from an industry not specified in the legislation, the radioactive substances legislation does not apply. This is because government has concluded it would be disproportionate to apply radioactive substances controls to these wastes. Waste not captured by the radioactive substances legislation is known as “out of scope”. However, the provisions of other waste legislation apply to out of scope waste. The government has the power to amend the specified NORM industrial activities and the “out of scope” values if necessary.

A.17 A graded approach has been implemented for the regulation of NORM wastes above out of scope values. The management (accumulation and disposal) of some NORM wastes can be carried out under the provisions of an exemption. Exemptions are set out in legislation (often referred to as the exemption regime) and allow prescribed NORM waste practices to be carried out without the requirement to have a permit .

A.18 For NORM wastes not captured by the exemption regime or where the waste manager cannot comply with the exemption conditions, a permit will be required from the appropriate environment agency.

A.19 The out of scope values and conditional exemption values for NORM are derived from a dose (risk) of 300 µSv per year. In contrast, the values for man-made radionuclides are derived from a dose (risk) of 10 µSv per year. This approach is in keeping with the standards proposed by the European Commission referred to in paragraph A.7.

A.20 Further information on wastes that fall within the scope of the radioactive substances legislation and the rationale for this is available in

²⁵ <http://www.legislation.gov.uk/ukdsi/2010/9780111491423/contents>

²⁶ <http://www.legislation.gov.uk/ukpga/1993/12/contents>

government guidance that was issued in 2011²⁷ to support the UK exemption regime. The government guidance also provides further detail on the exemption regime as does the regulators guidance. Full guidance on the exemption regime has been produced by the environmental regulators²⁸.

A.21 Land contaminated with radioactivity is of concern if it presents a threat to the environment or if it poses risks to users of the land. Where the risk associated with contamination is above levels specified in the relevant contaminated land regulations²⁹, those responsible for the land are required to mitigate the health and environmental impacts. Below these thresholds, the planning system can require remediation if appropriate for the proposed land use as a condition of granting planning permission.

Disposal of NORM waste at near-surface disposal facilities

A.22 Joint guidance on the near-surface disposal of solid radioactive wastes was issued by the environmental regulators in February 2009³⁰. Examples of near-surface disposal facilities for NORM waste and other LLW are the Low Level Waste Repository and suitably permitted landfill sites.

A.23 The environment agencies attach limits and conditions to the permits/authorisations for the accumulation and disposal of radioactive waste that they grant. These limits and conditions are binding on waste managers and provide the means by which they regulate the development and operation of any near-surface disposal facility for radioactive waste.

A.24 The developers and operators of near-surface facilities for solid radioactive waste disposal have to demonstrate that their facilities will properly protect people and the environment. They will need to show that their approach to developing the facilities and the location, design, construction,

²⁷ Guidance on the scope of and exemptions from the radioactive substances legislation in the UK, see <https://www.gov.uk/government/publications/guidance-on-the-scope-of-and-exemptions-from-the-radioactive-substances-legislation-in-the-uk>

²⁸ Radioactive substances : joint guidance on SEPA web site at http://www.sepa.org.uk/radioactive_substances/publications/guidance.aspx

²⁹ In relation to England, these are the Radioactive Contaminated Land (Modification of Enactments)(England) Regulations 2006 (SI 2006/1379) and in relation to Wales the Radioactive Contaminated Land (Modification of Enactments)(Wales) Regulations 2006 (SI 2006/2988). DECC published guidance for England in April 2012 "The Environmental Protection Act 1990: Pt IIA, Contaminated Land, Radioactive Contaminated Land Statutory Guidance", available at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/48325/4472-draft-statutory-guidance-covering-radioactive-cont.pdf.

³⁰ Near-Surface Disposal Facilities on Land for Solid Radioactive Wastes: Guidance on Requirements for Authorisation, February 2009, available at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/296507/geho0209bpjl-e-e.pdf

operation and closure of the facilities will meet a series of regulatory principles and requirements. The guidance sets out these principles and requirements, and provides information about the associated framework of legislation, government policy and international obligations.

A.25 A key requirement is that the developer/operator of a disposal facility should produce an environmental safety case. This should show how the facility meets the requirements set out in the guidance, and show that people and the environment are protected from the hazards associated with disposals to the facility. This includes ensuring that an equivalent standard of protection from the non-radioactive properties of the waste (e.g. heavy metals) is achieved as would be required under other relevant waste legislation were the waste non-radioactive.

A.26 Provisions are in place to exempt the disposal of solid NORM waste arising from industrial activities or land remediation where the concentration of the NORM waste is less than 5Bq/g, an example being pipe scale from the offshore oil and gas sector. These low-risk activities are cases where, historically, there have been significant volumes of NORM waste disposed of, yet there are only trivial consequences in the radiation dose experienced.

A.27 There is an additional option for disposal of NORM wastes with a NORM concentration between 5 and 10 Bq/g. These can be sent to a permitted landfill site, or can be disposed of to an 'assessed landfill.' An assessed landfill is one where the disposer has provided a robust radiological assessment to the relevant environment agency which demonstrates that radiation doses are not expected to exceed 1000 μ Sv per year to workers at the place of disposal, and 300 μ Sv per year to the public. Further guidance and a template assessment in support of an application for an exemption for the landfill disposal of NORM waste is available on request from the environment agencies.

Regulatory Role of the Health & Safety Executive and Office for Nuclear Development

A.28 The Health and Safety Executive ("HSE") is the government agency responsible for enforcing regulations and legislation on health and safety, which extends to some environmental matters e.g. transport of dangerous goods, chemical hazards, toxic substances and prevention of accidents. The Radioactive Materials Transport Programme of the Office for Nuclear Regulation is responsible for regulating the transport of radioactive materials and waste by road and rail in the UK. NORM waste generated as part of the nuclear fuel cycle is regulated by ONR under the Nuclear Installations Act 1965.

