National Institute for Public Health
and the Environment
Ministry of Health, Welfare and Sport

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Synopsis

National legal and regulatory framework in various North Sea countries concerning the transboundary movement of NORM residues

Inside and outside of the Netherlands, various non-nuclear industrial sectors, such as the petroleum and gas industries, deal with naturally occurring radioactive materials ('NORM'). As a result of their production processes, residues may be produced that contain or are contaminated with naturally occurring radioactive materials ('NORM residues'). In this study, 'residues' are defined as materials that can be further processed for the recovery of re-useable materials. The processing of these residues can result in the production of waste that contains naturally occurring radioactive materials ('NORM waste'). NORM waste can no longer be used and must be disposed of as radioactive waste via storage or landfills.

NORM residues are also imported for further processing in other countries. RIVM has therefore carried out a survey on policy and the legal and regulatory framework in Belgium, Germany, the United Kingdom, and Norway concerning the transboundary movement of NORM residues. In general, these countries do not allow imports of NORM residues for immediate disposal. Under certain conditions import is allowed, for example if NORM residues undergo further processing which allows for materials to be re-used.

This study was carried out at the request of the Dutch Authority for Nuclear Safety and Radiation Protection (ANVS). This study provides an overview of the international legal and regulatory framework for the transboundary movement of NORM materials, residues and wastes as well as conventional waste. Furthermore, a general advice is formulated as to which criteria could be used by the Netherlands to evaluate a request for imports of NORM residues. These criteria could be used for the potential development of a national policy.

Keywords: naturally occurring radioactive materials, NORM, waste, transfrontier shipment, transboundary movement, import, export, NORM waste, NORM residue, international legislation and regulations

Publiekssamenvatting

Regelgeving in omringende landen over de invoer van NORM reststoffen

In binnen- en buitenland hebben verschillende niet-nucleaire industriële sectoren, zoals de olie- en gasindustrie, te maken met materialen die van nature radioactiviteit bevatten ('NORM'). Als gevolg van de productieprocessen kunnen reststoffen ontstaan die van nature radioactiviteit bevatten ('NORM reststoffen'). 'Reststoffen' zijn in dit onderzoek gedefinieerd als materialen die nog verder verwerkt kunnen worden voor (gedeeltelijk) hergebruik. Bij de verwerking van deze reststoffen kunnen afvalstoffen ontstaan die van nature radioactiviteit bevatten ('NORM afvalstoffen'). Deze afvalstoffen kunnen niet meer worden hergebruikt en moeten als radioactieve afvalstoffen worden afgevoerd voor opslag of stort.

In het buitenland worden ook NORM reststoffen ingevoerd voor verdere verwerking. Het RIVM heeft daarom het beleid en de wet- en regelgeving van België, Duitsland, het Verenigd Koninkrijk en Noorwegen voor de invoer van NORM reststoffen in kaart gebracht. In het algemeen is het in deze landen niet toegestaan om NORM reststoffen in te voeren en vervolgens direct als afval af te voeren. Onder voorwaarden is het toegestaan om NORM reststoffen verder te verwerken, bijvoorbeeld als hierdoor materialen kunnen worden hergebruikt.

Dit onderzoek is op verzoek van de Autoriteit Nucleaire Veiligheid en Stralingsbescherming (ANVS) uitgevoerd. Op basis hiervan is op hoofdlijnen een advies geformuleerd over welke criteria Nederland zou kunnen gebruiken om een aanvraag voor de invoer van NORM reststoffen te beoordelen. Deze criteria zouden kunnen worden toegepast in te ontwikkelen regelgeving op dit gebied.

Kernwoorden: natuurlijke radioactiviteit, radioactiviteit van natuurlijke oorsprong, NORM, afval, rest- en afvalstoffen, overbrenging, invoer, uitvoer, internationale wet- en regelgeving

Contents

Summary

Various non-nuclear industrial sectors at home and abroad have to deal with material flows that contain naturally occurring radioactive material ('NORM'). As a result of their production processes, residues may be produced that contain or are contaminated with naturally occurring radioactive materials ('NORM residues'). In this study, 'residues' are defined as materials that can be further processed for the recovery of re-useable materials. NORM residues may then be imported with a view to processing in the country of destination. The processing of these residues can result in the production of waste that contains naturally occurring radioactive materials ('NORM waste'). These can no longer be re-used and must be managed as radioactive wastes. Under the current regulations, radioactive wastes that arise in the Netherlands following processing of imported NORM residues must (depending on the activity concentration or total activity) either be transported to the Central Organisation for Radioactive Waste (COVRA) or disposed of or processed at a designated landfill site. There are, as yet, no rules or regulations for managing imports of NORM residues and the resultant waste stream.

At the request of the Dutch Authority for Nuclear Safety and Radiation Protection (ANVS), this report reviews national policy, legislation and regulations relating to the transboundary movement of NORM residues from a number of North Sea countries, namely the United Kingdom, Belgium, Germany, Norway (and the Netherlands). In addition, a number of possible outline criteria have been formulated (based on the information obtained) which the Netherlands could use when assessing an application to import NORM residues.

Belgium, Scotland (United Kingdom) and Norway regulate imports and exports of NORM residues using a system of permits whereby the permit application must include information about the anticipated waste streams. This not only serves to shed light on (indirectly) imported NORM waste streams but also makes it possible to assess whether the country has adequate facilities and storage capacity for radioactive waste. In the case of exports, one can assess whether these facilities are adequate in the country of destination. Furthermore, the possibility to return any radioactive residue to its country of origin after processing can be discussed in advance. In order to safeguard disposal capacity in Germany, a restriction has been imposed on imports of NORM residues for the purposes of disposal at a landfill site ('NORM wastes'). Processing of NORM residues from abroad is only possible if the level of radiation protection is taken into consideration and it can be demonstrated that the processing is in compliance with the release requirements.

It can be concluded that a number of North Sea countries do not, in principle, allow importing of NORM wastes for the purposes of *direct* storage or disposal at a landfill site. Importing of NORM residues for processing purposes is only permitted in these countries if a permit or import registration has been granted by the competent authority. In this situation the application for a permit or import registration must be

assessed on a record-by-record basis and the competent authority can, if necessary, impose specific conditions.

This has resulted in a number of general criteria which the Netherlands could use when assessing imports of NORM residues: (1) In principle, it is not permitted to import NORM residues for the purposes of storage or disposal. (2) Processing of NORM residues should result in recovery of re-useable materials (full or partial).
(3) National processing and storage capacities need to remain manageable.

1 Background

Various non-nuclear industrial sectors at home and abroad have to deal with material flows that contain naturally occurring radioactive material ('NORM'). As a result of their production processes, residues[1] may be produced that contain or are contaminated with naturally occurring radioactive materials ('NORM residues') which must then be processed and managed. The Dutch Authority for Nuclear Safety and Radiation Protection (ANVS) has received permit applications for imports of NORM residues from abroad for the purposes of processing in the Netherlands. During processing, waste materials may arise that contain naturally occurring radionuclides ('NORM wastes'). These must be managed as radioactive wastes. Under the current regulations, the radioactive wastes must (depending on the activity concentration or total activity) either be transported to the Central Organisation for Radioactive Waste (COVRA) for storage and final disposal or disposed of or processed at a designated landfill site. Radioactive wastes are indirectly imported from abroad via this route and (depending on their nature) they may even end up in a planned Dutch facility for final disposal. There are, as yet, no rules or regulations governing this waste stream.

The ANVS has asked the National Institute of Public Health and the Environment (RIVM) to review the national legal and regulatory framework on the transboundary movement of NORM residues in various North Sea countries.

1.1 Aim

The aim of this study is to provide an overview of national policy, legislation and regulations relating to the transboundary movement of NORM residues in a number of North Sea countries. The following research questions have been formulated with this in mind:

1. How do various North Sea countries (Belgium, Germany, the United Kingdom and Norway) deal with economic activities involving imports of NORM residues whose subsequent processing gives rise to NORM residues and wastes?
2. How do the costs of storing and managing radioactive waste in the Netherlands compare with the situation in these other countries?
3. What criteria adopted abroad could be applied in Dutch policy concerning permit applications for activities involving NORM residues from abroad?

In parallel with this study the RIVM is conducting a further study of the scope and potential growth of imports of NORM residues to the Netherlands. The results of this study are described in a separate report. The combined results of these studies may enable the ANVS to make a decision on whether or not to formulate policy and legislation with regard to imports of NORM residues from abroad.

[1] 'Residues' here means: materials that can be further processed for the recovery of re-useable materials.

1.2 Scope

1. The study is confined to NORM residues and wastes, and in particular the residues and wastes in the oil and gas industry that arise during decontamination of contaminated parts of installations and the decommissioning of production platforms. The parts that are processed later in the cycle and the possible problems that may arise (e.g. scrap companies that will not accept scrap with an activity concentration below the clearance level after cleaning) fall outside the scope of this study.
2. The study focuses on the North Sea countries Belgium, Germany, the United Kingdom, as well as Norway. Although Norway is not a member of the European Union or Euratom, the problems surrounding imports of NORM residues may also play a role in Norway in view of the production platforms located in the Norwegian continental shelf of the North Sea and the Norwegian decommissioning and processing facilities. It has therefore been decided to include Norwegian policy, legislation and regulations in this study.
3. Material flows of residues and wastes from artificial radionuclides fall outside the scope of this study. It should be noted here that the waste streams of artificial radionuclides have been unequivocally regulated.
4. The study focused on the natural uranium enrichment industry, and especially on the waste stream from the depleted uranium. In the Dutch *National programme for spent fuel and radioactive waste management* it is stated that the stock of depleted uranium arising from the operation of the enrichment plant URENCO, and which should be managed as waste, is converted in France to solid uranium oxides. This material is stored in 3 m^3 containers in a storage facility for depleted uranium at COVRA. This waste flow is well regulated and not relevant for this study.
5. Insofar as the study focuses on the Dutch legislation and regulations concerning radiation protection, it will include both the *Radiation Protection Decree* (*Besluit Stralingsbescherming,* Bs) and the draft *Decree on Basic Safety Standards for Radiation Protection* (*ontwerpBesluit basisveiligheidsnormen stralingsbescherming,* draft Bbs), which was published in the Dutch Government Gazette on 27 March 2017[2].
6. The study does not address imports of raw materials.
7. The overview of national policy, legislation and regulations in this report is based on our interpretation of the international directives and regulations and the national legislation and regulations in the various countries. Some countries have been consulted during this study, but they are not involved in the drawing up of the report. The possibilities for a joint follow-up on this project will be investigated.

