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

The Scottish Government
Riaghaltas na h-Alba

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Department of Energy & Climate Change

The Scottish Government
Riaghaltas na h-Alba

Llywodraeth Cymru
Welsh Government

DOE

How to respond

We are inviting written responses to this consultation paper by 8 May 2014. The consultation is being coordinated by the Scottish Government, but all responses will be shared with the other three governments. Please send your response with the completed Respondent Information Form to:

NORMStrategy@scotland.gsi.gov.uk

or

Radioactive Waste and Nuclear Decommissioning Policy
Environmental Quality Division
Directorate for Environment and Forestry
The Scottish Government
1-D North, Victoria Quay
Edinburgh
EH6 6QQ

If you have any queries contact:

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We would be grateful if you would use the consultation questionnaire provided or could clearly indicate in your response to which questions or parts of the consultation paper you are responding, as this will aid our analysis of the responses received. This consultation can be viewed online on the consultation web pages of the Scottish Government website at http://www.scotland.gov.uk/consultations.

We need to know how you wish your response to be handled and, in particular, whether you are happy for your response to be made public. Please complete and return the Respondent Information Form which forms part of the consultation questionnaire, as this will ensure that we treat your response appropriately. If you ask for your response not to be published we will regard it as confidential, and we will treat it accordingly.

All respondents should be aware that the Scottish Government are subject to the provisions of the Freedom of Information (Scotland) Act 2002 and would therefore have to consider any request made to it under the Act for information relating to responses made to this consultation exercise. The other governments jointly releasing this paper are also subject to freedom of information legislation.

Where respondents have given permission for their response to be made public and after we have checked that they contain no potentially defamatory

material, responses will be made available to the public in the Scottish Government Library (see the attached Respondent Information Form). Arrangements will be made to allow easy access to the responses across the UK.

Following the closing date, all responses will be analysed and considered along with any other available evidence to help us finalise the NORM waste strategy. We aim to publish the finalised NORM waste strategy in June 2014. If you have any comments about how this consultation exercise has been conducted, please send them to the contact details above.

Contents.

Executive Summary

This consultation paper is being published jointly by the UK Government, the Scottish Government, the Welsh Government and the Northern Ireland Department of the Environment.

This consultation paper contains proposals for a strategy for the management of Naturally Occurring Radioactive Material (NORM) waste in the UK.

Our joint policy is to facilitate the sustainable and efficient management of Low Level Radioactive Waste in line with the waste hierarchy. 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.

Our proposed strategy for realising this in respect of the NORM sector is based on (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 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 take opportunities for more effective waste management. 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 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. Better information and data availability would improve the effectiveness of the market for NORM waste provision.

The rest of this consultation paper is set out in six chapters.

Chapter 1. Introduction, sets out the policy background, including the waste hierarchy and the UK's Low Level Waste Policy, and the objectives for the proposed strategy.

Chapter 2. Regulatory Framework, sets out the international background to the regulation of NORM, outlines the UK regulatory systems and describes the role of the land use planning system.

Chapter 3. Information about NORM waste arisings and routes for treatment and disposal, sets out the most comprehensive picture assembled of the NORM wastes produced in the UK and their current treatment and disposal destinations.

Chapter 4. Proposed UK NORM waste strategy, sets out the key planks of the proposed NORM strategy, stating the policy principles and key themes for the strategy. It also describes the roles and responsibilities in achieving these principles and themes, including the key role of waste producers.

Chapter 5. Early developments and proposals, describes some key recent and forthcoming developments that will affect the development of the NORM waste management sector in the UK. Government proposes to use these developments to advance the policy principles and proposed key themes for the NORM strategy set out in Chapter 4, while ensuring that we fulfil our international obligations. This chapter also discusses some proposed further clarifications to the regulatory regime, and considers how data available to the NORM market can be improved.

Chapter 6. Longer-term developments and monitoring, presents information on how government proposes to consider developments during the next five to ten years, including the possibility that volumes of NORM waste will rise, and risks to the implementation of the strategy.

Chapter 1. Introduction

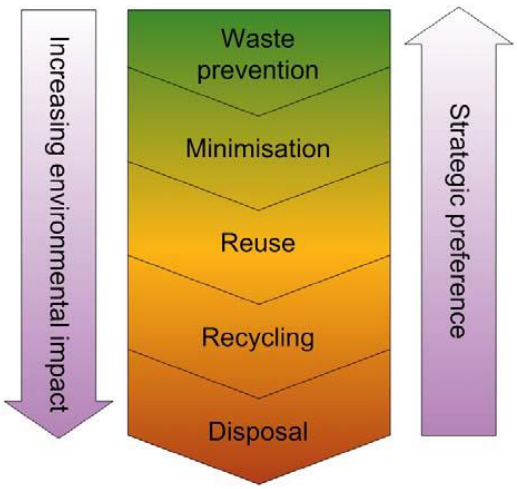
1.1 This consultation paper has been published jointly by the UK Government, the Scottish Government, the Welsh Government and the Northern Ireland Department of the Environment (hereafter referred to collectively as “government”). This consultation paper sets out our joint proposals for a strategy for Naturally Occurring Radioactive Materials (NORM) waste in the UK.

1.2 A Strategic Environmental Assessment (SEA) Environmental Report is being published for consultation alongside this paper.

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 (LLW) in line with the waste hierarchy (Figure 1). 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. 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, 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, and they 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 (i.e. to landfill) 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.
- Characterise waste such that it can be exempted, 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 reuse: 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 exemption[1].

Waste recycling: this is the preferred way forward for the treatment of some LLW, although this is not an option for some 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 to accommodate highly contaminated material.

1.5 We published a joint policy statement in 2007 which set out a high level framework for implementation of the policy. It also recognised the different LLW producing industries face different challenges, and committed Government to working with those industries to develop to facilitate implementation of the policy with respect to those industries.

[1] Waste covered by an exemption is still regarded as radioactive material/waste but the exemption reduces/removes regulatory controls where risks have been assessed as low for a waste management activity. In some instances, conditions are applied to these exempt activities.

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 published in 2010[2]. 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 2012[3].

1.7 The purpose of this consultation document is to inform the development of part two of the joint UK strategy for the non-nuclear industry, covering NORM waste. The final strategy will be published by the Scottish Government and be available from all four governments.

Scope of this strategy

1.8 The scope of the 2007 policy statement and the strategy documents referred to in paragraph 1.5 was limited to solid waste. We propose that a UK strategy for NORM should cover all NORM waste, regardless of activity level[4], including liquid and gaseous NORM wastes as well as solids.

1.9 This strategy is proposed to cover the whole of the UK, noting the existing 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. The continued close cooperation of the four territorial environment agencies will be instrumental to effective implementation. We intend to review the NORM strategy five years after its publication.

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

[2] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/48291/4616-strategy-low-level-radioactive-waste.pdf
[3] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/48291/4616-strategy-low-level-radioactive-waste.pdf
[4] In the UK LLW is defined in as radioactive waste having a radioactive content not exceeding four gigabecquerels per tonne (GBq/te) of alpha or 12 GBq/te of beta/gamma activity. While we have not seen any evidence to suggest of NORM waste arisings with a higher level of activity but this is at least a theoretical possibility.