A.29 The HSE enforces the Ionising Radiations Regulations 1999 which are also relevant to NORM waste. The main aim of the Regulations and the supporting Approved Code of Practice is to establish a framework for ensuring that exposure to ionising radiation arising from work activities is kept as low as reasonably practicable and does not exceed dose limits specified for individuals. This applies to exposure, whether from anthropogenic or natural radiation and from external radiation (e.g. X-ray set) or internal radiation (e.g. inhalation of a radioactive substance). The 1999 regulations therefore apply to NORM.

Regulation of Offshore Oil and Gas Industry

A.30 DECC is the UK government department with responsibility for regulating the offshore oil and gas industry. Oil and gas activities sit within the Energy Development Unit (EDU) with two separate units managing the licensing and environmental aspects of offshore oil and gas activities - Licensing Exploration and Development (EDU-LED), and offshore Oil and Gas Environment & Decommissioning (EDU-OGED).

A.31 DECC has regulatory responsibility for environmental protection from the low water mark out across the UK continental shelf and are the principal regulator for the offshore oil and gas industry for every stage of activity from licensing, to exploration, through new projects and operations to decommissioning.

A.32 DECC is responsible for the Petroleum Act 1998 and the Pollution, Prevention and Control Act 1999. The Marine and Coastal Access Act (MCAA) 2009 introduced a marine licensing system to cover those offshore energy activities that are the responsibility of DECC, and which are not excluded from the MCAA licensing provisions. The licensable activities are principally related to decommissioning operations, including activities such as disturbance of the seabed, the depositing and removal of materials and the use of explosives.

A.33 The vast majority of offshore energy activities relating to oil and gas exploration and production, gas unloading and storage, and carbon dioxide storage operations are controlled under the Petroleum Act 1998 or the Energy Act 2008, and specifically excluded from the marine licensing provisions under Part 4, section 77 of the MCAA. Therefore, operations that can be controlled under the Petroleum Act 1998 or the Energy Act 2008; or are exempted under the Marine Licensing (Exempted Activities) Order 2011, do not require a MCAA licence.

Land Use Planning: introductory comments

A.34 Land use planning in the UK is a devolved matter and separate planning policies and guidance frameworks are in place.

A.35 The planning system in the UK has traditionally not placed a significant emphasis on planning for radioactive wastes, including NORM. This has been as a result of low awareness of the issue and the paucity of clear strategic evidence. This draft strategy provides evidence that NORM waste generating industries are distributed across the UK, although they tend to be concentrated in certain areas where specific industrial sectors are located. There is a need to accommodate both operational and decommissioning arisings of NORM waste so that decisions can be made on a sustainable basis.

A.36 Planning helps shape the places in which people live and work and offers local communities real opportunities to influence how they want their area to develop. It operates through a system of plan preparation and control over the development and use of land. The statutory framework for forward planning differs in detail across the UK and is set out below, but there is a requirement that those preparing plans should take into account the waste management needs of their area, including for LLW. Together with national policy, regional and local plans where available are material to decisions on individual planning applications and when they form part of the statutory development plan have added weight. We consider that planning authorities should work with the environment agencies, the non-nuclear industry radioactive waste producers and operators of disposal facilities in shaping planning strategies that ensure the provision of suitable opportunities for the management and disposal of non-nuclear industry LLW and VLLW.

A.37 We see the planning system playing a pivotal role in the adequate provision of properly located waste facilities to meet national needs and move waste management up the waste hierarchy. A key role of this strategy is to provide information to support this process. The remit of waste planning authorities through planning legislation and relevant national planning policy is to ensure that land proposed for a particular waste management activity is suitable for that activity. A new or expanded waste facility cannot be operated without first obtaining both planning permission and an environmental permit (and any other relevant consents).

Land Use Planning: England

A.38 National waste planning policy is contained in Planning Policy Statement 10 Planning for Sustainable Waste Management (PPS10). This provides a positive framework to enable local authorities to prepare local plans that deliver sufficient opportunities for new waste management facilities in their areas. PPS10 and local plans contribute towards forming a wider national waste management plan to meet the requirements of the revised EU Waste Framework Directive. PPS10 is currently subject of review, with updated national waste planning policy (which has been subject to public consultation) due to be published in summer 2014. However, the intended updated policy will maintain the core planning approach to that currently set out in PPS10.

A.39 PPS10 restates the 'plan led' approach to planning for sustainable waste management. This, through the National Planning Policy Framework (NPPF), places the local plan as the keystone of the planning system and against which all individual planning applications will be judged. In formulating local plans, waste planning authorities take account of total waste arisings against current capacity, and therefore have an interest in the waste streams that may be consigned to particular waste facilities in their area.

A.40 The National Policy Statement for Hazardous Waste provides a framework for planning decisions on nationally significant infrastructure projects. Facilities which are mainly for the purpose of the final disposal or recovery of radioactive waste are not within scope. However, proposals for the development of hazardous waste facilities that might handle a relatively small proportion of low level radioactive waste alongside hazardous waste are within the scope where they also meet the definition of a nationally significant infrastructure project.