[2] Dutch Government Gazette 2017, No. 16500, 27 March 2017

1.3 Structure of the report

Chapter 2 begins with an overview of the definitions used in this report. Chapter 3 describes a number of important international directives and regulations concerning shipments of radioactive waste, radioactive substances, and conventional wastes, looking at the scope of these directives and regulations in relation to NORM residues and wastes. Chapter 4 then examines national legislation and regulations concerning shipments of NORM residues and wastes in the United Kingdom, Belgium, Germany, Norway and the Netherlands. Chapter 5 briefly looks at the differences and similarities in the way that the various countries regulate NORM residues and wastes. Chapter 6 then outlines the conclusions regarding the way in which the countries deal with imports of NORM residues. Finally, a number of recommendations are made in chapter 7 about how the Netherlands might take account of the regulations in the involved countries and what criteria might be used in assessing an application to import NORM residues.

2 Definitions

This study focuses on the application of both international and national directives, legislation and regulations. Included are directives and legislation concerning shipments of radioactive substances, radioactive wastes and conventional wastes. The definitions of the aforementioned terms may, however, vary between the different directives, legislation and regulations. This report will be based on the following definitions:

- Waste materials: released or non-radioactive material for which no further use is foreseen and which can be disposed of as conventional waste.
- Radioactive material: material that contains radionuclides with an activity and activity concentration above the exemption or clearance level.
- Radioactive wastes: material that contains radionuclides with an (activity and)[3] activity concentration above the clearance level and for which no further use is foreseen.
- Naturally occurring radionuclides: primordial radionuclides and their decay products. Cosmogenic radionuclides are not considered here.
- NORM: Naturally Occurring Radioactive Materials
- NORM materials: material that contains naturally occurring radionuclides with an (activity and)[4] activity concentration above the exemption or clearance level.
- NORM residues: material that contains naturally occurring radionuclides with an (activity and)[4] activity concentration above the exemption or clearance level, that have arisen from *work activities*[5] (Bs) or *practices involving natural sources*[6] (draft Bbs) and which may undergo further processing for the recovery of re-useable materials (full or partial).
- NORM wastes: material that contains naturally occurring radionuclides with an (activity and)[4] activity concentration above the clearance level that have arisen from *work activities* (Bs) or *practices involving natural sources* (draft Bbs) and for which no further use is foreseen.

It should be noted that the category under which particular material is grouped – and therefore which regulations apply – will depend on what definition is used.This can vary from country to country and it may also

[3] In the Bs the release of material from regulatory control is on the basis of compliance with activity values and/or activity concentration values. In the draft Bbs the release of material from regulatory control is on the basis of compliance with activity concentration values.
[4] In the Bs exemption and clearance of materials containing naturally occurring radionuclides is on the basis of compliance with activity values and/or activity concentration values. In the draft Bbs the exemption and clearance of materials containing naturally occurring radionculides is on the basis of compliance with activity concentration values.
[5] Work activities (Bs): "*the preparation, holding, use or disposal of a natural source insofar as it is not being, or has not been, processed on account of its radioactive properties, except in connection with an intervention, an accident or a radiological emergency*".
[6] Practice involving natural sources (draft Bbs): "*practice relating to naturally occurring radioactive material within the meaning of Article 3.2*" (reference to a Ministerial Regulation containing a list of practices involving naturally occurring radioactive material).

change with the implementation of new regulations. Where applicable, the internationally applied definitions will be explained in this report. See the RIVM report '*Invoer van NORM reststoffen*' for the definitions used in the Dutch legislation and regulations [1].

3 International directives concerning shipment and management of (radioactive) waste materials and radioactive substances

There are a number of international directives, treaties and regulations relating to imports and exports (or "shipments") of conventional wastes and, more specifically, imports and exports of radioactive wastes and radioactive substances. It has, however, been established that NORM residues and wastes can fall outside the scope of international directives concerning shipment, which can give rise to uncertainty as to what regulations apply to these substances [2]. This is largely due to the definitions that are used. A number of important international directives (together with their fields of application) are discussed in the paragraphs below (Table 1).

Table 1 Overview and scope of international directives

Directive / Regulation	**Hereinafter referred to as**	**Scope**
Directive 2006/117/Euratom on the supervision and control of shipments of radioactive waste and spent fuel	Euratom Directive 2006/117	radioactive wastes → NORM wastes outside scope
Regulation (EC) No. 1013/2006 of the European Parliament and of the Council of 14 June 2006 on shipments of waste	WSR	conventional wastes → NORM wastes within scope
Regulation (Euratom) No. 1493/93 of the Council of 8 June 1993 on shipments of radioactive substances between Member States of the European Community	Regulation 1493/93	radioactive substances → NORM materials/residues outside scope
Directive 2011/70/Euratom establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste	Euratom Directive 2011/70	radioactive wastes → Depends on Member State whether NORM wastes fall within scope[7]
Directive 2013/59/Euratom laying down basic safety standards for protection against the dangers arising from exposure to ionizing radiation	Euratom Directive 2013/59	radioactive substances and radioactive wastes → NORM materials and NORM wastes within scope

3.1 Shipments of radioactive waste

Euratom Directive 2006/117 establishes a system for the supervision and control of transboundary shipments of radioactive waste and spent

[7] If NORM wastes are regarded by the competent regulatory authority of a Member State as radioactive waste then NORM wastes fall within the scope of Euratom Directive 2011/70.

fuel in order to ensure that the population is protected against ionizing radiation.

Scope
"Radioactive wastes" are defined in the Directive as:
"radioactive material in gaseous, liquid or solid form for which no further use is foreseen by the countries of origin and destination, or by a natural or legal person whose decision is accepted by these countries, and which is controlled as radioactive waste by a regulatory body under the legislative and regulatory framework of the countries of origin and destination".

Article 1, para. 2 of Euratom Directive 2006/117 states that this applies to transboundary shipments of radioactive waste or spent fuel whenever:

a) *the country of origin or the country of destination or any country of transit is a Member State of the Community; and*
b) *the quantities and the concentration of the consignment exceed the levels laid down in Article 3(2) points (a) and (b) of Directive 96/29/Euratom.* (This is a reference to a table of exemption values based on activity or activity concentration.)

According to Article 1, para. 5, however, Euratom Directive 2006/117 does not apply to *transboundary shipments of waste that contains only naturally occurring radioactive material which does not arise from "practices"*. The Directive itself does not give a definition of the term "practice", but this can be found in Euratom Directive 96/29[8]:
"a human activity that can increase the exposure of individuals to radiation from an artificial source, or from a natural radiation source where natural radionuclides are processed for their radioactive, fissile or fertile properties, except in the case of an emergency exposure".

Article 1, para. 4 of Euratom Directive 2006/117 states that it also does not apply to shipments of radioactive material that are recovered, through reprocessing, for further use.

Control system
Euratom Directive 2006/117 requires a system of prior authorization for shipments of radioactive waste out of, through or into an EU state. Prior to shipment the holder of the radioactive wastes submits an application for authorization to the competent authority of the Member State of origin. The latter will forward the application for authorization to the competent authority of the Member State of destination, and to the authorities of any Member States of transit, for consent. If all the consents necessary for shipment have been given, the competent authority of the Member State of origin will authorize the holder to carry out the shipment. The competent authority of the Member State of destination is also informed. The consignee of the radioactive wastes must send an acknowledgement of receipt to the competent authority of the Member State of destination for each shipment.

[8] Directive 96/29/Euratom will be repealed with effect from 6 February 2018 and replaced by Directive 2013/59/Euratom (see section 3.5).

It should also be noted that Article 2 of Euratom Directive 2006/117 states that the Directive does not affect the right of a Member State or an undertaking in that Member State to which radioactive wastes are shipped for processing, or other material is shipped with the purpose of recovering the radioactive wastes, to return the radioactive waste to the country of origin after treatment.

NORM wastes
Although generally speaking no major problems have been reported by the Member States after the implementation of Euratom Directive 2006/117, two points of concern arising from the defined scope have been raised by a few Member States [2]:

1. There is no harmonization of clearance levels for radioactive wastes within the EU. This may mean that radioactive substances are released in one Member State, but in another Member State they must still be managed (and shipped) as radioactive wastes[9]. Appendix 1 of this report includes a brief outline of clearance levels and accompanying management of a number of natural radionuclides [3].
2. Transboundary shipments of NORM wastes do not fall under Directive 2006/117/Euratom, nor under Directive 2006/21/EC concerning the management of waste from extractive industries[10]. It is not clear under what rules NORM waste shipments are regulated.

An advisory committee has been set up within the European Commission which will further investigate both of these issues [2]. It is not clear how advanced this process is.