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 whether the radioactivity is associated natural radionuclides, or anthropogenic radionuclides excepting those originating from the nuclear fuel cycle.

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

Development of this document

1.12 The development of this document has been guided by a Project Board comprising representatives from industry, local government, as well as the four governments and environmental regulators.

1.13 We commissioned an independent review of the legislation and regulation in the UK as it applies to NORM waste management, that is discussed in Chapter 2 below. We carried out a data collection exercise during the first half of 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 reported in Chapter 3.

1.14 This consultation paper was informed by the parallel development of a Strategic Environmental Assessment (SEA), led by the Environmental Assessment Team in the Scottish Government.[5] The scoping study for the SEA was consulted upon in early Autumn 2013. The SEA has informed the development of this draft strategy at the same time as it has been developed to reflect the strategy contents.

1.15 The objective of the proposed 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:

[5] http://www.scotland.gov.uk/Publications/2014/02/8435/downloads

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.

Question 1: Do you have any comments on chapter 1, which includes discussion of the background, scope and objectives for the proposed NORM waste strategy?

Chapter 2 – Regulatory Framework

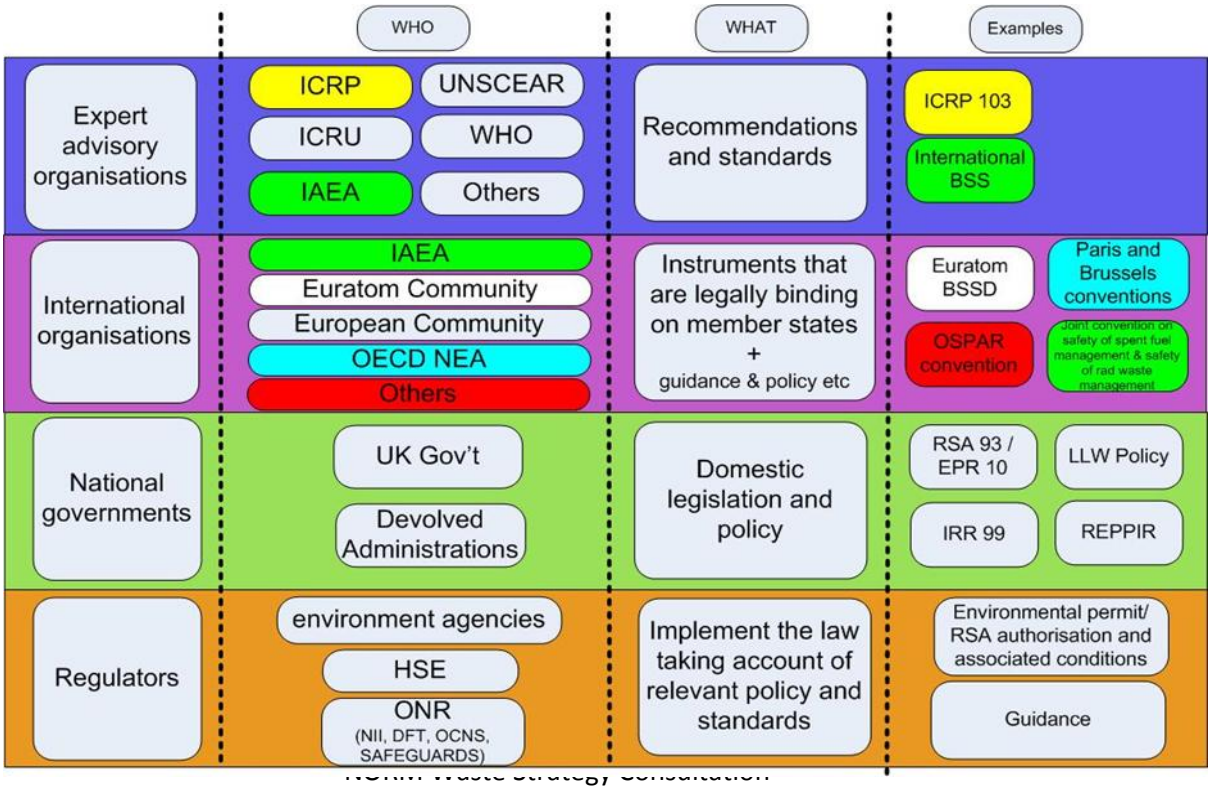
2.1 As part of the development for a NORM waste strategy, we commissioned an independent report into the legislative and regulatory framework for NORM waste in the UK. We are making this report available to inform the consultation process. The paper forms part of the consultation package.

2.2 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

2.3 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 law. This relationship is summarised in the table below (see Glossary for explanation of acronyms).

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



2.4 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 this draft strategy. The report concluded that there is a regulatory system that is fit for purpose to protect human health and the environment. 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.

International background to the regulation of NORM waste

2.5 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.[6] For many years, the focus of these standards was on exposure to anthropogenic radionuclides. In the case of NORM the variable background radiation, and the difference in practices and tolerance towards NORM, slowed down the setting of international standards.

2.6 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 will adopt the revised Euratom BSS in early 2014 and it is discussed at chapter 5.

2.7 Guidance issued by the European Commission [RP 122 Part II] http://ec.europa.eu/energy/nuclear/radiation_protection/doc/publication/122_part2.pdf 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 regulation as the reason for a higher exposure limit for NORM radiation. The Commission guidance sets a dose increment in addition to

[6] http://www.icrp.org/

background exposure from natural radiation sources of 300 µSv/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 guidance (RP 122 Part I), http://ec.europa.eu/energy/nuclear/radiation_protection/doc/publication/122_part1.pdf the Commission recommends a dose criterion of 10 µSv per year as the basis for regulating anthroprogenic practices.

2.8 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

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

2.10 The UK Strategy for Radioactive Discharges published in 2009[7] sets out how the UK implements the agreements reached at the 1998 OSPAR[8] Ministerial meeting and the objectives of the OSPAR Radioactive Substances Strategy (RSS)[9]. 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.

2.11 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;

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[7] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/249884/uk_strategy_for_radioactive_discharges.pdf

[8] 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 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.

[9] http://www.ospar.org/content/content.asp?menu=00120000000070_000000_000000#radioactive

- progressive reductions in human exposures to ionising radiation resulting from radioactive discharges, as a result of planned reductions in discharges.

2.12 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

2.13 NORM waste is a specific term used in legislation and 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 Chapter 3 generate, or have the potential for generating, NORM wastes. Different process steps give rise to different volumes and activity concentrations of NORM waste.

2.14 The main environmental legislation used to control NORM wastes in the UK is the Environmental Permitting (England and Wales) Regulations 2010 (EPR 10)[10] in England and Wales and the Radioactive Substances Act 1993 (RSA 93)[11] in Scotland and Northern Ireland. Although the legislation is different, the regulatory systems are very similar in practice across the UK.

2.15 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 to facilitate better coordination of interested parties. For unconventional gas, the regulatory regime is in place for exploration, and the regulatory regime for production is unlikely to vary much, if at all from conventional regulation. This is discussed further in chapter 6.

2.16 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 waste is less

[10] http://www.legislation.gov.uk/uksi/2010/675/contents/made
[11] http://www.legislation.gov.uk/ukpga/1993/12/contents

than the specified values, 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". 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.

2.17 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 .

2.18 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.