A.41 Many current waste plans currently focus primarily, but not exclusively, on Local Authority Collected and Commercial and Industrial wastes. Waste planning authorities are nonetheless expected to plan for the sustainable management of waste in their areas, including waste streams such as low level radioactive waste, as are set out in DCLG "Guidance for local planning authorities on implementing planning requirements of the European Union Waste Framework Directive (2008/98/EC)". Typically, older style local waste plans have not explicitly addressed radioactive waste. This has been for a variety of reasons, perhaps most significantly the lack of a nationally definitive statement or evidence on strategic needs. This situation is changing through the production of new, or the updating of existing, local waste plans by waste planning authorities.

A.42 Strategic matters were formally addressed in the planning system by regional plans, with PPS10 encouraging regional planning bodies to consider evidence on strategic waste arisings and capacity requirements as collaged by the Regional Technical Advisory Boards. The Localism Act 2011 made provision for the abolition of regional strategies and introduced the requirement for the Duty To Co-Operate in relation to planning of “strategic”, cross-local authority boundary, planning matters. Waste has been identified as a strategic matter in the National Planning Policy Framework. The evidence presented in this document will be an important part of setting out the scale of the issue to be addressed by the Duty to Co-Operate. This means that LLW may need to be considered at a greater than local level. While this is not a “duty to agree”, it is a fundamental requirement of plan making. Authorities who do not take a positive and on-going approach to this issue, and so are unable to demonstrate how they have complied with the Duty at the independent examination of their local plans, will find that they are not be able to proceed further to adopt their draft plan. In light of this strategy waste planning authorities should actively consider what scale of NORM waste they need to plan for, including potential waste movements from other areas.

Land Use Planning: Wales

A.43 The general planning policy framework in Wales is provided by Planning Policy Wales/Minerals Planning Policy Wales (PPW/MPPW) and Technical Advice Note 21 Waste (TAN 21). PPW and TAN 21, in particular, set the context for the preparation of Local Development Plans and for decision making in relation to waste proposals as part of a plan-led approach. Along with local authority development plans PPW and TAN 21 form part of the wider national waste management plan in Wales required to meet the obligations set out in the revised EU Waste Framework Directive.

A.44 To date, local planning authorities in Wales have also collaborated to produce Regional Waste Plans as a means of facilitating the provision of infrastructure necessary to accommodate waste arisings across all waste streams. These plans have provided information on both the types of waste facilities required in a region and the types of locations likely to be acceptable. The outcomes have been implemented through each local authority’s development plan. However, the publication of new waste policy in Towards Zero Waste has signalled a new approach based on a Wales-wide strategic waste assessment through the provision of a Collections, Infrastructure and Markets Sector Plan and adjustments are currently being made to the planning framework to reflect this.

A.45 Radioactive wastes have traditionally not been explicitly addressed by either Regional Waste Plans or development plans and do not feature as part of the latest Wales-wide waste assessments. This has largely been due to the lack of a definitive UK statement raising radioactive waste as an issue and the lack of evidence to date on strategic needs.

A.46 NORM waste generating industries are distributed across the UK, although they tend to be concentrated in certain areas where specific industrial sectors are located. There is a need to accommodate both operational and decommissioning arisings of NORM waste. Collaborative monitoring arrangements are set to form a key part of revised waste planning approaches in Wales and this should provide a mechanism to account for any new evidence on NORM arisings which may come forward and for making any necessary adjustments to waste planning approaches.

Land Use Planning: Northern Ireland

A.47 Planning Policy Statement 11 “Planning and Waste Management” (PPS11) sets out the Department of the Environment’s policies for the development of waste management facilities, and explains the relationship between the planning system and those authorities responsible for the regulation and management of waste. The Department is currently undertaking a comprehensive consolidation and review of existing planning policy in order to bring forward a single planning policy statement in advance of the transfer of planning powers to District Councils in 2015 as part of the larger Local Government Reform Programme.

A.48 In accordance with the requirements of Article 23 of the Waste and Contaminated Land (Northern Ireland) Order 1997, each of the District Councils must prepare a statement (the Plan) of arrangements made and proposed to be made for the recovery, treatment and disposal of controlled wastes arising in their districts. Three regional waste management groups, representing the District Councils, have prepared Waste Management Plans that cover the whole of Northern Ireland and contain information on the type, scale and locations of waste facilities that will be required during the period of the Plans. In doing so they must take account of the Department’s Waste Management Strategy that sets out its policies in relation to the recovery and disposal of waste in Northern Ireland. Together with the Strategy, they form part of the wider national waste management plan required to meet the obligations set out in the revised Waste Framework Directive.

A.49 The Department has recently published a revised Waste Management Strategy (“Delivering Resource Efficiency”) and the three Waste Management Plans are being revised accordingly. Historically, Northern Ireland has not been host to NORM waste generating industries, therefore at this time NORM waste has not been explicitly addressed in either the Department’s waste strategy or the Councils’ plans. Should any new evidence of NORM waste management requirements come forward, the Department of the Environment will work with District Councils to consider adjustments to waste planning approaches.

Land Use Planning: Scotland

A.50 In Scotland, there are two key documents that inform the planning system, the National Planning Framework and Scottish Planning Policy (SPP). Both of these documents have been revised and new versions published in June 2014.

A.51 Scotland’s Scottish Zero Waste Plan (ZWP) sets out how planning decisions can support the move to zero waste for Directive wastes. There is additional guidance on planning and waste contained in Planning Advice Note (PAN) 63. PAN 63 is being redrafted to supplement SPP and ZWP. This will include coverage of planning for provision for treatment and disposal capacity for LLW.

A.52 It is clear that some of the longest journeys taken by NORM wastes in the UK are from Scottish sources to disposal facilities in England. This is inefficient and potentially increases the vulnerability of valuable Scottish business sectors to changes in the availability of disposal resources. However, it is not clear that the gaps in disposal provision in Scotland are caused by the planning system, rather than by the reluctance of providers in coming forward with proposals to develop capacity.