3.2 Shipments of conventional waste

Regulation 1013/2006 (WSR) introduces a system for the supervision and control of shipments of waste with a view to improving environmental protection.

Scope
As defined in the *European Framework Directive on Waste* (Directive 2008/98/EC)[11], "waste" here means:
"any substance or object which the holder discards or intends or is required to discard".

The WSR does not apply to shipments of radioactive waste *as defined in Euratom Directive 2006/117* (see section 3.1)[12].

[9] For Pb-210, for example, there are clearance levels of 1 Bq/g, 5 Bq/g and 100 Bq/g in Norway, the United Kingdom and the Netherlands (Bs), respectively. In the Netherlands the clearance level will change to 1 Bq/g after implementation of Euratom Directive 2013/59.
[10] NORM wastes from the oil and gas industry do not fall within the scope of Euratom Directive 2006/117 since the naturally occurring radioactive material arises as a by-product and is not processed for its radioactive properties.
[11] The WSR makes reference to Directive 2006/12/EC. This Directive has been repealed with effect from 12 December 2010 and replaced by Directive 2008/98/EC.
[12] Regulation 1013/2006 makes reference to Directive 92/3/Euratom. This Directive has been repealed with effect from 25 December 2008 and replaced by Directive 2006/117/Euratom.

Control system
Depending on the type of waste concerned and the aim of shipment (for recovery or disposal), there is a general information procedure or a procedure of prior written notification and consent for shipments of waste from the authorities concerned. The notification of a shipment is submitted in the country of dispatch. The authority of that country forwards the notification to the competent authority of destination and copies to the competent authority (or authorities) of transit.

NORM wastes
Insofar as they cannot be included within the scope of Euratom Directive 2006/117, NORM wastes do not appear to be explicitly excluded from the WSR. One could therefore argue that shipments of NORM wastes are covered by the regulations on conventional waste. On the other hand, it could also be argued that, following the implementation of Euratom Directive 2013/59, shipments of NORM wastes fall directly under the radioactive waste regulations (see section 3.5).

3.3 Shipments of radioactive substances

Regulation 1493/93 introduces an EU-wide system of declaration for shipments of radioactive substances between EU countries[13].

Scope
The Regulation applies to shipments of sealed sources and "other relevant sources", which are defined as:
"any radioactive substance not being a sealed source intended for direct or indirect use of the ionizing radiation it emits for medical, veterinary, industrial, commercial, research or agricultural applications".

The Regulation applies only if the quantities and concentrations exceed the levels laid down in Directive 96/29/Euratom. (This is a reference to a table of exemption values based on activity or activity concentration.)[14]

Control system
This Regulation requires a prior declaration for shipments of radioactive substances between Member States of the European Union. Prior to shipment the holder of the radioactive substances should obtain a declaration from the consignee to the effect that the consignee complies both with the EU legislation and with relevant national requirements for safe storage, safe use and safe disposal of sources or waste. Standard documents are available for this purpose. The consignee should first provide this declaration to the competent authority of the country of destination. The competent authority confirms with its official stamp on the document that it has taken note of the declaration and the declaration is then sent by the consignee to the holder. Neither the

[13] Regulation 1493/93 also applied to shipments of radioactive waste until 1 January 1994. It ceased to apply following implementation of Directive 92/3/Euratom. This Directive has since been repealed and replaced by Directive 2006/117/Euratom.
[14] Regulation 1493/93 makes reference to Directive 80/836/Euratom. This Directive has been repealed with effect from 13 May 2000 and replaced by Directive 96/29/Euratom. This will be repealed with effect from 6 February 2018 and replaced by Directive 2013/59/Euratom (see section 3.5).

Regulation nor the declaration form includes any instructions regarding the return of radioactive substances.

NORM materials/residues
Depending on what exactly is understood by the indirect use of ionizing radiation for application in industry, it is debatable whether NORM materials fall within the scope of Regulation 1493/93. If "NORM materials" is understood to mean *natural sources insofar as they are not being or have not been processed due to the radioactive properties* then one cannot really speak of indirect use of ionizing radiation. After all, the radiation is not used in industry and only arises as a by-product. As far as shipments of NORM materials are concerned, it can be argued that these do not fall within the scope of Regulation 1493/93.

3.4 Management of radioactive waste

Euratom Directive 2011/70 establishes a Community framework to ensure the responsible and safe management of spent fuel and radioactive wastes in order to avoid imposing an unnecessary burden on future generations. The Directive obliges Member States to establish and maintain an appropriate national legislative, regulatory and organizational framework for this management. This consists in part of setting up a national programme for the implementation of spent fuel and radioactive waste management policy.

Scope
Euratom Directive 2011/70 applies to all stages of spent fuel and radioactive waste management, from generation to disposal, when the radioactive waste results from civilian activities. "Radioactive wastes" here means:
"radioactive material in gaseous, liquid or solid form for which no further use is foreseen or considered by the Member State or by a legal or natural person whose decision is accepted by the Member State, and which is regulated as radioactive waste by a competent regulatory authority under the legislative and regulatory framework of the Member State".

It should also be noted that Article 2, para. 4 of Euratom Directive 2011/70 states that this Directive does not affect the right of a Member State or an undertaking in that Member State to return the radioactive wastes to the country of origin after processing, if:

a) *radioactive waste is to be shipped to that Member State or undertaking in that Member State for processing, or*
b) *other material is to be shipped to that Member State or undertaking in that Member State with the purpose of recovering the radioactive waste.*

Control system
The general principles of Euratom Directive 2011/70 include a number of articles relating to shipments of radioactive waste. For example, Article 4, para. 2 states that if radioactive waste is shipped to a Member State or a third country, the ultimate responsibility for the safe and responsible disposal of those materials, including any waste as a by-

product, remains with the Member State or third country from which the radioactive material was shipped.
Article 4, para. 4 states that radioactive waste shall be disposed of in the Member State in which it was generated. This requirement can be waived if at the time of shipment an agreement is in place between the Member State concerned and another Member State or a third country to use a disposal facility in one of them. Account should be taken of the criteria established by the Commission with regard to requirements for exports[15].

NORM wastes
NORM wastes are not explicitly excluded from Euratom Directive 2011/70. If NORM wastes are regarded by the competent regulatory authority of a Member State as radioactive wastes, then NORM wastes will fall within the scope of the Directive.

3.5 Implementation of Euratom Directive 2013/59

With effect from 6 February 2018 Euratom Directive 96/29 will be repealed and replaced by *Euratom Directive 2013/59 laying down basic safety standards for protection against the dangers arising from exposure to ionizing radiation*. The distinction that is currently made between "work activities", of which naturally occurring radionuclides are an unintended by-product, and "practices", in which radioactivity is used consciously and intentionally, will then cease to apply. As described in section 3.1, Euratom Directive 2006/117 explicitly does not apply to *transboundary shipments of waste that contains naturally occurring radioactive material that does not arise from "practices".* With the removal of the distinction between "work activities" and "practices" NORM wastes may possibly fall within the scope of Euratom Directive 2006/117. It is not yet entirely clear what, internationally, the implications of the new definitions will be. In the Netherlands it is intended that the shipment of NORM wastes will be regulated by Euratom Directive 2006/117 after the 6th of February 2018.

The implementation of Euratom Directive 2013/59 also changes the exemption and clearance levels, which in turn alters the scope of Euratom Directive 2006/117 on shipments of radioactive waste and Regulation 1493/93 on shipments of radioactive substances. For a number of natural radionuclides the exemption and clearance levels may be reduced. This is expected to result in an increase in the amount of material that has to be managed and shipped as radioactive waste. If NORM wastes are, indeed, to fall within the scope of Euratom Directive 2006/117 then the lowering of the clearance levels may mean an increase in the quantity of NORM wastes that have to be shipped as radioactive waste.

3.6 Synopsis

Shipments of NORM residues and wastes that are not being (or have not been) processed due to their radioactive properties or result from these practices appear to be excluded from the international directives on

[15] Commission recommendations concerning criteria for exports of radioactive wastes and spent fuel to third countries (2008/965/Euratom).

transboundary shipments of radioactive waste and radioactive substances. Thus imports and exports of NORM wastes currently appear to be covered by the conventional waste regulations. The international directive on radioactive waste management does appear to allow NORM wastes to be stored in another Member State if an agreement is in place between the Member States concerned at the time of shipment. The implications of the implementation of Euratom Directive 2013/59 for other international directives are not yet entirely clear.

4 National legislation and regulations on shipment of NORM in various North Sea countries

In practice the lack of clear international frameworks with regard to shipments of NORM wastes and NORM residues is proving to be problematic (see section 3.1). This has, in some cases, led to differences in national legislation after implementation of Euratom directives concerning shipments.

This section gives an overview of the national legislation and regulations relating to shipments of NORM residues and wastes in a number of North Sea countries: United Kingdom, Belgium, Germany, Norway and the Netherlands. This will provide a picture of how these countries deal with imports of NORM residues and wastes, whereby after processing in the country of destination, NORM wastes can arise that must be managed as such.The results are summarized in Table 2 at the end of this section.

4.1 United Kingdom

The UK has fairly extensive policy frameworks with regard to the management of NORM wastes. Documents relating specifically to shipments of NORM wastes have been published which interpret the legislation and regulations [4, 5]. The principal issues concerning NORM waste strategy in the UK are discussed here. It should be noted that this section relates to the current legislation and regulations. The possible implications of the proposed withdrawal from Euratom for this legislation are not included.