2.19 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 they are derived from a dose (risk) of 10 µSv/y. This approach is in keeping with the standards proposed by the European Commission referred to in paragraph 2.6.

2.20 Further information on wastes that fall within the scope of the radioactive substances legislation and the rationale for this is available in the government guidance. The government guidance also provides further detail on the exemption regime[12]. Full guidance on the exemption regime has been produced by the environment agencies[13].

2.21 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 regulations, 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.

[12] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69357/pb13624-rsl-guidance-110914.pdf
[13] http://www.environment-agency.gov.uk/business/sectors/117678.aspx

Disposal of NORM waste at near-surface disposal facilities

2.22 Joint guidance on the near-surface disposal of solid radioactive wastes was issued jointly by the four environmental regulators in February 2009[14]. Examples of near-surface disposal facilities for NORM waste and other LLW are the Low Level Waste Repository and suitably permitted landfill sites.

2.23 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 operators and provide the means by which they regulate the development and operation of any near-surface disposal facility for radioactive waste.

2.24 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, operation and closure of the facilities will meet a series of 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.

2.25 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 is non-radioactive.

2.26 There is an additional option for disposal of NORM wastes with a NORM concentration between 5 and 10 Bq/g or for higher volumes of wastes with a NORM concentration below 5 Bq/g. These can be sent to a permitted landfill site, or there is a disposal route 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 1 mSv per year to workers at the place of disposal, and 300 μSv per year to the

[14] http://a0768b4a8a31e106d8b0-50dc802554eb38a24458b98ff72d550b.r19.cf3.rackcdn.com/geho0209bpjl-e-e.pdf

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

2.27 The 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.

2.28 The Ionising Radiations Regulations 1999 are also relevant to NORM waste. The main aim of the Regulations and the supporting Approved Code of Practice (ACOP) 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 regulations therefore apply to NORM.

Regulation of Offshore Oil and Gas Industry

2.29 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).

2.30 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.

2.31 DECC is responsible for the Petroleum Act 1998 and the Pollution, Prevention and Control Act 1999. The introduction of the Marine and Coastal Access Act (MCAA) 2009 has 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.

2.32 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

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

2.34 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.

2.35 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.

2.36 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

2.37 National waste planning policy is contained in Planning Policy Statement 10 Planning for Sustainable Waste Management (PPS10) which is currently the subject of review. 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.

2.38 PPS 10 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.

2.39 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.

2.40 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.

2.41 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

2.42 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.

2.43 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.

2.44 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.

2.45 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

2.46 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.

2.47 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.

2.48 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

2.49 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 are currently under review, and following public consultations are for finalising by June 2014.

2.50 Scotland's Scottish Zero Waste Plan (ZWP) sets out how planning decisions can support the move to zero waste for Directive wastes. There is addition 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.

2.51 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.

Question 2: Do you have any comments on chapter 2, which includes discussion of the current regulatory framework in the UK for NORM wastes, including the land use planning system?

Chapter 3: Information about NORM waste arisings and routes for treatment and disposal

3.1 This chapter provides information on the findings of a data collection exercise carried during the first half of 2013 to underpin the NORM waste strategy. The aims of the data collection exercise were as follows:

- to identify all those industry sectors producing NORM wastes,
- to determine the characteristics and quantities of NORM wastes that they produce,
- to determine how those NORM waste are currently managed, including their treatment and disposal,
- to identify any issues concerning the management of NORM wastes which adversely impact on the businesses generating and managing those wastes.

3.2 The data collection exercise was carried out by sending out questionnaires to specific companies, trade associations and professional bodies thought to be involved with the NORM industrial activities listed for the purposes of regulation under the UK Radioactive Substances Legislation and those companies known to manage NORM waste. Where appropriate, face to face meetings took place also.

3.3 An overview of the information gathered is presented in this chapter. More detailed information on specific sectors identified as being present in the UK is included in the NORM Waste Strategy - Data Collection Report. This Report summarises information gathered during the data collection exercise. It is presented in the form of “pen portrait” for each industrial activity identified in the UK that produces NORM waste. Each pen portrait summarises who produces the NORM waste, how it is produced and how it is managed. There is also a discussion of the regulatory, policy and waste management issues for each NORM industrial activity

NORM waste producing sectors

3.4 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 is 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

3.5 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)

3.6 Other than those already included on the UK list, there were no additional NORM industrial activities identified during the data collection exercise as producing NORM wastes. However, it has been noted that geothermal energy could fall into the third category listed above, in that it could bring waters containing NORM from deep underground to the surface. It is understood that most geothermal energy systems operate on a closed loop system and any water brought to the surface would be returned underground (to heat up again). Should radioactive scales be generated their management would be classed as a NORM industrial activity. However, with current information, it is believed that there is no need to add this activity to the list.

Description and estimates of current NORM wastes being generated

3.7 Table 3 provides a high level summary of the different types of in scope NORM waste that each type of industrial activity generates. Further information is given in the relevant pen portraits contained in the NORM Waste Strategy – Data Collection Report.

Gaseous waste – current

3.8 The only industrial sector that was identified as generating gaseous wastes that required permitting was the iron and steel sector. All three UK iron and steel facilities have permits with appropriate limits and conditions to dispose of these wastes directly to the atmosphere. No gaseous NORM waste related issues have been identified.

Liquid waste – current

3.9 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 levels 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.

3.10 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 Estuary and no issues with this disposal route have been identified.

3.11 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 m3	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
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	Permitted	Discharge to estuary

					~ 0.6 GBq U-238		
Zirconia	1	Solid:		[possible Th-232]			
Production of iron and Steel	3	Solid: hydrocylone 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

3.12 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.

3.13 The vast majority of the solid waste (the filter cake component) produced by the titanium dioxide industry contains very low levels 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 theses 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.

3.14 Table 4 presents the annual quantities of solid NORM waste generated that currently require management at specialist facilities that are permitted to manage radioactive waste. It should be noted that there are a number of uncertainties that mean the data presented in Table 3 are likely to be upper estimates. 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

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	??	??	??
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

Estimates and uncertainties of future waste estimates

3.15 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

3.16 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 as it 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 providing if the ‘assessed landfill’ disposal route (see paragraph 2.26) continues to be available. 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.

3.17 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.

3.18 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. 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

3.19 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.

3.20 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

3.21 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 how much NORM waste will be generated or what its characteristics will be.

3.22 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.

3.23 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.

3.24 The quantities of liquid NORM waste generated will depend on the number 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. As considered later in this chapter, the oil and gas industry is currently struggling to find suitable permitted water treatment facilities onshore to which to send their produced water for treatment and disposal.

Land Contaminated with NORM

3.25 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 indentified, the characteristics of contamination, when it is decided to remediate them and what remediation or clean-up standards are selected.

3.26 The pen portrait on land contaminated with NORM gives some examples of quantities of waste that may be generated when remediating contaminated sites.

Conclusion on NORM waste arisings

3.27 Uncertainties in future NORM waste generation can be attributed to legislation, policy and regulatory interpretation; where appropriate these are

captured and dealt with in a further part of this consultation document. 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, but it is unlikely that additional specialist NORM waste treatment facilities will be required. Thus, a conclusion can be drawn that there is currently no ‘capacity gap’ for specialist NORM waste treatment and disposal facilities.