Annex B: NORM Waste Arisings and Treatment Routes

B.1 An extensive data collection exercise was carried out during 2013 in support of the development of this strategy. The results of this exercise were reported in the consultation paper and in an accompanying Data Collection Report.

NORM waste producing sectors

B.2 Table 2 below reproduces the list of NORM industrial activities set out in the UK radioactive substances legislation. The table indicates which NORM industrial activities have been identified as being present in the UK and which of those produces NORM wastes which are in scope of the legislation. Wastes which are in scope of the legislation are those which are legally classed as “radioactive waste” and are subject to some form of regulatory controls.

Table 2: NORM industrial activities and their presence in the UK

NORM industrial activity listed in legislation	Present in UK	Produces in-scope NORM wastes
Production and use of Thorium or Thorium compounds, and the production of products where thorium is added	Yes	Yes
Production and use of Uranium or Uranium compounds, and the production of products where uranium is added	Yes	Yes
Extraction and production/use of rare earth elements	No	-
Mining and processing of ores other than Uranium	Yes	None identified
Production of oil and gas	Yes	Yes
Removal and management of radioactive scales and precipitates from equipment associated with industrial activities	Yes	Yes
Any industrial activity utilising phosphate ore	No	-
Manufacture of Titanium dioxide pigments	Yes	Yes
Extraction and refining of zircon and manufacture of zirconium compounds	Yes	-
Production of:		
- Tin,	No	-
- Copper,	No	-
- Aluminium,	Yes	None identified
- Zinc,	No	-
- Lead,	No	-
- Iron and steel	Yes	Yes
Coal mining dewatering	Yes	None identified
Water treatment for drinking water	Yes	None identified
China Clay extraction	Yes	Yes
Management of NORM contaminated land	Yes	Yes

B.3 In general, NORM industrial activities can be separated into three groups.

- Those that use radioactive substances for their chemical or physical properties (use of uranium and thorium compounds)
- Those that generate radioactive waste as a by-product of extracting wanted substances from natural minerals and ores (iron or titanium dioxide production)
- Those that result in radioactive substances being moved from one part of the environment (generally deep underground) into parts of the environment where they would not normally be found. (extraction of oil and gas, coal mine de-watering)

Description and estimates of current NORM wastes being generated

B.4 Table 3 provides a high level summary of the different types of in scope NORM waste that each type of industrial activity generates. It should be noted that there are a number of uncertainties in the data presented in Table 3. The estimates are based on replies to the data collection process and there is uncertainty whether the estimates are correct or are higher or lower than actual quantities. In particular:

- the data for the offshore oil and gas industry is based on operator reports which make no distinction between exempt and non-exempt wastes,
- radioactive wastes may be treated and conditioned by adding non-radioactive material (particularly oil and gas and china clay waste). Such treatment may result in non-exempt wastes being re-classified as exempt radioactive wastes,
- the onshore oil and gas data is based on data from the largest onshore facility; this facility does not make disposals every year,
- some data may be based on limit of detection measurements,
- some responses to the consultation exercise suggested that there was more waste than had been captured in the data collection exercise.

Gaseous waste – current

B.5 All three UK iron and steel facilities and a condensate refinery were identified as holding permits to dispose of gaseous wastes directly to the atmosphere. No gaseous NORM waste related issues have been identified.

Liquid waste – current

B.6 Three industry sectors have been identified that generate liquid NORM wastes. The most significant of these is the oil and gas industry which generates in excess of 200 million cubic metres of produced water every year. The majority of this waste stream arises offshore and installations are permitted to discharge produced water directly to sea or re-inject back into the seabed or hydrocarbon bearing formation where suitable facilities exist. Some liquid wastes streams contain concentrations of oil that prevent disposal at sea – such wastes must be sent to shore for treatment. Respondents to the data collection process indicated that onshore disposal of produced water from oil and gas installations was becoming a problem because of a lack of permitted wastewater treatment facilities. We do not have sufficient information to confirm this.

B.7 One of the titanium dioxide manufacturers is permitted to dispose of significant quantities of liquid waste. Disposal of this waste stream is to the Humber Estuar

B.8 The final industry making discharges of NORM liquid wastes are those businesses using small quantities of uranium and thorium compounds. The quantities being disposed of are small enough that they may be disposed of to sewer under the provisions of the UK exemption order regime. No issues impacting on their NORM waste management have been identified.

Table 3: Summary of types of NORM waste produced by industrial activities in the UK

Industrial sector	Number of facilities in UK	Description of waste	Quantity per year	Main radionuclide and typical concentration	Average Total Activity	Permitted or exempt	Main disposal methods
Thorium coated lens manufacturers	1	Solid: mixed solid waste	~ 1000 kg	Th-232 < 50 Bq/g	up to 50 MBq Th-232	Permitted	currently sent to LLWR
Academic uses of U and Th compounds	100s	Solid: U and Th compounds	few kg	U-238 and Th-232		Exempt	Burial or incineration
		Liquid: containing U and Th	few kg	U-238 and Th-232		Exempt	Sewer
Oil and gas industry – Offshore	>100 operational installations	Solid: scales sludge etc	~ 800 tonnes	Ra-226, Ra-228, Pb-210	~ 6 GBq Ra-226	Mixture	Direct to sea, burial or incineration
		Liquid: mainly produced water	~ 200 million m ³	Ra-226 ~ 2 Bq/l Ra-228 ~ 1 Bq/l	~ 0.3 TBq Ra-226 ~ 0.2 TBq Ra-228	Permitted	Direct to sea or reinjection