Legislation and regulations concerning shipment of radioactive wastes
In the UK, Euratom Directive 2006/117 has been transposed into national legislation via the *Transfrontier Shipment of Radioactive Waste and Spent Fuel Regulations 2008* (TFSRW). Article 4 states that it is prohibited to transport radioactive wastes without authorization. According to Article 3, para. 2 (c), however, these regulations do not apply to transboundary shipments of waste that contains naturally occurring radioactive material that does not arise from practices.

Legislation and regulations concerning radioactive wastes and radioactive substances
UK legislation concerning radioactive substances is enshrined in the *Radioactive Substances Act 1993* (RSA93)[16], which applies in Scotland and Northern Ireland, and the *Environmental Permitting Regulations 2010* (EPR10), which apply in England and Wales. This legislation also incorporates regulations concerning radioactive wastes.

[16] In 2011 the RSA93 was amended by 'The Radioactive Substances Act 1993 Amendment (Scotland) Regulations 2011' and 'The Radioactive Substances Act 1993 (Amendment) Regulations (Northern Ireland) 2011'. This has resulted in redefinitions of "radioactive material" and "radioactive waste" in the RSA93. Discussions here are based on the modified definitions.

"Radioactive substances" and "radioactive wastes" have the following meaning in UK legislation:
"a material that is not waste or waste that falls into one of the following groups:

- *NORM industrial activities;*
- *Processed radionuclides of natural, terrestrial or cosmic origin;*
- *Radionuclides that are not of natural, terrestrial or cosmic origin."*

Furthermore, the activity concentration of the materials must be higher than the exemption level in order for them to be regarded as radioactive material. "NORM industrial activities" are defined as:
"industrial activities that involve radionuclides of natural, terrestrial or cosmic origin and are included in Table 1".

An overview of these industries is given in Table 3 of Appendix 2 of this report. Industrial activities whereby radionuclides of natural, terrestrial or cosmic origin are processed due to their radioactive, fissile or fertile properties are explicitly excluded.

NORM wastes
As stated in Euratom Directive 2006/117, shipments of NORM wastes do not fall under the TFSRW Regulations on shipments of radioactive wastes. Waste materials that contain NORM or are contaminated with NORM that has not been processed due to their radioactive, fissile or fertile properties do therefore fall under the provisions of the EU regulations concerning shipments of conventional waste [5]. This means that shipments of NORM wastes are subject to the WSR (see section 3.2).

National UK legislation on radiation protection (RSA93 and EPR10) does, however, apply to NORM wastes. This is the case for NORM wastes that arise from specific industrial activities. This means industrial activities in which use is made of uranium or thorium *and* listed industrial activities in which NORM is only present incidentally (Appendix 2, Table 3 part 1 *and* 2). If NORM wastes arise from these industrial activities and the radionuclide concentrations in the waste material are higher than the values given for solid, liquid or gaseous materials then NORM wastes are regulated in the UK as radioactive wastes [6]. This means that shipments of NORM wastes must be authorized under national legislation (RSA93 and EPR10) [5].

NORM materials
Other than NORM wastes, national UK legislation (RSA93 and EPR10) on radiation protection only applies to NORM materials that arise from industrial activities in which use is made of uranium or thorium (Appendix 2, Table 3 part 1) and the activity concentrations are higher than the values given for solid, liquid or gaseous materials. These NORM materials are regarded and regulated as radioactive materials. Other materials which contain naturally occurring radionculides which are not used for their radioactive or fissile properties are not regarded as radioactive material and therefore fall outside the scope of the national UK legislation.

Control system
Shipments of NORM wastes to and from the UK are subject to various international treaties and EU and domestic legislation. The important point to mention here is that in domestic legislation NORM wastes from specific industrial activities are subject to the same policy frameworks as other types of radioactive wastes. Broadly speaking, the policy is that radioactive wastes are not imported to or exported from the UK. A permit can only be granted if all practicable waste management options have been explored. A permit is not granted unless importing or exporting [4]:

- for the recovery of re-usable materials; or
- for treatment that will make its subsequent storage and disposal more manageable.

In practice this means that shipments of NORM wastes should be examined on a case-by-case basis before the competent authority can decide whether or not to approve the shipment. Prior to export the undertaking must comply with the regulations concerning shipments of conventional waste *and* be in possession of a permit to dispose of radioactive waste to the facility abroad. In certain situations, however, this may result in conflicting requirements. An example cited by the Scottish Environment Protection Agency (SEPA) is the repatriation of scale following treatment of contaminated metals [5]. This can be regarded as an import for disposal, which is prohibited under the regulations governing conventional waste. Such situations will need to be addressed on a case-by-case basis, taking into account the specific circumstances of the proposed shipments of NORM wastes. SEPA has published a Guidance Document which includes the information that would need to be supplied in an application for shipment of NORM wastes [5]. This information is attached to this report in Appendix 3.

Dealing with NORM residues from abroad
A strategy (referred to below as 'the strategy') for dealing with NORM waste in the UK was published in 2014 [4]. This strategy was duly accepted by the UK Department of Energy and Climate Change (DECC), the Scottish Government, the Government of Wales and the Northern Ireland Department of the Environment [4]. As far as imports and exports of NORM wastes are concerned, the various governments have noted that there may be NORM waste streams that do not generate sufficient quantities of waste to be regarded as commercially viable waste management options in the country that produces the waste. It is therefore beneficial for the industry to have access to facilities abroad, and vice versa for facilities in the UK to be able to accept waste from abroad for processing. The strategies relating to the Scottish and UK oil and gas industry also promote the use of domestic skills and expertise from abroad. Insofar as such goals can be achieved under the relevant legislation and regulations, imports and exports of NORM wastes are supported.

4.1.1 ***Synopsis***

To summarize, NORM wastes that arise from specific industrial activities are subject to the same policy frameworks as other types of radioactive wastes in the United Kingdom. Imports and exports of NORM wastes are regulated through a system of permits for radioactive waste. There must

also be compliance with the regulations concerning shipments of conventional waste. In the United Kingdom it is considered beneficial for the industry to have access to facilities abroad, and conversely for facilities in the United Kingdom to be able to accept waste from abroad for processing.

4.2 Belgium

Importing of NORM residues that generate radioactive wastes in Belgium appears to be limited and is underpinned by a system of permits.

Legislation and regulations concerning shipment of radioactive wastes and radioactive substances
In Belgium Euratom Directive 2006/117 was implemented via the *Decree for the Regulation of Imports, Transit and Exports of Radioactive Substances* (*Besluit tot de regeling van de invoer, de doorvoer en de uitvoer van radioactieve stoffen*). This Decree applies both to shipments of radioactive substances and shipments of radioactive waste.

The regulations concerning shipments of radioactive waste are incorporated in chapter 5 of the Decree. Article 11 states that it is prohibited to transport radioactive waste without authorization. When the applicant is established in Belgium, the application for imports and exports also needs to include the opinion of the Belgian National Agency for Radioactive Waste and Enriched Fissile Material (NIRAS). According to Article 10, however, chapter 5 does not apply to shipments of waste that contain only naturally occurring radioactive substances and do not arise from practices.

The regulations concerning shipments of radioactive substances are likewise included in the above Decree. Article 3 of this Decree states that importing of radioactive substances may only be undertaken by a natural or legal person who is registered with the Agency. To this end a completed registration form must be submitted to the Belgian Federal Agency for Nuclear Control (FANC). As far as imports of material for decontamination are concerned, information must be provided in advance about the waste that might be generated. At the same time, it is necessary to answer the question as to whether the waste is being returned by the consignor. A registration application will be refused if the conditions stated in Article 3 of the above Decree are not fulfilled. This means that the undertaking must have a permit for practices involving radioactive material in accordance with the *General Regulation* (*Algemeen reglement,* ARBIS). The legislation does not include any specific grounds for refusing the import registration as far as the production of radioactive wastes as a result of the processing of imported radioactive substances is concerned.

As stated in Article 18 of the above Decree, exports of activated or radioactively contaminated materials or equipment for treatment purposes are likewise subject to a system of prior authorization by the FANC if there is a possibility of radioactive waste arising as a result of the treatment. The holder submits the permit application using the form issued by the FANC. The FANC consults the NIRAS about the possibility of returning the radioactive waste and its subsequent management.

However, Article 2 states that the above Decree does not apply to imports of natural radiation sources if the natural radionuclides that they contain are not being (or have not been) processed for their radioactive, fissile or fertile properties. Provided that the activity or the activity concentration does not exceed the clearance level specified in the *General Regulation* (ARBIS); in the case of the U-238 and Th-232 series the activity or activity concentration must not be more than ten times the clearance level.

NORM wastes
Shipments of NORM wastes do not fall under the *Decree for the Regulation of Imports, Transit and Exports of Radioactive Substances* (or Euratom Directive 2006/117) but are covered by conventional waste legislation. In principle, this means that it is prohibited to import NORM wastes for the purposes of disposal at a landfill site. The quantities of NORM wastes that may end up in a landfill site are restricted via a permit that is granted to the landfill site. Unrestricted imports of NORM wastes could affect this storage capacity.

NORM residues
The *Decree for the Regulation of Imports, Transit and Exports of Radioactive Substances* applies to imports of NORM materials whose activity and activity concentration exceeds ten times the clearance level.

In practice, the regulations on shipments of NORM residues correspond to the regulations on other NORM activities that involve imports of raw materials from abroad. In Belgium there are, for example, several non-ferrous[17] companies that import residues from primary non-ferrous production abroad with a view to further processing.