Treatment and disposal routes for NORM waste

3.28 Further details about treatment and disposal routes for NORM waste and issues for the NORM waste management market can be found in the pen portraits in the NORM Waste Strategy - Data Collection Report. International NORM waste treatment and disposal options are similar to those used in the UK. A discussion of the regulation of the trans-frontier shipment of NORM waste for treatment and disposal can be found in 5.11-5.17 in chapter 5. NORM waste can be generated as a solid, a liquid or as a gas and the main waste types and radionuclides are explained in Table 3.

Treatment of Solid Scales, Sludges etc

3.29 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.

3.30 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. Onshore, scale and sludge treatment includes physical or chemical processes, and scale can also be disposed of to landfill.

3.31 Oil and gas NORM contaminated plant and equipment requires 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. Scale deposits are normally removed by high pressure water jetting. Chemical treatment to dissolve scales is also carried out on routine basis for downhole applications. Shot blasting is also used.

3.32 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.

3.33 Most companies offer descaling services on a commercial basis to a range of other industries, but one company provides an exclusive service 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.

3.34 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

3.35 For NORM wastes arising from 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

3.36 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.

3.37 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 preference for incineration that incorporates energy recovery.

3.38 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 that can be sent for heat treatment. 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

3.39 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.

3.40 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 acceptable geological formation.

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

3.42 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 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.

3.43 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

3.44 Gaseous treatment 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. 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 operate only once 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 that can be sent for heat treatment. The environmental impact of airborne or gaseous discharges is assessed during the determination of the environmental permit. In all cases the permit will include a condition that the volume and activity of waste discharged should be minimised.

Disposal Options

3.45 Most NORM waste is disposed of as exempt radioactive waste in landfills that are permitted to accept controlled wastes[15]. 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.

3.46 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

3.47 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

[15] 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.

which is then macerated using specialist equipment to a particle size of 1000 microns or less prior to disposal.

3.48 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.

3.49 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

3.50 One of the key questions for the NORM waste Strategy is whether there are sufficient, and available, NORM waste treatment and disposal facilities, now and in the future. 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. Chapter 5 considers the need to improve data to increase our knowledge of the adequacy of capacity. Chapter 6 includes a discussion of uncertainty about future NORM waste arisings from some sectors, and some longer term considerations about capacity.

3.51 One important factor is public perception and the, often negative, attitude, to having NORM waste treatment and disposal facilities located near to populated areas. This issue is not just for NORM waste but is a factor that impacts on all planning decisions concerning waste. NORM waste treatment and disposal providers cited difficulties in obtaining the necessary planning permissions under the land use planning regime. Evidence from the data collection process indicates that those NORM waste disposal facilities contacted should have sufficient capacity to take NORM wastes generated over the next two to three years. However, given that there are only a handful of landfills that can take non-exempt NORM waste and only one that can take hazardous NORM waste, these landfills can be deemed as critical assets for the NORM industry. All of these landfills are in England, with the exception of one landfill able to take non-exempt non-hazardous NORM waste in Scotland. There are no landfills available currently in Northern Ireland or Wales. The limited geographical availability of these facilities clearly places a constraint on the extent to which

the proximity principle can play a role in influencing decisions on waste management.

3.52 Also, there are few treatment and disposal providers. Respondents to the data collection exercise indicated that they operate in a market which is subject to stringent regulatory controls and this manifests in them being subject to environmental and safety permissions which incur high costs; often associated with using consultants to carry out radiological assessments. As a result of these costs, market barriers to new treatment and disposal providers are high. However, decisions to enter the NORM waste treatment and decommissioning market are for supply chain providers to make on the basis of their own business case decisions.

3.53 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.

Question 3: Do you agree Chapter 3 adequately describes UK NORM waste arisings and routes for treatment and disposal? What additional information can you provide?

Chapter 4. Proposed UK NORM waste strategy

Vision

4.1 Our overall aims for LLW management in the UK are described in the opening chapter. In summary, the policy is designed to embed the waste hierarchy into LLW management in order to minimise its environmental impact and ensure that infrastructure is used appropriately and efficiently.

Proposed strategy

4.2 Our proposed strategy for realising this in respect of the NORM sector is based on (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 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.

4.3 We want to ensure progress with the implementation of the strategy, to increase the effectiveness of NORM management, to allow for growth in the NORM creating sectors and in treatment and disposal firms, and to ensure continued protection of human health and the environment. We are particularly keen to see the developments and proposals identified in Chapter 5 have an early, positive impact on the effectiveness of the NORM management sector. However, we do not want to put in place an implementation process that is burdensome, and distracts limited capacity in government and economic regulators from taking action to managing process. We are currently considering a time-limited group to coordinate government's response to the issues discussed in Chapter 5. We are considering possible involvement of industry representatives in such a group, again trying to balance the additional effectiveness of the implementation against the cost to such representatives of their time involvement.

Policy Principles

4.4 Our proposed strategy is based around the following policy principles. These principles reflect the UK Low Level Waste policy, as well as drawing on wider policy for radioactive wastes, and for all wastes.

- Availability of flexible waste management options for NORM waste is essential for hazard reduction and the continued operation of industries of economic importance to the UK economy and to regional economies.
- The storage, treatment and disposal of NORM waste should be carried out without significant risk to the environment or human health, using the Best Available Techniques / Best Practicable Environmental Option.

- Given the diverse physical, chemical and radiological nature of NORM wastes, the availability of proportionately regulated waste management routes is essential.
- It is for the market to provide treatment and disposal capacity for NORM waste. The strategy will aim to remove barriers to the effective functioning of the market.
- There should be an effective regulatory system so that NORM wastes can cross international boundaries for treatment, where consistent with the policy on transfrontier shipments set out in the LLW policy.
- Waste prevention should be implemented by all producers of NORM waste wherever practicable and the waste management hierarchy applied and demonstrated.
- Effective planning for NORM waste management throughout its lifecycle, including appropriate characterisation and segregation of wastes, and material that will become waste, in order to address the various waste acceptance criteria needed to secure appropriate treatment and disposal, is critical to flexible management of NORM waste.
- Integration of strategies for all wastes (both radioactive and non-radioactive, Directive waste) is important nationally and for individual waste producers.
- The development of adequate skills and knowledge resources is important to the effective development of NORM waste treatment, particularly in growing sectors.

4.5 Consideration of these principles alongside the information gathered from stakeholders including industry and regulators about current NORM waste practices, has given rise to the following key themes for this strategy.

Key Themes

4.6 These themes feed into the consideration of early developments and proposals for the NORM waste sector set out in Chapter 5, and the longer-term developments and monitoring discussed in Chapter 6:

- **Clarity of regulatory regimes**. There are various points that have been highlighted where the regulatory regime appears to include anomalies, uncertainties and potentially contradictory limits and thresholds. We need to provide clarity wherever possible, and ensure that there is an effective regulatory regime 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 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 Chapter 3 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, 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.

Question 4: Do you agree with the Key Themes for the NORM waste strategy set out in Chapter 4? What different or additional themes should the strategy address?

Responsibility for NORM wastes

Overview of roles and responsibilities

4.7 While there are important roles for government and regulators, the ultimate solutions to 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 deliver the necessary waste management solutions.