Industrial sector	Number of facilities in UK	Description of waste	Quantity per year	Main radionuclide and typical concentration	Average Total Activity	Permitted or exempt	Main disposal methods
Oil and gas industry –Onshore	29 oil fields 7 gas fields	Solid: scales sludge etc	Up to 20 tonnes	Pb-210, Po-210 Ra-226,	1-2 GBq Pb-210	Mixture	Burial or incineration
		Liquid: mainly produced water	~ 12 million m3	Ra-226 ~ 2 Bq/l Ra-228 ~ 1 Bq/l		Permitted	reinjection
Titanium dioxide	2	Solid: filter cake	~ 200 000 tonne	U-238 sec, Th232 sec	> 50 GBq U238	Exempt or out of scope	Burial
		Solid - filter cloths	~ 10 tonnes	Ra-226	~ 1 GBq Ra-226	Permitted	currently sent to LLWR
		Liquid - effluent	3-4 million m3	Th-232 sec; U-238sec	~ 1 GBq Th-232 ~ 0.6 GBq U-238	Permitted	Discharge to estuary
Zirconia	>1	Solid: magnesium dross	~40 kg	Th-232	~232 MBq Th-232	Mixture	Burial

Industrial sector	Number of facilities in UK	Description of waste	Quantity per year	Main radionuclide and typical concentration	Average Total Activity	Permitted or exempt	Main disposal methods
Production of iron and Steel	3	Solid: hydrocyclone overflow filter cake	~ 10 000 tonnes	Pb-210~ 10 Bq/g Po-210 ~ 6 Bq/g	This residue can be blended with other residues to enable use as a feedstock by cement industry. Otherwise burial		
		Gas - effluent		Po-210, Pb210	Each site has its own permitted limits	Permitted	Discharge to atmosphere
Extraction of china clay	18	Solid		Ra-226, Ra-228		Mixture	Burial
Management of contaminated land	Unknown	Solid: soil, rubble and discreet radioactive items or	Highly variable	Ra-226 from a few Bq/g to 1000s of Bq/g	Highly variable	Mixture	Burial

Solid waste – current arisings

B.9 The sectors producing the largest quantities of solid NORM waste in terms of mass generated per year are the titanium dioxide industry (~ 200 000 tonnes), the steel industry (~ 10 000 tonnes) and the oil and gas industry (~ 800 tonnes). However, this does not reflect the quantities of waste that are sent to specialist facilities that are permitted to manage radioactive waste.

B.10 The vast majority of the solid waste (the filter cake component) produced by the titanium dioxide industry contains very low concentrations of radioactivity meaning that it is either not classed as radioactive waste or that it can be disposed of as exempt waste to a non-permitted facility under the provisions of the radioactive substances exemption regime. Similarly, the steel industry do not currently dispose of any radioactive waste to specialist radioactive waste facilities, as these residues are being utilised as a source of raw materials by other industries or are stored with the intention of recovering more iron from the waste. Of the 800 tonnes of NORM waste generated by the oil and gas industry a significant proportion of this is currently disposed of directly to sea; the average quantity of NORM waste sent for management on shore in the period 2007-2011 was around 160 tonnes containing 4.2 GBq of radium-226.

B.11 Table 4 presents estimates of the annual quantities of solid NORM waste generated that currently require management at specialist facilities that are permitted to manage radioactive waste. There remain some uncertainties about these estimates.

Table 4 Estimates of annual NORM solid waste requiring specialist treatment or disposal

Industry	Waste type	Approximate quantity in tonnes per year	Approximate total activity per year
Oil and gas – offshore	Scales and sludge May be hazardous due to heavy metal and hydrocarbon content	~ 160	~ 4 GBq Ra-226 ~ 2 GBq Ra-228 ~ 0.3 GBq Pb-210
Oil and gas – onshore	Scales and sludge May be hazardous due to heavy metal and hydrocarbon content	< 20	< 0.05 GBq Ra-226 < 1 GBq Pb-210+
Titanium dioxide	Filter cloths	~ 10	~ 1 GBq Ra-226
China clay	Scale		
Zirconia industry	magnesium dross	~0.04	~232 MBq Th-232
Thorium coated lens manufacturer	Mixed solids	~ 1	~ 0.05 GBq Th-232
Contaminated land	Soil, building rubble, discrete items	Very variable	Very variable but anticipated to be less than 1 GBq Ra-226
Total		< 300 tonnes	< 6 GBq Ra-226 ~ 2 GBq Ra-228 ~ 1 GBq Pb-210 ~ 232 MBq Th-232

Estimates and uncertainties of future waste estimates

B.12 As part of the data collection exercise, the industries generating NORM waste were asked if they anticipated any change to the amount of types of wastes generated. Information is presented below on a sector basis, grouped where factors influencing future waste management are common.

Iron and steel, titanium dioxide and zirconium industries

B.13 Those industries that import and process raw materials (steel and titanium dioxide) noted that global competition for ores with the lowest amount of impurities affects the characteristics of the waste that they generate. As competition increases it is likely that ores with higher natural radionuclide content will be sourced in the future, which will in turn generate wastes with high radionuclide content. The largest impact may be on the titanium dioxide industry and may result in all its waste generated being classified as in scope and thus requiring to be regulated under radioactive substances legislation. If this were to happen, the impact could be mitigated if results of the radiological assessment confirm that the does to the public from the ‘assessed landfill’ disposal route remain low. As the global economic situation recovers from recession it is also likely that demand for titanium dioxide products will increase which could in turn increase the quantities of waste generated.