Control system
In general, NORM storage and processing capacities must practise "sustainable management". Consequently there is no outright ban on importing NORM-contaminated materials for decontamination. Strictly speaking the Belgian operator is then the producer of the NORM wastes. Belgian operators must obtain a permit for decontamination activities. The permit declaration must contain information about the anticipated quantities and activity of the NORM wastes. If the NORM wastes are found to be unmanageable, a permit will not be granted. Furthermore, the permit may stipulate specific conditions such as mandatory take-back by the consignor or a restriction on the quantity or the activity of the waste materials that arise. In addition, the operator must provide data on the waste materials that are actually produced (stating their origin and destination). This gives an insight into the waste streams that arise as well as making it possible to revise the conditions in the permit.

There are no formal criteria for assessing the manageability of NORM wastes in the declaration. A decision can only be assessed on a record-by-record basis and the actual information given in the declaration. Based on the declaration, restrictions can be imposed when granting the

[17] Non-ferrous metals are metals that contain no iron.

permit or else a permit can be refused. If a permit is not granted for work activities involving natural sources, this will also result in the import registration being refused.

Dealing with NORM residues from abroad
As in the Netherlands, shipments containing radioactive material unintentionally are sometimes discovered at Belgian ports [1]. These may be NORM residues, which must then be processed. Examples are thorium-containing lamps from abroad, which had to be dismantled. As far as the dismantlement of the thorium-containing lamps is concerned, the Belgian company that carries out the dismantlement activities is regarded as the waste producer. The thorium cathodes that remain after dismantlement must be managed as radioactive waste. Information about the anticipated quantity was provided in the permit application and a written agreement from NIRAS accepting the thorium cathodes also had to be supplied. In addition, data have to be provided annually about the waste materials that are produced.

*4.2.1 **Synopsis***

To summarize, importing of NORM wastes for the purposes of disposal at a landfill site is prohibited in Belgium under conventional waste legislation. Imports and exports of NORM residues are permitted and they are regulated using a system of import registrations and permits. Here consideration is given in advance to radioactive waste streams that may arise as a result of import to Belgium or export. There are, however, no formal criteria for assessing the manageability of NORM waste streams.

4.3 Germany

Legislation and regulations concerning shipment of radioactive wastes
Euratom Directive 2006/117 has been transposed into German legislation via the *Nuclear Waste Shipment Ordinance* (*Atomrechtliche Abfallverbringungsverordnung*, AtAV). According to Article 1, para. 2 (2), however, this Regulation does not apply to transboundary shipments of waste containing only naturally occurring radioactive material that does not arise from practices as stated in the *Radiation Protection Ordinance* (*Strahlenschutzverordnung,* StrlSchV). "Practices" are defined here as:
"operations involving naturally occured radioactive substances that are carried out due to the radioactivity of these substances".

According to Article 1, para. 2 (3), the AtAV also does not apply to shipments of radioactive substances that can be recovered through reprocessing.

Legislation and regulations concerning shipments of radioactive substances
In Germany, as in the other EU Member States, Regulation 1493/93 applies to shipments of radioactive substances (other than fissile materials) from or to EU Member States (see section 3.3). Shipments of radioactive substances from and to countries outside the EU are regulated in the *Radiation Protection Ordinance* (StrlSchV). Depending on the material to be transported, such shipments are subject to

authorization or notification. Furthermore, the StrlSchV includes provisions concerning protection of members of the public against radiation from naturally occurring radioactive substances, more specifically the "residues". "Residues" are defined here as: *"materials which are generated during the processes of industry and mining specified in Appendix XII, Part A and which meet the criteria specified therein".*

An overview of these industries can be found in Appendix 4 of this report. Materials with an activity concentration below 0.2 Bq/g are not included, nor are materials used as raw materials in the above-mentioned processes. The provisions relating to residues apply explicitly to imports of (NORM) residues generated abroad[18]. Transboundary shipments of residues to Germany for the purposes of disposal are prohibited under Article 97, para. 5.

NORM wastes
In line with Euratom Directive 2006/117, shipments of NORM wastes do not fall under the *Nuclear Waste Shipment Ordinance* (AtAV). Although NORM wastes are not defined as such in the *Radiation Protection Ordinance* (StrlSchV), these wastes are characterized in several studies conducted on behalf of the German Federal Office for Radiation Protection (BfS) as NORM residues that cannot be released under Article 98 of the *Radiation Protection Ordinance*. Hence they are still radioactive substances within the meaning of the *Atomic Energy Act* (*Atomgesetz*, AtG) and NORM wastes remain within the scope of the *Radiation Protection Ordinance* [7, 8].

NORM residues
The provisions concerning residues in the *Radiation Protection Ordinance* (Articles 97-102) apply to NORM residues and to imports of NORM residues generated abroad.

Control system
The German Federal Office for Economic Affairs and Export Control (BAFA) is responsible for the authorization and notification procedures relating to transboundary shipments of radioactive substances and radioactive wastes in Germany [9, 10]. The competent authority in radiation protection of a federal state is responsible for the supervision of NORM residues, as regulated in Articles 97-102 of the *Radiation Protection Ordinance*.

Those who carry out work activities that give rise to (NORM) residues requiring surveillance and whose utilization or disposal may cause the effective dose guidance value of 1 mSv per year for the general public to be exceeded should take measures for the protection of the general public. NORM residues that exceed the established surveillance limits fall under the supervision of the competent authority. If the surveillance limits are exceeded, the competent authority of a federal state can, upon application, release the residues for the purposes of a particular

[18] A 'Regulation Amending Radiation Protection Regulations' (*Verordnung zur Änderung strahlenschutzrechtlicher Verordnungen*) was issued in 2011 (Federal Council Journal no. 266/11) which incorporated this addendum (*inter alia*).

utilization or disposal. In order for this to happen it must be demonstrated that:

- The radiation exposure of members of the public (1 mSv per year) is not exceeded as a result of such disposal or utilization, even without further activities, and
- the planned utilization or disposal is permissible according to conventional waste legislation.

Residues that can be released are processed as conventional waste and disposed of. Residues that cannot be released must be reported to the competent authority in radiation protection, together with information concerning the origin, mass and activity concentration of the residues. The competent authority in radiation protection can then determine whether protective measures need to be taken and specify the manner in which the residues must be disposed of. This also applies to new applications in which residues may arise which have not yet been explicitly incorporated in the *Radiation Protection Ordinance* [11].

Work activities where more than an annual total of 2000 tonnes of residues accumulate, are utilized or disposed are subject to mandatory notification. They must be notified both to the competent authority in radiation protection and to the competent waste legislation authority.

The following regulatory system is in place to ensure that shipments to Germany of NORM residues generated abroad are controlled:

- Importing of NORM residues to Germany for the purposes of disposal is prohibited.
- Importing of NORM residues to Germany is permitted if it is proved in advance to the competent authority that the surveillance limits are met or that the prerequisites for the release from surveillance for the purpose of a defined recycling are given.

Dealing with NORM residues from abroad
One of the aims of the *Regulation Amending the 2011 Radiation Protection Ordinance* was to restrict transboundary shipments of NORM. NORM residues that arise abroad during specific industrial processes and are imported to Germany for recycling are subject to the same supervision as NORM residues that have arisen in Germany. This means that the same level of radiation protection will apply for NORM residues from abroad. A restriction of the landfilling of foreign NORM residues is deemed necessary because otherwise there could potentially be capacity constraints for German NORM residues [12]. The Regulation also needs to prevent the ban on disposal of foreign NORM residues being circumvented through the addition of a processing step for the residues if the main aim of shipment is, in fact, disposal [12]. The importer of NORM residues must therefore be able to demonstrate to the competent authority that the recycling is in compliance with the release requirements.

4.3.1 ***Synopsis***

Germany explicitly prohibits importing of NORM residues from abroad for the purposes of disposal in Germany. It is permitted to import NORM residues for recycling purposes provided that the the prerequisites for

the release from surveillance for the purpose of a defined recycling are given. The foreign NORM residues fall under the same supervision as NORM residues that have been generated in Germany.

4.4 Norway

Legislation and regulations concerning radioactive wastes
Regulations concerning radioactive pollution and radioactive waste came into force in Norway on January 1st 2011 under Norway's 1981 *Pollution Control Act*, which regulates radioactive waste in an integrated system alongside hazardous waste [13]. The application regulations[19] then defined what is deemed to be, and must be managed as, "radioactive waste" as follows:
"objects of personal property or substances that are considered to be waste under the Pollution Control Act section 27 first paragraph and contain or are contaminated with radioactive substances with specific activity that exceeds or is equal to values listed in annex I letter a".

A "radioactive substance" is understood to be [14]:
"any substance that emits alpha, beta or gamma radiation".

And "waste" is defined as:
"discarded objects of personal property or substances. Surplus objects and substances from service industries, manufacturing industries and treatment plants, etc., are also considered to be waste. Waste water and exhaust gases are not considered to be waste."

It should also be noted that the Norwegian Radiation Protection Authority (NRPA) determines what, in case of doubt, is to be regarded as radioactive waste, including radioactive waste that must comply with certain requirements for disposal.

Legislation and regulations concerning shipments of radioactive waste
Regulations concerning the recycling of waste are incorporated in the Norwegian *Waste Regulations*. Chapter 16 of these Regulations deals with radioactive waste management and, more specifically, imports and exports of radioactive wastes.

NORM wastes
As no distinction is made in the definitions between radioactive sources of artificial or natural origin, NORM wastes would appear to fall under the *Pollution Control Act*. When the activity concentration of the NORM wastes exceeds the exemption levels, NORM wastes will be regarded and regulated as radioactive wastes. NORM wastes with an activity concentration between 1 and 10 Bq/g can be taken to a landfill site for hazardous waste [13]. The above legislation also stipulates when radioactive wastes have to be taken to an authorized disposal site. In the case of NORM wastes, this is, in principle, at an activity concentration above 10 Bq/g. They can be disposed of to the Stangeneset depot for NORM wastes in Norway [13].