4.8 There are many important players in creating a more effective waste management regime for NORM wastes in the UK. Improvements to legislation and to regulatory practice, which are the responsibility of the governments and regulators, are discussed in Chapter 4. That chapter also considers the role of local authorities in facilitating the development of an adequate network of treatment and disposal facilities.

4.9 Waste management companies that operate treatment or disposal facilities have clear responsibilities to operate within the terms of their environmental permits, and other relevant legislation and planning conditions. Decisions over 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.

4.10 The Low Level Waste Repository is the national repository for LLW in the UK, and is owned by the Nuclear Decommissioning Authority, the body with the 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. The Environment Agency is currently consulting on the application as part of its decision making process. The outcome of this is not yet known, and may result in constraints in the types and quantities of radionuclides (including long-lived radionuclides such as radium which are common constituents of many NORM wastes).

The role of NORM waste producers

4.11 Although these other parties discussed above have important roles to play, responsibility for waste rests ultimately with the producers of that waste. This section sets out broad guidance on the roles and responsibilities of producers of NORM wastes.

4.12 The principles that are set out at paragraph 4.8 are important to the role of waste creators. 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.

4.13 It is important and good business practice, for NORM waste producers to plan for the waste they will produce. Such planning should be carried out in an integrated way across all the wastes that a site or firm will produce, both radioactive and non-radioactive, Directive waste. The 2007 LLW policy states that plans for the management of all radioactive waste must be developed by waste managers. 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.

4.14 LLW management plans must take into account all current and anticipated future arisings of LLW, and their radiological and non-radiological properties. 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.

4.15 In addition, the preparation of LLW management plans shall be based on:

- use of a risk-informed approach to ensure safety and protection of the environment;
- minimisation of waste arisings (both activity and mass); forecasting of future waste arisings, based upon fit for purpose characterisation of wastes and materials that may become wastes;
- consideration of all practicable options for the management of LLW;
- a presumption towards early solutions to waste management;
- appropriate consideration of the proximity principle and waste transport issues; and
- in the case of long term storage or disposal facilities, consideration of the potential effects of future climate change.

4.16 NORM waste producers have a responsibility to ensure that they can access suitable skills and knowledge and resources to carry out the planning and operation of their waste management. This advance planning should form an integral part of the plan for the development of a facility or process. Many firms will rely on external consultants to produce the plans to discharge or dispose of NORM wastes. It is important that early consideration is given to the availability of suitable expertise, particularly in fast growing sectors. Adequate training should be given to staff to allow them to effectively carry out waste management operations. Early engagement with the relevant environment agency is good practice that we encourage.

4.17 NORM waste producers deciding on disposal routes need to consider the proximity principle and transport issues. However, these issues should not be the dominant ones considered by the environmental regulators and NORM waste producers.

4.18 The availability of adequate data on NORM wastes is in the interests of all parts of the sector. In the absence of adequate data, treatment and disposal providers may not come forward with proposals to increase capacity, and there may be no early warning of capacity constraints. It is therefore in the collective interest of NORM waste producers to cooperate with data collection exercises, to ensure adequate data and thus help to stimulate good availability of treatment and disposal routes.

Question 5: Do you have any comments on how NORM waste producers are performing with respect to the roles and responsibilities set out in Chapter 4?

Chapter 5. Early developments and proposals

5.1 This chapter describes some key recent and forthcoming developments that will affect the development of the NORM waste management sector in the UK. Government proposes to use these developments to advance the policy principles and proposed key themes for the NORM strategy set out in Chapter 4, while ensuring that we fulfil our international obligations. This chapter also discusses some proposed further clarifications to the regulator regime, and considers how data available to the NORM market can be improved.

Revised EU Basic safety standards

5.2 As described in Chapter 2, the radiation protection framework for NORM waste regulation in the UK will have to take due account of the new requirements in the revised Euratom BSS Directive (BSS) to be adopted in early 2014.

5.3 There is detailed and specific discussion in the European and international literature about how to apply the international radiological protection framework to NORM waste management. The criteria used for considering regulation of NORM are fundamentally different from those used for practices dealing with anthropogenic radionuclides, often citing the ubiquitous nature of NORM. There is widespread acceptance of a radiation dose limit of 10 μSv for anthropogenic radionuclides, but a strongly held view by many countries that a value of around 1 mSv/y is more appropriate for NORM and indeed is already a *de facto* standard.

5.4 The definition of 'practice' will be reviewed as part of the revisions to the Euratom Basic Safety Standards Directive; the term will look to capture all human activity that can increase the exposure of individuals to radiation from a radiation source during planned exposure situations, and hence it will not distinguish between the sources of exposure. This may also resolve the issue in the longer-term.

Dose limits, dose constraints and other dose criteria.

5.5 The review of NORM policy and legislation highlighted the potential for confusion when referring to dose criteria, limits or constraints and what these relate. This will be particularly so where there are criteria sharing the same numerical values e.g. the dose constraint to the public of 0.3 mSv/yr or the criterion for NORM being out of scope of regulation of 0.3 mSv/yr. Similarly the 1mSv/yr public dose limit and 1mSv/yr criterion in relation to exposure of workers from NORM for considering out of scope are conceptually different. Such attention should also probably be paid to 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.

5.6 The current criteria, constraints and dose limits that apply to NORM waste in the environmental regulation regime are as follows:

- out of scope of regulation for NORM waste is underpinned by a dose criterion of 300 µSv per year to the public. For artificial radionuclides it is 10 µSv per year
- the norm exemptions are by a dose criterion of 300 µSv per year to the public and 1000 µSv per year to landfill workers
- the environmental regulators are required 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 dose limit
- when determining applications the environmental regulators are required to have regard to the following maximum doses (dose constraints) which may result from the planned activity:
    a. 300µSv from any single source (meaning an installation)
    b. 500 µSv from any single site (where they are multiple installations on the same site)
- regulators have to have regard to the "threshold for optimisation" which dependent on geographical administration has been set at either 10 or 20 µSv.

5.7 The new Basic Safety Standards Directive is expected to be more explicit that the current BSSD 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 proposes to review the appropriateness, applicability and consistency of the various values, following final agreement of the new BSS. The outcomes of the review will inform implementation of the new BSS which must be transposed into UK law 4 years following its agreement.

Question 6: Do you agree that the various values underpinning NORM waste regulation should be reviewed? If yes please provide any information you feel would be appropriate to take into account including how best the outcome of the review can be implemented.

Obligations to other EU Member States

5.8 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 as will make it possible to determine whether the implementation of such 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.[16]

5.9 Recommendation 2010/635/Euratom lists types of operation for which a submission is required; this includes "the industrial processing of naturally occurring radioactive materials subject to a discharge authorisation". During the NORM Strategy data collection exercise, several NORM waste management companies that carry out activities falling within the specified operation, expressed the view that the requirement to make a submission would be disproportionate when compared to other activities not required to make a submission. This would 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.

5.10 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 EC. We will keep under review the interpretation of the requirements of the Article 37 Recommendation in conjunction with the new provisions of the BSSD (once issued) to ensure that the UK is not making submissions that are disproportionate. We will ensure that the UK continues to fulfil its obligations by making submissions that are appropriate and consistent with the spirit and intent of Article 37 of the Euratom Treaty.