B.14 In the case of the steel industry, it is also possible that the concentrations of NORM radionuclides in the gaseous discharges may increase if poorer quality raw materials are used. However, high temperature incinerator operators have informed us that there is sufficient flexibility in the permits to manage any future increase in discharges as a result of such changes.

B.15 The steel industry highlighted two issues that may change the quantities of waste they generate that may require specialist management. The first was that, should there be any change in regulatory attitudes allowing the blending of filter cake, this could result in an additional 10 000 tonnes of non-exempt waste requiring disposal per year under an environmental permit. The second issue is that consideration is being given to investing in a new plant which will allow iron recovery from some existing residues, thereby reducing the amount of raw material imported and minimising the quantity of waste requiring disposal. One potential negative impact of this new plant would be to increase the concentration of NORM in the steel residues. Metals in the residues may be recovered and sent to other industries as a source of raw material, otherwise the residues would require appropriate management as radioactive waste.

“Conventional” oil and gas industry

B.16 The quantity of NORM waste generated by the oil and gas industry is very much dependent on the continued economic viability of oil and gas extraction. This in turn is dependent on the ease of extracting the oil and gas, the price of oil and gas and the relevant government tax regimes. All of these factors mean that it is difficult to predict when an installation will cease production. Once an oil and gas installation ceases production, routine operational wastes will cease to be generated. However there will be a quantity of decommissioning wastes produced. It is very difficult to predict the quantities and characteristics of NORM wastes that will arise from decommissioning offshore and onshore installations, due to the limited number of oil and gas installations that have been decommissioned to date.

B.17 Another significant influence on the quantity of NORM wastes requiring treatment and disposal in specialist onshore radioactive waste management facilities is the acceptability of current offshore management practices. Any change regarding the acceptability of offshore disposal of NORM waste direct to sea would result in a significant increase of NORM waste brought to shore for treatment and disposal.

“Unconventional” oil and gas industry

B.18 The “unconventional” gas industry, which includes extraction of shale gas and coal bed methane, is still in its infancy in the UK and therefore it is difficult to predict with any confidence, at this stage, how much NORM waste will be generated or what its characteristics will be until more exploratory drilling and analysis is undertaken.

B.19 We anticipate the quantities of solid waste generated will be consistent with the onshore oil and gas industry and can be managed using the same treatment and disposal routes.

B.20 There is also a large uncertainty regarding the quantity and radiological characteristics of liquid waste (known as flow back waters) that will be generated from shale gas extraction that uses hydraulic fracturing. The radiological characteristics will be greatly influenced by the specific geology that is being exploited. Evidence from the US and preliminary results from exploration activities in the UK suggests that the concentrations of natural radionuclides in the liquids will be higher than those found in “conventional” produced waters.

B.21 The quantities of liquid NORM waste generated will depend on the number of shale gas extraction wells and whether or not there is any possibility of re-using the flow back water. It is very likely that some on-site or bespoke treatment facilities will be required to manage this water. The oil and gas industry is currently looking at the capacity for treatment and disposal facilities as part of its planning for shale gas.

Land Contaminated with NORM

B.22 It is almost impossible to predict how much waste will be generated from the management of land contaminated with NORM. It is highly dependent on how many and at what time contaminated sites are identified, the characteristics of contamination, when it is decided to remediate them and what remediation or clean-up standards are selected.

Conclusion on NORM waste arisings

B.23 Uncertainties in future NORM waste generation can be attributed to lack of data and the effects of legislation, policy and regulatory interpretation, These issues are considered in this strategy. However for the purpose of estimating future NORM waste arisings, the best estimate that can be made is an expectation that the quantities and activities of NORM waste is likely to increase in the next five years.

Treatment and disposal routes for NORM waste

Treatment of Solid Scales, Sludges etc

B.24 NORM waste is often treated prior to disposal. Solid NORM waste includes scale, sludges and sand that precipitate on the internal surfaces of plant and equipment during oil and gas extraction or is an unwanted by-product following the processing of minerals or metal ores. Scale deposits produced during offshore oil and gas production tend to be thicker than those generated in onshore gas production where thin scale deposits and thin films are more common. Also, the quantities of NORM scale produced in onshore oil and gas fields tend to be lower than that generated in offshore oil and gas production.

B.25 Current practice on offshore installations is to remove as much scale as possible. This scale is usually macerated to reduce its particle size before it is disposed of directly to sea or is re-injected where facilities allow. Only scales that are inaccessible or cannot be disposed of to sea due to other chemical or physical properties are brought onshore for treatment and then disposal. Chemical treatment to dissolve scales is also carried out on routine basis for downhole applications..

B.26 Some oil and gas NORM contaminated plant and equipment requires to be brought ashore to be cleaned to remove the NORM scale deposits to improve process efficiency. These scale deposits build up on downhole and topside process equipment including tubulars, pipework, valves, spools and process vessels. After its removal, the scale can be disposed of to landfill.

B.27 Descaling to remove NORM scale from contaminated pipes, equipment and machinery is a mature treatment technology used in the UK where the NORM scale removed is then treated and disposed of. The pen portraits give further details of companies who offer services to remove NORM scale from contaminated pipes, equipment and machinery before it is returned for continued usage, or disposed of.

B.28 Most companies offer descaling services on a commercial basis to a range of other industries, but one company uses in-house facilities to descale contaminated equipment of NORM waste produced from the extraction of china clay. Most of the NORM scale removed is then treated and disposed of as exempt waste to a local landfill.

B.29 Most descaling companies use high pressure water jetting to remove the thick scale that deposits and entrains on the surface of pipework and equipment used in NORM industries. However, there is a new method known as a “dry” process where contaminated metallic components are size reduced and decontaminated by shot blasting.