[19] Regulations on the application of the Pollution Control Act to radioactive pollution and radioactive waste

NORM residues
Within the Norwegian legislation and regulations no distinction is made between 'wastes' and 'residues'. Materials (wastes) that can be further processed for the recovery of re-useable materials is also considered to be 'waste'.

Control system
A permit is needed from the NRPA for imports and exports of radioactive wastes (including NORM wastes) to or from Norway [15]. This requires compliance with specific conditions. Exports of NORM wastes are, for example, only possible if this is necessary in order to achieve an environmentally sound and safe solution for waste management. However, as Norway has good NORM wastes facilities, it seems less likely that export will lead to a better solution [15]. A permit from the NRPA is also required for imports of NORM wastes and this is only granted if there are well-grounded waste management reasons for doing so. Moreover, waste management facilities are required to have the necessary authorisations and capacity. Although there are requirements for import and export of radioactive wastes, there are no specific criteria formulated to asses for example "well-grounded waste management reasons".

In chapter 16 of the Norwegian *Waste Regulations* importing and exporting of offshore installations for decommissioning purposes are mentioned separately alongside imports and exports of radioactive wastes. Import and export of offshore installations that contain both radioactive waste and hazardous waste require one joint authorisation from the Norwegian Environment Agency (NEA) and the NRPA. The WSR procedures are followed for the purposes of the shipment (see section 3.2). The NRPA has published a Guidance Document for radioactive material from the oil and gas industry [16]. This states that before importing can take place, an investigation must be conducted to ascertain whether the installation contains radioactive wastes and whether there are still sealed sources within the installation. This information must be provided with the application [16].

Dealing with NORM residues from abroad
The import of NORM residues is permitted if the requirements for an authorisation from NRPA are met. Although the import of NORM wastes for direct disposal is possible within the Norwegian legislation and regulations, it is not likely to be permitted.

Importing of production platforms for decommissioning purposes (especially from the United Kingdom) is an example of the importing of NORM residues to Norway. In 2011 the Norwegian Climate and Pollution Agency (NCPA) carried out a study which, among other things, investigated the amount and type of waste material and the decommissioning capacities in Norway, looking both at the present and the future [17]. At the time there were four authorized decommissioning facilities for offshore installations in Norway. Several offshore installations have been imported from the United Kingdom for decommissioning in the past few years and several countries from the North Sea region are expected to be interested in Norway's decommissioning facilities in the coming years. Waste generated in

these operations is for the most part steel, but radioactive wastes may also be released after decommissioning. In general, larger quantities of NORM residues and wastes can be expected in installations from oil fields than from gas fields. The decommissioning of a large platform is estimated to generate three tonnes of radioactive waste (>10 Bq/g) compared with one tonne of radioactive waste from the decommissioning of a small platform [17]. This is only scaling and does not include sludges and solid wastes. It should be noted that estimates of the quantities of NORM residues and wastes from each installation are subject to great uncertainty [1, 17].

Importing of offshore installations (or parts thereof) for decommissioning purposes is problematic owing to the uncertainties in international directives and differences in national legislation governing shipments of radioactive and other waste materials. The competent authorities of Norway, the United Kingdom, Denmark and Germany have therefore set up a working group to consider the problems surrounding the anticipated NORM residue and waste streams from decommissioning projects in the North Sea [15].

4.4.1 ***Synopsis***

To summarize, NORM waste strategy in Norway is subject to the same regulations as other types of radioactive waste. Imports and exports of NORM wastes are subject to authorization and a permit is only granted if specific conditions are fulfilled. Shipments of offshore installations (or parts thereof) for decommissioning purposes are regulated in accordance with the EU Waste Shipments Regulation (WSR).

4.5 The Netherlands

Legislation and regulations concerning shipments of radioactive wastes
In the Netherlands Directive 2006/117/Euratom on shipments of radioactive waste[20] has been implemented via the *Decree on Import, Export and Transit of Radioactive Waste and Spent Fuel* (*Besluit in-, uit- en doorvoer van radioactieve afvalstoffen en bestraalde splijtstoffen,* Biudras). Under this Decree it is prohibited to transport radioactive wastes to the Netherlands without authorization. However, Article 2 states that this Decree does not apply to shipments of radioactive waste containing naturally occurring radionuclides which are not used for their radioactive properties.

Legislation and regulations concerning shipments of radioactive substances
The Netherlands has also enacted the *Transport of Fissionable Materials, Ores and Radioactive Materials Decree* (*Besluit vervoer splijtstoffen, ertsen en radioactieve stoffen,* Bvser), which relates both to the transportation of radioactive substances within the Netherlands and the shipment of radioactive substances into or out of Dutch territory. Article 1a, para. e states that this Decree does not apply to natural sources used to undertake work activities if their activity concentration is lower than or equal to ten times the level values for exempted substances, as

[20] Directive 2006/117/Euratom concerning supervision and control of shipments of radioactive waste and spent fuel

stated in Table 2.2.7.2.2.1. of Annex 1 of the *Regulations on the Transport of Hazardous Substances by Rail* (VSG) and the *Regulations on the Transport of Hazardous Substances by Land* (VLG). This contains a reference to the relevant table in the *European Agreement concerning the International Carriage of Dangerous Goods by Road* (ADR)[21].

Legislation and regulations concerning shipment of conventional waste
Dutch regulations concerning conventional wastes can be found in chapter 10 of the *Environmental Management Act* (*Wet milieubeheer*, Wm), which complies with the *European Framework Directive on Waste* (Directive 2008/98/EC). Chapter 10 also transposes the *EU Waste Shipments Regulation* (WSR). This is implemented in the *EU Waste Shipments Regulation Implementing Ordinance*.

NORM wastes
Transboundary shipments of NORM wastes fall outside the *Decree on Import, Export and Transit of Radioactive Waste and Spent Fuel* (Biudras).
Article 10.1a, para. 1 (d) of the *Environmental Management Act* states that chapter 10 does not apply to radioactive wastes. This is in line with the *European Framework Directive on Waste* and the WSR. Shipments of radioactive waste *as defined in Directive 2006/117/Euratom*[22] are excluded from the WSR. NORM wastes do not, however, fall within the scope of the aforementioned Directive and would therefore appear not to be explicitly excluded from the WSR.

The *Environmental Management Act* does not include a definition of radioactive wastes. More specifically, chapter 10 does not apply to practices*, insofar as this is subject to requirements imposed by or pursuant to the Nuclear Energy Act (Kernenergiewet,* KeW*).* An Order in Council (AMvB) relating to the *Nuclear Energy Act* imposes rules regarding shipments of radioactive waste (Biudras, section 3.1). However, shipments of NORM wastes (not been (or are not being) processed for their radioactive properties) fall outside the scope of that AMvB and consequently there do not appear to be any related requirements under the *Nuclear Energy Act*.

It could therefore be argued that shipments of NORM wastes are covered by the WSR and the *Environmental Management Act* and, therefore, by the regulations concerning shipments of conventional wastes. However, from the 6th of February 2018, NORM wastes will be regulated in the Netherlands by Directive 2006/117/Euratom (see section 3.1 and 3.5).

In the Netherlands an opinion can be requested from the Inspectorate of the Environment and Transport (ILT) if it is unclear whether the substance to be transported is, in fact, regarded as waste.

[21] Under an amendment to the VSG and VLG regulations, the exemption values for activity and activity concentration have, since 2015, been incorporated in Table 2.2.7.2.2.1 of the ADR. Table 2.2.7.2.2.1 in Annex 1 of the VSG/VLG has thus ceased to apply.
[22] Regulation 1013/2006 makes reference to Directive 92/3/Euratom. This Directive has been repealed with effect from 25 December 2008 and replaced by Directive 2006/117/Euratom.

NORM materials/residues
The *Transport of Fissionable Materials, Ores and Radioactive Materials Decree* (Bvser) applies to imports and exports of NORM materials with an activity concentration higher than ten times the level values for exempt material (ADR).

Control system
Under Article 32, para. 1 (a and b) of the *Transport of Fissionable Materials, Ores and Radioactive Materials Decree* (Bvser) imports or exports of NORM materials with an activity higher than the level values for an exempt consignment and an activity concentration higher than ten times the level values
for exempt material (ADR) are subject to mandatory notification[23]. Radioactive substances may only be imported if the substances are intended for a person who is authorized to hold those substances.

It should be noted that no information needs to be provided in the notification form about any anticipated radioactive waste streams arising from practices involving the imported (or exported) material. It should also be noted that in the Netherlands *work activities* involving natural sources may be subject to exemption level values other than those stated in the ADR for *import and transport*. For example, the exemption level values for Ra-226 and Ra-228 are 1 Bq/g for *work activities* and 10 Bq/g for *import and transport*.

For shipments of NORM wastes it could be argued that, untill February 6th 2018, they are covered by the regulations concerning shipments of conventional waste. Depending on the type of wastes involved and the aim of the shipment (for recovery or disposal), there is a general information procedure or a prior written notification and consent from the authorities concerned for shipments of waste (see section 3.2) [18]. Notification of a shipment is submitted in the country of dispatch. The authority of that country forwards it to the other authorities. In the Netherlands the notification of waste shipments is examined by the Inspectorate of the Environment and Transport (ILT) [18].