Question 7: Do you have any comments about the implementation of Article 37 requirements in the UK with respect to the management of NORM waste?

Import and export of NORM waste

5.11 There is some interest, particularly from the offshore oil and gas sector, in the potential development of international services for NORM management. This could increase the range of geographical options available to offshore NORM producers while also allowing niche treatment services (i.e. for complex waste forms) to be developed, and provided more cost effectively as a result of scale efficiencies. This potential will need to be considered in light of the general policy on import and export of radioactive waste and conventional wastes as well as domestic and international legislation.

5.12 The Scottish oil and gas industry strategy[17] sets out the desire for North Sea decommissioning expertise to reside within the UK. This will require careful

[16] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:279:0036:0067:EN:PDF
[17] '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

consideration of the constraints and opportunities provided by the current policies and legislation affecting the import and export of waste and radioactive waste across international borders.

5.13 UK Government general policy is that radioactive waste should not be imported to or exported from the UK except in specifically defined and limited circumstances.[18] With respect to NORM waste it is possible that such circumstances could include situations in which there are reusable materials that can be extracted from the wastes, or materials are being treated to make them more manageable.

5.14 The policy is based on a presumption of national self-sufficiency for radioactive waste management. If the policy were elaborated to facilitate the import and/or export of NORM waste, careful consideration would need to be given to the final disposal of the radioactive waste residues following processing of the raw waste form, and in particular to whether this would 'add materially' to the UK's radioactive waste inventory.

5.15 The import and export of conventional and radioactive waste is also subject to international conventions and EU legislation.

- The Directive on the supervision and control of shipments of radioactive waste and spent fuel (Council Directive 2006/117/Euratom) and the Directive on the management of waste from extractive industries (Council Directive 2006/21/EC) do not apply to shipments of natural radioactive substances which do not result from treatment.

- The UK applies the Waste Shipments Regulation (EC Regulation 1013/2006) to cover the shipments of NORM wastes, the requirements of this regime would apply if NORM waste were to be exported. However, although NORM waste is not explicitly mentioned, the general principle in the UK (as set out in the UK Plan for Shipments of Waste[19]) is NOT to export waste for disposal. The UK Plan currently does not facilitate the treatment of NORM wastes abroad, with the facility to return the treated waste.

5.16 Further information about the Regulation and information on how it applies to those shipping wastes (in each of the Administrations) is available on the internet[20].

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

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

[20] http://www.environment-agency.gov.uk/business/sectors/32447.aspx http://www.sepa.org.uk/waste/waste_regulation/transfrontier_shipment/regulations_and_guidance.aspx

5.17 The European Commission's Report 9016/13[21] has indicated that an advisory group will investigate and address the issue of transboundary shipments of NORM not arising from authorised practices which are excluded from the Directive on the supervision and control of shipments of radioactive waste and spent fuel (Directive 2006/117/Euratom) and Directive on the management of waste from extractive industries and amending Directive 2004/35/EC (Directive 2006/21/EC). The UK will actively engage with this advisory committee.

Question 8: Do you have any comments about the regulation of the import and export of NORM waste in the UK?

Averaging and charactisation of NORM wastes

5.18 One issue for the proposed NORM Strategy is waste disposability, in particular the extent of heterogeneity that is acceptable and the approach to waste 'averaging' that should apply. This is not an issue limited to the management of NORM waste, but instead relates generally to the management of radioactive waste for disposal (irrespective of the type of waste e.g. demolition rubble or contaminated soils).

5.19 Anyone generating radioactive waste needs to consider how best to manage its treatment and disposal. The extent of characterisation and analysis that is required, including the volume over which any activity will be 'averaged' will depend on a variety of factors.

5.20 Whilst general practice is to segregate wastes, and certainly to avoid dilution of higher activity waste solely to achieve a reduction in classification, this 'mixing' of wastes is an issue addressed within the Joint Guidance on the Management of Higher Activity Radioactive Wastes which 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).'[22]

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http://www.doeni.gov.uk/niea/waste-home/regulation/transfrontier_shipment_of_waste.htm

[21] Report from the Commission to the European Parliament, the Council and the European Economic and Social Committee on the implementation by the Member States of Council Directive 2006/117 EURATOM on the supervision and control of shipments of radioactive waste and spent fuels

[22] Joint Guidance on the management of higher activity radioactive waste on nuclear licensed sites, Part 3a Waste minimisation, characterisation and segregation http://www.hse.gov.uk/nuclear/wastemanage/rwm-part3a.pdf

There is similar guidance in the Environment Agency's Radioactive Substances Regulation (RSR) Environmental Principles: RSMDP8 segregation of wastes.[23]

5.21 Whether or not the consideration of heterogeneity involves an issue of potential mixing of different 'categories' of waste, operators are expected to ensure that they have sufficient information about any waste they intend to receive onto a site for disposal in order to ensure they continue to maintain an appropriate environmental safety case (ESC) for disposal.

5.22 Some environmental safety cases have historically based their assessments of risk on the basis of an assumed homogeneous activity within waste consignments. More recently, operators have recognised the importance of any discrete single items, or longer lived high specific activity particles, that may individually challenge the ESC. Such experience has emphasised the importance of having a suitable understanding of the wastes intended for receipt / disposal at any site sufficient to confirm whether or not they can be accepted within the safety case demonstrated for the site. Normally operators set out Waste Acceptance Criteria (WAC) to establish suitable controls to ensure that the ESC is not challenged. Where however, anyone wishes to consider disposal of any wastes that do challenge an existing ESC the regulators would expect the operator to review and revise the ESC and only accept the disposal of such wastes once they have been demonstrated to be environmentally safe and consistent with legal targets and criteria.

5.23 It is important that anyone generating radioactive waste and intending to consign it to another site for treatment/disposal, fully recognises the importance of the Environmental Safety Case for the site, and the role that the WAC plays in safeguarding this.

5.24 In all cases Consignors of waste should use best available techniques to characterise, sort, and segregate their wastes to facilitate their disposal by optimised routes (condition 2.3.3 of the EPR 10 permit template) and to provide the Consignee with sufficient information needed to allow them to consider the acceptance or otherwise of their wastes (condition 3.1.6 of the EPR 10 permit template). That means consignors need to assess and clearly show why they consider disposal to a particular site to be the preferred option over segregation and management by other means. This demonstration should include what the benefits are to the environment, in addition to wider considerations, and should be discussed with the local regulator as part of normal business.

5.25 The extent of 'averaging' that is appropriate in any situation depends on a variety of factors, most importantly the level of detailed information that is

[23] See http://www.environment-agency.gov.uk/business/sectors/111010.aspx

required to support the ESC for disposal (see above) rather than a matter for regulators to prescribe. Considerations and approaches to this topic are set out well in existing guidance for nuclear industry practitioners (the 'Clearance and Exemption Working Group Industry Code of Practice') which deals with approaches to the treatment of different forms of waste based on consideration of the type of contamination and provenance etc. Rather than attempting to set out new guidance, these same principles and approaches can be used by practitioners in the non-nuclear industry wishing to manage NORM wastes. The guidance is at: http://www.cewg.co.uk/

Question 9: Do you have any comments on the approach in the UK to the averaging and characterisation of radioactive waste, or on the adequacy of guidance on this issue?