Treatment of Land Contaminated with NORM Radionuclides

B.30 For NORM wastes arising from the management of land contamination, if treatment is carried out it tends to be methods to remove the NORM radionuclides from soil using simple in situ treatment methods such as soil washing and filtration to strip out the NORM radionuclides. Waste encapsulation is also a commonly used treatment method for isolating and leaving wastes in-situ.

High Temperature Treatment

B.31 If the NORM waste contains combustible materials, high temperature techniques such as incineration, plasma arc etc can be used. Incineration is particularly useful for treating sludges.

B.32 Incineration is sometimes referred to as a disposal option for combustible wastes because it reduces NORM waste volumes; volume reductions of 90% are quoted by incineration service suppliers. It should be noted, however, that incineration results in the generation of volumes of ash, with higher radionuclide concentrations, which then require final disposal (generally to landfill). In line with the waste hierarchy, there should be a preference for incineration that incorporates energy recovery.

B.33 Incineration requires any volatile radionuclides dispersed in incinerator gases to be captured in the gaseous abatement system. For that reason, incinerators taking non-exempt NORM waste require to be permitted by the environment agencies. The non-volatile radionuclides are transferred and then remain in the incinerator ash. In order to control the amount of radioactivity in the ash or residues, the environmental permit includes limits on the amount of radioactivity in the waste. In all cases the permit will include a condition that the volume and activity of waste discharged should be minimised. All the facility operators contacted said that their capacity to take NORM waste was not constrained by their environmental permit. Two operators said that the ash generated as a by-product of the incineration process is sent to landfill for disposal as exempt radioactive waste.

Treatment of Liquid NORM Wastes

B.34 Treatment of liquid NORM wastes onshore uses conventional wastewater treatment methods to remove oil and the NORM radionuclides. The primary route for disposal of liquid waste is through the sewerage system. Disposal of liquid radioactive waste in this way follows the principle of dilute and disperse.

B.35 Offshore, where possible and practicable, produced water is disposed of by reinjection beneath the seabed. Re-injection is used on those installations that have

appropriate facilities and equipment, and where it is geologically acceptable. However, the majority of produced water is disposed direct to sea in accordance with an environmental permit because most installations do not have suitable reinjection capabilities or an acceptable geological formation.

B.36 Some liquid wastes have properties (e.g. oil content is too high) that mean that they cannot be discharged directly to sea. Such wastes must be sent onshore for treatment and subsequent disposal.

B.37 There is some evidence that onshore treatment and disposal of produced water is becoming an issue for some industries (particularly oil and gas production) who generate NORM waste which cannot be classed as exempt radioactive waste. Information obtained by the data collection process is that, within the UK, there are only three facilities permitted to store NORM wastes and two facilities permitted to discharge liquid NORM radionuclides. Another issue is that NORM wastes produced during oil and gas production tend to contain organic hydrocarbons and inorganic heavy metals such as cadmium and, particularly, mercury. Thus, liquid NORM waste treatment often requires use of a combination of different processing techniques to remove the organic and inorganic elements.

B.38 If the market for extracting unconventional gas expands as predicted, it is likely to increase the volume of liquid NORM waste generated. On site treatment options may be feasible, but there may also be a need for some liquid NORM to be sent to specialist NORM wastewater treatment service suppliers.

Treatment of Gaseous NORM Wastes

B.39 Gaseous treatment of NORM wastes tends to use hydrocyclones, filtration, etc. There is a relatively small amount of airborne or gaseous radioactive waste discharged from premises where NORM industrial activities are carried out.

Disposal Options

B.40 Most NORM waste is disposed of as exempt radioactive waste in landfills that are permitted to accept controlled wastes³¹. The UK exemption regime requires those disposing of exempt waste to keep an adequate record of the NORM waste which is disposed of on or from any premises. The exemption allows disposal of exempt waste along with non-radioactive wastes, or it can be sent to an operator who has the appropriate permit to treat or dispose waste.

³¹ Controlled waste is defined in the Environmental Protection Act 1990 and the Controlled Waste Regulations 1992 as household, industrial and commercial waste or any such wastes that require a waste management licence for treatment, transfer or disposal.

B.41 Predominantly, there are three separate disposal routes for NORM wastes generated by the offshore industry.

- Disposal by discharge to sea (subject to the appropriate permit)
- Disposal by reinjection down a disposal well to an acceptable geological formation or depleted reservoir used to extract oil and gas
- Disposal by sending to shore

B.42 The disposal option determines whether or not NORM contaminants have to be removed prior to disposal. Disposal options are limited and depend on the location of the NORM decontamination operations. Prior to disposal to sea or disposal by reinjection, oil contaminants are removed from the NORM waste which is then macerated using specialist equipment to a particle size of 1000 microns or less prior to disposal.

B.43 Produced water generated offshore is either re-injected down the production well or is discharged direct to sea in accordance with an environmental permit which requires the operator to notify the relevant environment agency where the concentration of radium-226 in the produced water being discharged to sea exceeds 0.1Bq/ml.

B.44 Offshore reinjection of NORM scale, produced water and drill cuttings negates the need for transportation and onshore treatment and subsequent disposal of the NORM waste. The OSPAR Treaty prevents waste treated onshore being taken back offshore for disposal by reinjection. Onshore, reinjection of NORM waste is also used.

Adequacy of NORM waste treatment and disposal capacity

B.45 Comparison of the information on NORM waste arisings and current landfill capacity suggests that there is no immediate disposal capacity problem for solid, non-hazardous NORM containing waste. The same can be said for NORM waste that has hazardous substances, however, there is only one landfill site in the UK that can take hazardous NORM waste making this disposal route fragile.