The *National Waste Management Plan 2009-2021* (*Landelijk afvalbeheerplan*, LAP2) states that there has long been an international free market in conventional waste destined for recovery [19]. Within the established framework (WSR), the waste materials concerned can therefore be shipped to other European countries and OECD states almost without restriction[24]. Landfilling, on the other hand, is still subject to capacity regulation and the principle of national self-sufficiency [19]. An assessment is made for each shipment to establish whether shipment for recovery is justified. A relevant factor in the assessment is the ratio between the proportion of waste recovered and the proportion landfilled. The recycling rate is also a key factor in the case of streams that are suitable for recycling. A number of general

[23] Article 32, para. 1(a) states that the import of a radioactive substance into Dutch territory from a country outside the European Union is subject to mandatory notification. There is no separate legal text with regard to mandatory notification of the import of radioactive substances into Dutch territory from another Member State of the European Union.
[24] Organization for Economic Cooperation and Development

guidelines have been formulated in the LAP2 with this in mind [19]. A number of these guidelines that could potentially be applicable to imports of NORM residues are discussed in section 7.1.

*4.5.1 **Synopsis***

In the Netherlands imports and exports of NORM residues are subject to mandatory notification under the *Transport of Fissionable Materials, Ores and Radioactive Substances Decree*. Shipments of NORM wastes are, however, excluded from the Dutch regulations concerning imports, exports and transit of radioactive wastes and appear to be covered by the WSR and the *Dutch Environmental Management Act* and therefore by the regulations concerning shipments of conventional wastes.

Table 2 Overview of the legal and regulatory framework on the transboundary movement of NORM residues in various North Sea countries

	Importing of NORM-contaminated materials for processing	Importing of NORM residues	Importing of NORM wastes	Resultant residue stream?
United Kingdom	**Permitted**[1] → If for the purposes of decontamination and re-use of the material **Not permitted**[2,3] → If for the purposes of decontamination and scrapping of the material (see Importing of NORM wastes)	**Not permitted**[2,3] → Unless practice involving radioactive waste is authorized and conventional waste regulations have been observed: o Importing results in the recovery of re-usable materials or in treatment that will make its subsequent storage and disposal more manageable	**Not permitted**[2,3] → If waste materials are imported for disposal → Unless practice involving radioactive waste is authorized and conventional waste regulations have been observed: o Importing results in the treatment that will make its subsequent storage and disposal more manageable	**Not known**
Belgium	**Permitted**[1] → If practice (decontamination activity) is authorized and import registration is in place → Import registration mandatory if (for the U-238 series and the Th-232 series) the activity and the activity concentration is more than ten times the clearance level (section 4.2)	**Permitted**[1] → See Importing of NORM-contaminated materials for processing	**Not permitted**[3] → If waste materials are imported for disposal → Unless WSR notification procedure has been completed, and → country of origin within EU or a signatory to the Basel Convention	→ Residues stored or disposed of in Belgium, or → Take-back of residues by country of origin *(regulated via permit)*

Germany	**Permitted**[1] → If the surveillance limits are met, or → If the prerequisites for the release from surveillance for the purpose of a defined recycling are given (section 4.3)	**Permitted**[1] → See Importing of NORM-contaminated materials for processing[1]	**Not permitted**[1] → If waste materials are imported for disposal	→ Residues that can be released are processed and disposed of as conventional waste → Residues that cannot be released must be reported to the competent authority in radiation protection, which may determine that protective measures need to be taken and via what route the residues are to be disposed of → Take-back of residues by country of origin
Norway	**Permitted**[2,3] → Import of offshore installations for decommissiong purposes: If under joint authorization from NRPA and NEA	**Permitted**[2,3] → If under authorization NRPA (requirements are met)	**Not permitted**[2,3] → If waste materials are imported for disposal → Unless under authorization NRPA (requirements are met)	**Not known**
The Netherlands	**Permitted**[1] → If practice (holding) is authorized and import has been notified. → Notification of import mandatory if activity exceeds limit value and activity concentration are more than ten times the exemption level for transport [1]	**Permitted**[1] See Importing of NORM-contaminated materials for processing	**Not permitted**[3] → If waste materials are imported for disposal → Unless WSR notification procedure has been completed, and → country of origin within EU or a signatory to the Basel Convention [19]	→ Residues stored or disposed of in the Netherlands, or → Take-back of residues by country of origin

[1] Covered by legislation and regulations on radioactive substances of the country concerned
[2] Covered by legislation and regulations on radioactive wastes of the country concerned
[3] Covered by legislation and regulations on conventional wastes of the country concerned

5 Discussion

The following definitions are used in this report for NORM residues and NORM wastes:

- NORM residues: *material that contains naturally occurring radionuclides with an (activity and) activity concentration above the exemption or clearance level that have arisen from work activities (Bs) or practices involving natural sources (draft Bbs) and which may undergo further processing for the recovery of re-useable materials.*

- NORM wastes: *material that contains naturally occurring radionuclides with an (activity and) activity concentration above the clearance level that have arisen from work activities (Bs) or practices involving natural sources (draft Bbs) and for which no further use is foreseen.*

The scope of the international directives relating to shipments of radioactive waste, radioactive substances and conventional wastes is not always clear in relation to NORM residues and NORM wastes. As indicated in section 3.1, this has been recognized within the European Commission as far as Euratom Directive 2006/117 on shipments of radioactive waste is concerned and an advisory committee has been established [2]. Furthermore, the competent authorities of Norway, the United Kingdom, Denmark and Germany have set up a working group to collaborate in addressing the problems that surround the provisions concerning NORM residues and NORM wastes (see section 4.4) [15]. This was occasioned by the anticipated NORM residue and NORM waste streams that are set to arise in the near future following the decommissioning of production platforms in the North Sea.

The following differences in regulations concerning shipments of NORM residues and NORM wastes have been found in the national legislation of several countries:

NORM residues
The material flow that is defined in this report as 'NORM residue' is defined in the United Kingdom as 'NORM waste' and regulated under the legislation on radioactive wastes in the *Radioactive Substance Act 1993* (RSA93) and the *Environmental Permitting Regulations 2010* (EPR10). Shipments must also comply with the international regulations on conventional wastes. In Belgium shipments of NORM residues are regulated under the legislation on shipments of radioactive substances in the *Decree for the Regulation of Imports, Transit and Exports of Radioactive Substances.* In Germany imports of NORM residues for recycling purposes are covered in the *Radiation Protection Ordinance* (StrlSchV), where they are permitted under certain conditions.

NORM wastes
In line with Euratom Directive 2006/117, shipments of NORM wastes are excluded from national legislation on shipments of radioactive waste in the countries that have been discussed. In the United Kingdom

shipments of NORM wastes are regulated under the legislation and regulations on radioactive wastes in the RSA93 and EPR10 and they must also comply with the regulations on conventional wastes. Shipments of NORM wastes in Belgium are covered by conventional waste legislation. In Germany imports of NORM residues for the purposes of disposal ('NORM wastes') are regulated in the StrlSchV. In Norway NORM wastes are regarded as radioactive wastes, which are regulated under the *Pollution Control Act*. It should be noted that none of the countries mentioned above permits imports of NORM wastes for the purposes of storage or landfilling.

Although the definitions vary, the underlying problems appear to be similar. Radioactive waste management in the country of destination needs to remain manageable in connection with imports of NORM residues and NORM wastes. Belgium, Scotland (United Kingdom) and Norway regulate imports and exports of NORM residues using a system of permits and information about the anticipated waste streams must be provided in the permit application. This provides transparency over (indirectly) imported NORM waste streams and also makes it possible to assess whether domestic facilities and storage capacity for radioactive waste are adequate. In the case of exports one can assess whether these facilities are adequate in the country of destination. One can also discuss in advance the possibility of take-back of any radioactive residue. In order to safeguard storage capacity in Germany, a ban has been imposed on imports of NORM residues with a view to disposal at a landfill site ('NORM wastes'). Recycling of NORM residues from abroad is only possible if the surveillance limits are met or that the prerequisites for the release from surveillance for the purpose of a defined recycling are given.

In relation to the United Kingdom it is noted that there may be NORM residue and NORM waste streams in a country that do not generate sufficient quantities of processing material to warrant setting up commercially viable facilities there. It may be beneficial for the industry to have access to facilities abroad, and conversely for domestic facilities to be able to accept NORM residues from abroad for processing. For example, the Dutch industry currently also makes use of facilities abroad and, conversely, the industry abroad makes use of Dutch facilities.

Little information has been obtained with regard to the costs of managing radioactive wastes in the involved countries and the Netherlands.

Finally, it is noted that the United Kingdom notified the European Council on 29 March 2017 that it proposes to leave the European Union and Euratom. The UK Environmental Law Association (UKELA) has looked into the possible consequences of withdrawal from Euratom for nuclear safety in the United Kingdom [20]. It has published a paper stating that EU legislation applicable at the time of withdrawal will be transposed into UK legislation. It is therefore considered unlikely that significant changes will occur in the short term. In the longer term maintaining close regulatory equivalence between UK and Euratom nuclear safety legislation and regulations seems both a realistic and necessary aim [20]. The paper notes that the agreements and

arrangements concerning shipments of radioactive waste (Euratom Directive 2006/117) and radioactive substances (Regulation 1493/93) require additional consideration. This may necessitate new agreements being reached between the UK and Euratom [20].

6 Conclusion

This report gives an overview of the national legal and regulatory framework in various North Sea countries with regard to the transboundary movement of NORM residues and NORM wastes (Table 2). The countries concerned are the United Kingdom, Belgium, Germany and Norway.

In principle, imports of NORM wastes for the purposes of *direct* storage or landfilling are not permitted in these countries. NORM wastes are in this report explicitly understood to be *radioactive wastes that contain naturally occurring radionuclides that have arisen from work activities (Bs) or practices involving natural sources (Bbs) and for which no further use is foreseen.*

Importing of NORM residues for processing purposes is only permitted in these countries if a permit or import registration has been granted by the competent authority. NORM residues are in this report *radioactive material that contains naturally occurring radionuclides that have arisen from work activities (Bs) or practices involving natural sources (Bbs) and which may undergo further processing for the recovery of re-useable materials.* The applications for a permit or import registration must be assessed on a record-by-record basis. The applicant also needs to provide data on the waste streams that are expected to arise following processing of the NORM residues.