Conditioning to facilitate disposal

5.26 Government accepts that some waste must be conditioned to facilitate their future management, be this 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. Mixing is distinct from conditioning and is where two waste streams or waste and material are added together but not for the purpose of ensuring the product can be handled or transported more easily. Equally additional material may be added to treat the waste to make it less hazardous (conventional or radioactive hazards) so that it meets the waste acceptance criteria of the accepting facility.

5.27 In carrying out such conditioning, we accept 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, does not compromise future management and that they have used best available technique/best practicable means to minimise the amount of material used to condition the waste.

5.28 Deliberate and inappropriate dilution of waste is undesirable as it may needlessly use raw materials, result in additional waste being sent to landfill taking up additional unnecessary capacity, avoid appropriate regulatory controls and may put compliant businesses at a commercial disadvantage.

5.29 Government expects the environment agencies to ensure the above requirements are complied with as part of their routine permitting and inspection regime. Where it is apparent that an operator is carrying out a process with the main purpose of diluting the radioactive waste in order to avoid regulatory

controls, we would expect the regulator to take appropriate action to stop the process.

Question 10: Do you agree with this position on dilution that takes place during the conditioning of waste?

Conditioning to facilitate recovery

5.30 Government believes that conditioning of NORM waste, including mixing with non-radioactive waste, to facilitate a further use or recovery is an effective means of moving up the waste hierarchy and reducing the amount of wastes going for disposal. It is also helps wider efficiency in the economy by making better use of resources and reducing the need for the use of newly extracted materials.

5.31 Government also recognise that there may be legitimate concerns that such conditioning is simply a way to avoid regulatory controls and depending on the use may result in additional radiation exposure to the public (e.g. 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 their being a legitimate use and demand for the conditioned material. In addition, we expect the conditioning to be carried out such that it is not an operation simply to dilute the waste and so to avoid regulation relating to its disposal. Government believes that adequate controls exist under the radioactive waste legislation to allow the environment agencies to prevent inappropriate conditioning.

5.32 It is clear that some criteria are required to allow the environment agencies to determine when conditioning for reuse is acceptable. Government proposes the following criteria:

- 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 be comparable to 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 less use of other resources.

5.33 Government is of the view that whist 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 and it is not acceptable to mix wastes containing anthropogenic radionuclides with non-radioactive waste.

Question 11: Do you agree with the criteria proposed by government to assess whether or not views conditioning of NORM waste to facilitate recovery of is acceptable?

Regulatory mechanisms to facilitate recovery

5.34 Recovery and use of NORM wastes is an effective means of moving up the waste hierarchy. However, there situations where waste manager and public perception concerns associated with permitting requirement for radioactive waste are impeding recovery. In particular, potential users of NORM waste do not want to be associated with dealing with radioactive wastes that require an environmental permit.

5.35 There are several approaches that may resolve this problem: the first is designing regulatory position statements (analogous to “end of waste” protocols) for operations, the second is providing for exemptions for particular uses. Regulatory position statements can be the most comprehensive measure, providing for waste to be recovered when a set of criteria are achieved. However, this is a more involved process for the waste producer and some users of wastes may be put off the use of the material once it is regulated as a waste.

5.36 An exemption for NORM waste entering a particular process avoids the requirement for a permit for that material, and is less burdensome for operators. To remain within the radioactive substances exemption regime, the conditions have to be adhered to. If the conditions are not met, the operation is no longer exempt and the NORM waste would require to be permitted. In order for an exemption to be created, a case would have to be made demonstrating that the process was consistent with the exemption criteria.

5.37 It may be that the criteria set out above in paragraph 5.32 for conditioning for recovery may 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 wastes.

Question 12: Do you think it is necessary to put in place regulatory mechanisms to facilitate the recovery and use of NORM wastes, and if so please give details?

Waste management companies' access to information about exempt radioactive waste

5.38 One of the conditions of the 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.

5.39 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.

5.40 Waste management companies have noted that if they process exempt waste it will result in radioactivity being discharged or disposed of with other waste including permitted waste. The exemption regime is unclear how such contributions are dealt with by the permit and if they count towards the permitted limits. Similarly waste managers cannot take account of such discharges if they do not know they are receiving exempt wastes. The other concern is that exempt waste may pose an unacceptable risk to workers, for example operatives on a sorting line.

5.41 Government has created the exemption regime to minimise 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 sorting lines. We would welcome any specific examples of exemptions that are not adequately addressed by the radiological assessment.

5.42 Government proposes to ask the environment agencies to work with the affected companies to better understand concerns about the receipt of exempt radioactive waste at facilities permitted to receive radioactive waste. Although there is no legal requirement to inform a waste manager that waste contains exempt waste, there is nothing preventing this information from being disclosed. It could be a legitimate question that waste companies ask as part of their waste acceptance arrangements.

Question 13: Do you agree that there should be no requirement to inform waste management companies about exempt radioactive waste? If not please provide any information that would justify a change to the current position.

Limitations on exemption use if a Waste Producer has a Permit

5.43 Some NORM producers believe that the exemption regime places unnecessary restrictions on the ability to make use of the NORM waste exemption. In particular, the “assessed landfill” exemption cannot be used if a waste producer has a permit for disposal of NORM waste exceeding 10 Bq/g.

5.44 For example, the manufacture of titanium dioxide produces different waste streams with the different activity concentrations. Small quantities of waste with NORM concentrations above 10Bq/g are sent to specially permitted facilities like the LLWR. Large volumes of waste with NORM concentrations in the range 5-10Bq/g are suitable for disposal under the provision of the assessed landfill exemption, but the exemption regime prohibits disposal to an assessed landfill.

5.45 The intention of the legislation was not to prevent use of the exemption in the situation described here. Therefore government proposes to review this restriction with a view to making any necessary changes to the legislations when a suitable opportunity arises.

Improving Data Availability

5.46 The data presented in Chapter 3 is the most comprehensive picture of the NORM sector in the UK that has been assembled to date. However, even that is based on voluntary returns from only a proportion of firms, 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.

5.47 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 to open up opportunities for wider integration of radioactive waste issues such as development of relevant skills, research & development etc.

5.48 Taken in isolation, the findings in Chapter 3 suggest that there is sufficient disposal capacity for solid NORM wastes for some years ahead. However, this is based on a relatively small number of disposal sites for some classes of waste, and is therefore a potentially vulnerable equilibrium. There is also a need for an overall view on the levels of arisings of nuclear site LLW and VLLW, and from

non-nuclear industry sources for a complete picture. 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 nuclear site decommissioning (where NORM activities have caused contamination).

5.49 However, any data collection exercise places a burden on business, and we would carry out a careful assessment, including a cost-benefit analysis, to determine whether there is value in gathering data going forward by any method, before imposing a burden on companies. This assessment will be informed by the responses to this consultation paper. Good data is in the interests of waste creating sectors as it will encourage adequate capacity to emerge, and help to foresee and prevent capacity crunches. These benefits have to be balanced with the costs of improved data collection.

5.50 The assessment of options for data collection would consider the following:

- How to incentivise those managing NORM waste to provide the data (no regulatory obligation at present),
- The balance of voluntary data submission and collection through regulatory conditions,
- How to collect the data, including the possible role of industry groups,
- How to record the data, and the extent to which existing data exercises would be used to collect and/or present the data(such as EEMS, RWI),
- How to make the data available (with due consideration to commercial sensitivities, etc.) and what are the main uses and benefits of the data.