B.46 Operators of all four landfills that are permitted to accept NORM waste operate under planning conditions concerning how they accept and consign waste; these usually impose requirements on NORM waste providers that all consignments should have a total NORM radioactivity concentration less than 200Bq/g. Thus, it may be that it is the activity concentration of the NORM waste and not the landfill disposal capacity that has the biggest impact on NORM waste disposals. A common regulatory practice is to impose monthly activity limits on what can be accepted at

the landfill. This could also have an impact where various NORM waste producers want to dispose their NORM waste at the same time.

B.47 Uncertainty regarding future volumes of liquid NORM waste means it is unknown whether there will be sufficient capacity for the treatment and disposal of such waste. This situation will need to be monitored during the life of the strategy and further data will be reviewed at the appropriate time.

Glossary

BSS (Basic Safety Standards) Directive In 1996 the Euratom Community (comprising EU Member States) adopted a revised Basic Safety Standards Directive (Euratom BSS) to update the common legislative platform on radiological protection across the EU. The BSSD was revised again and adopted in early 2014. Members States have to implement it by February 2018.

DECC (Department of Energy and Climate Change) The UK Government Department with responsibility, *inter alia*, for policy on radioactive waste in England. For the UK's role in international law and agreements on radioactive waste, and for regulation of the offshore oil and gas sector.

EA (Environment Agency) The environmental regulator for England. The Agency's role is the enforcement of specified laws and regulations aimed at protecting the environment, in the context of sustainable development, predominantly by authorising and controlling radioactive discharges and waste disposal to air, water and land. The Environment Agency also regulates nuclear sites under the Environmental Permitting Regulations and issues consents for non-radioactive discharges.

EEMS The Environmental Emissions Monitoring System (EEMS) is the environmental database relating to the UK offshore oil and gas industry. DECC, as the main environmental regulator of the offshore oil and gas industry, is ultimately responsible for EEMS, and controls access to the system. The offshore oil and gas industry is required to report accurate, timely and consistent data. This allows DECC to carry out the necessary monitoring and reporting on the environmental performance of the offshore oil and gas industry.

EPR (Environmental Permitting Regulations) 2010 The legislation for permitting of activities involving the keeping, treatment and disposal of radioactive waste in England and Wales

Euratom The Euratom Treaty establishing the European Atomic Energy Community (Euratom) was created to facilitate the peaceful use of nuclear energy. The Euratom Treaty today helps to pool knowledge, infrastructure, and funding of nuclear energy. It ensures the security of atomic energy supply within the framework of a centralised monitoring system.

HSE (the Health and Safety Executive) is the national independent watchdog for work-related health, safety and illness.

IAEA The International Atomic Energy Agency.

ICRP The International Commission on Radiological Protection (ICRP) is an advisory body providing recommendations and guidance on radiation protection.

ICRU The International Commission on Radiation Units and Measurements.

ILW Intermediate Level Radioactive Waste.

LLW Low Level Radioactive Waste.

LLWR The national Low Level Waste Repository, managed by the NDA.

NDA Nuclear Decommissioning Authority.

NORM Naturally Occurring Radioactive Materials arise naturally in the Earth's crust as a result of radioactive elements created through cosmic processes, and radionuclides created through radioactive decay of these elements.

NRW (Natural Resources Wales) Natural Resources Wales (NRW) was created in 2013 with a mission to ensure that the environment and natural resources of Wales are sustainably maintained, enhanced, and used, now and in the future. Regulation of business and industry are amongst its statutory responsibilities. This includes the regulation of the disposals of radioactive wastes from nuclear sites, as well as other premises in Wales. All permits relating to sites generating or disposing of radioactive waste in Wales are issued by NRW. Compliance with these permits at nuclear sites is currently carried out by the Environment Agency specialists on behalf of NRW, however, enforcement is undertaken directly by NRW.

OECD NEA The Nuclear Energy Agency (NEA) is a specialised agency within the Organisation for Economic Co-operation and Development (OECD), an intergovernmental organisation of industrialised countries, based in Paris, France.

ONR The Office for Nuclear Regulation (ONR) independently regulates nuclear safety and security at nuclear licensed sites in the UK. It also regulates the transport of radioactive materials and works closely with the IAEA and European Commission to ensure that the UK's safeguarding obligations are met.

OSPAR The Convention for the Protection of the Marine Environment of the North-East Atlantic or OSPAR Convention is the current legislative instrument regulating international cooperation on environmental protection in the North-East Atlantic.

Permit used generally in this strategy to refer to a permit or other form of authorisation issued by the relevant environment agency under the relevant legislation for the activity and country.

Produced water is a term used in the oil industry to describe water that is produced as a byproduct along with the oil and gas. Oil and gas reservoirs often have water as well as hydrocarbons, sometimes in a zone that lies under the hydrocarbons, and sometimes in the same zone with the oil and gas. Oil wells sometimes produce large volumes of water with the oil, while gas wells tend to produce water in smaller proportion.

RCL Radioactive Contaminated Land.

RWI UK Radioactive Waste Inventory, maintained by the NDA
<http://www.nda.gov.uk/ukinventory/>

RSA 93 Radioactive Substances Act 1993.

RP 122 European Commission guidance, Radiation protection 122, on the BSS Directive clearance and exemption levels.

SEA Strategic Environmental Assessment.

SEPA Scottish Environment Protection Agency.

UNSCEAR The United Nations Scientific Committee on the Effects of Atomic Radiation.

Waste Hierarchy The preference for waste prevention over minimisation over re-use over recycling over disposal.

WHO World Health Organisation.



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