Question 14: Do you support measures to improve the collection and sharing of data on NORM wastes? What processes could be used to collect data with an acceptable burden to business? What role can industry and industry groups play in collecting data?

Chapter 6. Longer-term developments and monitoring

6.1 This chapter presents information on how government proposes to consider longer-term developments that may emerge in the next five to ten years. There are a number of areas where significant changes in the processes given rise to NORM wastes are likely. It is not currently clear that these developments require policy or regulatory changes. There are issues that need to be monitored to allow early warning of emerging problems and to inform further policy development. This chapter considers the how we can manage the risks to the implementation of the proposed strategy.

Developments in processes that produce NORM

6.2 This section outlines the most significant changes that are likely to happen in NORM waste producing sectors in the next five to ten years. We shall monitor these developments, in order to provide information to waste producers and the treatment sector about emerging volumes of NORM waste needing treatment. We shall 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

6.3 There is a high level of uncertainty about the pace and ultimate scale of development of shale gas extraction in the UK. The safe disposal of wastes will be the responsibility of the firms extracting the gas. Environmental regulators are considering proportionate regulation, using the opportunity of consideration of NORM waste generated from shale gas extraction, to also ensure that there is an effective regulatory regime for other industries generating similar wastes. NORM waste would arise from the process, predominantly in liquid form but also some solid and gaseous wastes. The potentially large volume of liquid waste would come from the fluid use in the fracturing process, 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.

6.4 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 treatment works or effluent treatment sites. 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. Therefore, the waste producer should undertake a radiological assessment of the discharge in deciding whether to apply to the relevant environment agency for a permit to regulate the control of these radioactive discharges.

6.5 Based on scenarios or probable NORM waste generation, there will need to be developments of capacity for treatment/disposal in the medium term. As this industry has not yet materialised, there has been no decision about how it will dispose of its wastes. The important fact is that it will be regulated in an appropriate manner, and capacity will be monitored, to give information to the market about the levels of treatment capacity needed as it comes available.

6.6 As set out in paragraph 4.13, 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

6.7 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.

6.8 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.

6.9 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

6.10 As discussed in Chapter 2, 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

6.11 Growth in other countries, especially China, means increased demand for the higher quality ores (those with lower concentrations of impurities). This is already leading to the use of lower quality ores in UK industry, which can in turn lead to higher production of NORM residues.

6.12 Industry and environmental regulators need to work together to consider uses for these residues that can either prevent them being regarded as wastes, or can be covered by exemptions. These issues are covered in greater detail in paragraph 4.3 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

6.13 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 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 any contamination on MoD sites, and former MoD sites.

6.14 In Chapter 1, we discussed the relationship between NORM waste and the volumes of other LLW and VLLW from the nuclear industry, and from the non-nuclear industry. These wastes share many parts of the supply chain for treatment and disposal services. There needs to be wider work across government and the NDA to ensure that consideration of capacity issues are taking account of the widest possible picture on likely future arisings. This work would be greatly helped by improvements and integration of data, as discussed in paragraph 5.46.

Question 15: Do you have any information about the areas of potential growth in NORM arisings identified in Chapter 6, or on other possible growing sources of NORM waste?

Market Development

6.15 We hope that the additional information in this consultation document on arisings, and efforts to improve future data availability, will help in the functioning of a healthy market for NORM disposal and treatment. 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 has been discussed in paragraph 3.53, some disposal sites have struggled to attract sufficient volumes of NORM to justify this fixed cost.

6.16 There are already parties in the market that perform a brokerage system in some circumstances, consolidating volumes of waste and arranging bulk disposal to regulated sites. There is arguably a wider role for a broker or brokers in the market, to consolidate a larger proportion of NORM wastes into the best available disposal routes. This would be particularly valuable for small scale waste producers, and could help to ensure the most effective use of available capacity (for example by not sending to a limited route licenced for hazardous waste such waste as does not need that route). This role could also make the disposal of NORM as non-exempt waste more appealing, and encourage the development of capacity for recovery and reuse of NORM. However, it is clearly not an appropriate role for government or regulators to appoint any individual firm to this brokerage role. This would have to be something that emerged from the market.

6.17 As discussed in paragraph 4.16 there are concern about availability of skills and knowledge for fast growing sectors, both within and outwith firms. We encourage early consideration by firms of the capacity they need in order to demonstrate effective management of wastes. This should be a central part of their planning for expansion of activities, and failure to plan could back their proposals for growth. It is particularly important that firms who are seeking to expand in sectors that will produce NORM wastes consider the capacity in consultancy markets for advice and waste planning services, if these will be relied upon as facilities are developed.

6.18 As a simple step to improving the functioning of the market, the environmental agencies are considering providing enhanced easy access to reference lists of permitted treatment and disposal facilities.

Question 16: How can the functioning of the market for NORM treatment and disposal services be improved? Is there a potential role for an enhanced brokerage facility for NORM wastes?

6.19 Our proposals for implementation of the proposed strategy are discussed in Chapter 4. Government and environmental regulators are also considering facilitating the initial meetings of industry groups to take forward some of the improvements set out in this strategy. Industry groups could be involved in collecting data, encouraging the development of treatment and disposal routes, and possibly in acting as brokers between waste creators and the waste

managers. We believe that it could be worth the investment of time by individual firms in such groups if it could increase the range of treatment and disposal routes available. Clearly, involvement in such groups would be entirely voluntary, so it would ultimately be for individual businesses to decide if involvement was sufficiently valuable to justify the time spent.

Question 17: What is the best way to involve industry in the implementation of this strategy?

Risks to implementation

6.20 There are three main risks to the implementation of this strategy:-

- Lack of capacity in government and regulators to address the complex issues;
- Shocks to the provision of NORM treatment and disposal facilities;
- Unexpected growth in NORM arisings.

These risks 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 shall seek an implementation 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 paragraph 5.1 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.

Question 18: Do you have any comments on the risks to implementation that are described in Chapter 6? Would you identify any additional risks?

Concluding comments

6.21 There is a range of uncertainties over the future volumes of NORM wastes because of changes in the industrial processes. Effective implementation of the proposed NORM strategy will lead to a stronger market for NORM waste management services, better able to deal with changes to the volumes of wastes produced.

Question 19: Do you have any other comments about the consultation paper or the proposed NORM strategy?

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 Euratom. 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 will adopt the revised Euratom BSS in early 2014 and it is discussed at chapter 5.

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 Environment Agency is responsible for environmental regulation in England.

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 initially created to coordinate the Member States' research programmes for 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. ONR was formed on 1 April 2011 as an agency of the Health and Safety Executive (HSE). ONR is now working towards becoming an independent statutory corporation.

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.

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 Office for Nuclear Regulation is responsible for all nuclear sector regulation across the UK. ONR was formed on 1 April 2011 as an agency of the Health and Safety Executive (HSE).
ONR is now working towards becoming an independent statutory corporation.

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 paper 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.

RCL Radioactive Contaminated Land

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

RSA 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 reuse over recycling over disposal. Illustrated by Figure 1 on page 6.

WHO World Health Organisation

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