The various North Sea countries do not appear to have formulated any formal criteria (or else these are not known) for use when assessing the application to import NORM residues and NORM wastes.

However, a number of general criteria have emerged in the course of this study which the importing and subsequent processing of NORM residues must meet before the competent authorities of the various countries will grant consent:

- Processing of the NORM residues should, to some extent, result in re-use of materials.
- Processing of the NORM residues makes subsequent storage and disposal more manageable.
- Prerequisites for the release from surveillance for the purpose of a defined recycling are given.
- National processing and storage capacities need to remain manageable.

Which of the above general criteria apply will vary from country to country.
If a permit is ultimately granted in response to an application, the competent authority can then still impose specific conditions.

7 Recommendations

If the Netherlands wishes to emulate the way in which a number of North Sea countries deal with NORM residues from abroad, it would also need to adopt a system of permits for imports of NORM residues. At present the Netherlands has a system of mandatory notification. When applying for a permit, undertakings would need to supply certain information in advance, such as:

- the anticipated amount, nuclide composition and activity concentration of the waste streams that arise during the work activities;
- the waste management route(s).

In addition, it would subsequently be necessary to report the waste streams that arise from processing. Based on this information and on data concerning the Dutch capacities for storage, landfilling and processing of NORM, one could then assess the manageability of the NORM waste streams on a case-by-case basis and also, generally speaking, gain a better insight into the manageability of these material flows.

Furthermore, if the NORM waste streams prove unmanageable, certain conditions could be imposed (based on the permit application) before the import permit is granted, such as:

- mandatory take-back of any radioactive residue by the consignor;
- restriction on the amount or the activity of the resultant NORM waste stream.

There are also companies in surrounding countries that offer facilities for processing NORM residues from abroad. It would be possible (and compatible with both competition and sustainable management goals) to reach joint agreements with surrounding countries regarding shipments of NORM residues. For example, collaboration could be sought with the working group that is investigating the problems surrounding the NORM residue and NORM waste streams that are expected to arise from decommissioning projects in the North Sea (see section 4.4).

7.1 Possible criteria

In parallel with this study, another RIVM study is investigating the scope and potential growth of imports of NORM residues to the Netherlands. A number of general criteria that might be applied when assessing applications to import NORM residues have emerged from the results of these two studies.

1. **In principle, importing of NORM residues for the purposes of storage or disposal is not permitted.**
   This is a fundamental principle applied in surrounding countries. It is essentially about imports of NORM wastes, since no further use or re-use of these NORM residues is foreseen. It also ties in with the basic principle of national self-sufficiency that is

enshrined in Dutch conventional waste policy. We are aware of a number of possible conditions and exceptions to this basic principle:

- Processing of the NORM residues will make its subsequent storage and disposal more manageable (UK).
- The NORM wastes cannot be processed or disposed of in the country of origin (LAP2[25]).
- The radioactive residual fraction of Dutch NORM residues that have been processed abroad has to be shipped back to the Netherlands for disposal (LAP2).

2. **Processing of NORM residues results in recovery of re-useable materials (full or partial).**
   In the United Kingdom this criterion has to be met before an import permit is granted. This also ties in with the policy on conventional waste, which is guided by the waste hierarchy. In principle, an international free market can be said to exist within the EU for conventional wastes destined for "recovery". A number of frameworks have been created within Dutch conventional waste policy for assessing whether the rate of "recovery" or "recycling" justifies shipment in specific cases. A number of general guidelines may possibly also be applicable to imports of NORM residues for the purposes of further processing and re-use:
   - Where the recovery rate is less than 100%, no objection is made if the proportion landfilled (the residual fraction or residue) in a particular case is considered reasonable. Factors to be considered here are (LAP2):
     - Whether the proportion landfilled is greater than or equal to the standard percentage used for the waste material concerned (or its principal component);
     - Recently developed processing options for the wastes concerned in relation to the associated costs;
     - In the event of a larger proportion being landfilled than is customary for the waste concerned, to what extent the notifier adequately explains that forms of processing other than landfilling are technically impossible for the fraction concerned, or else the costs are substantially higher;
     - In the event of a larger proportion being landfilled than is customary for the waste concerned, to what extent the notifier demonstrates that, in absolute terms, the proceeds from the material recovered in this particular case exceed the costs of landfilling the fraction that has to be landfilled.

3. **National processing and storage capacities need to remain manageable.**
   One of the fundamental principles of radioactive waste management in all surrounding countries appears to be that the processing, storage and disposal capacities within the country

[25] the National Waste Management Plan 2009-2021

concerned need to remain manageable. Alongside information about the anticipated NORM waste streams after import, there must also be data about domestic processing, storage and disposal capacities in order to allow an assessment to be made based on this criterion. There are a number of possible conditions that can be imposed if the NORM waste streams that arise after importing the NORM residues prove unmanageable. In principle, it should be possible to impose the following conditions both in the authorization of the *work activities* and in a specific case of *import*:

- Mandatory take-back of the radioactive residue by the country of origin.
- Restriction on the amount or the activity of the resultant NORM waste stream.
- Prerequisites for the release from surveillance for the purpose of a defined recycling are given (Germany).

The latter condition is currently included in the German legislation and regulations. The background to this particular condition is that in Germany a restriction on the landfilling of foreign NORM residues is considered necessary because there might otherwise be capacity constraints for German NORM residues.

8 References

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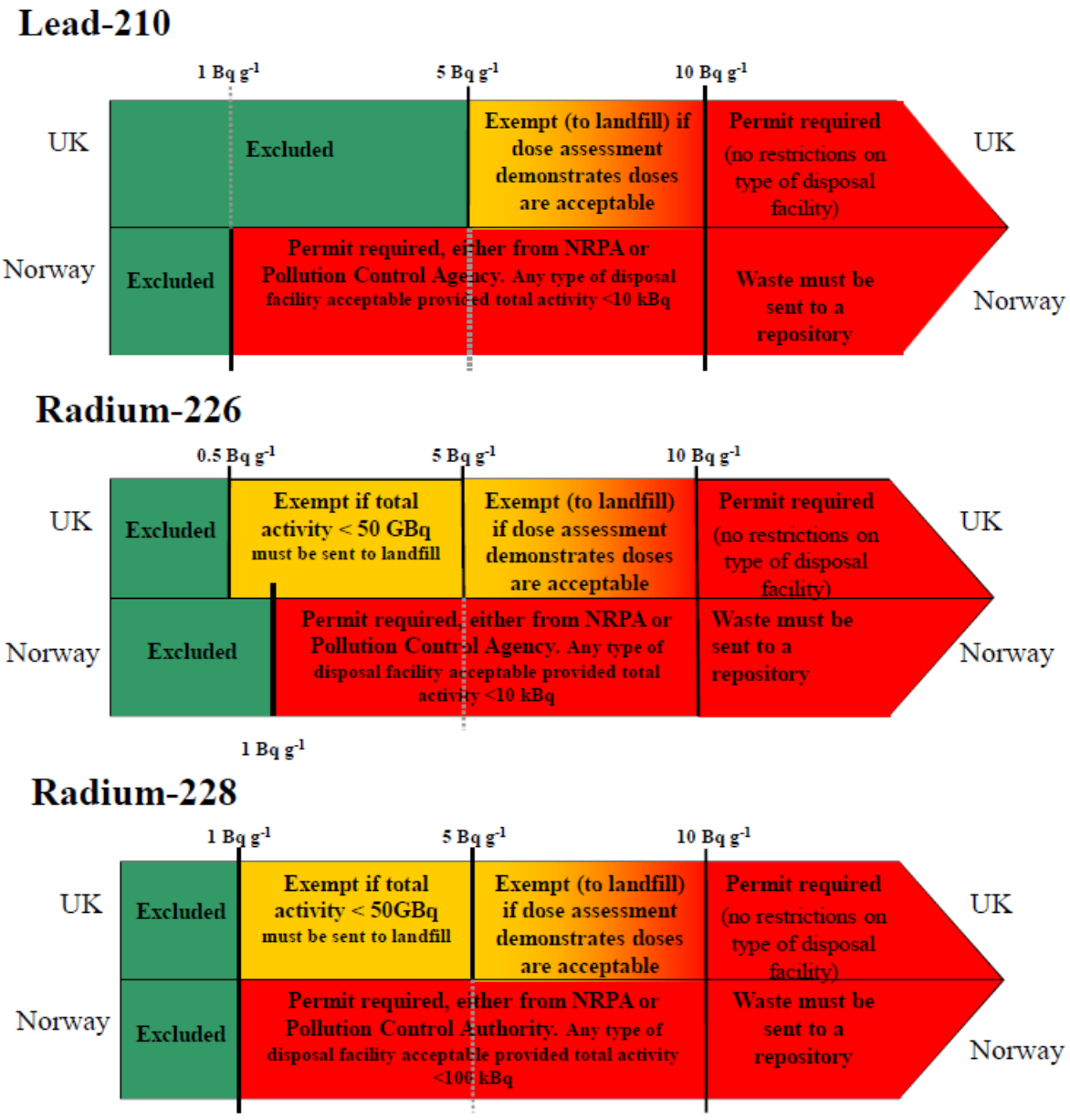
Appendix 1 Comparison of a number of clearance levels

The graphics below are from a presentation given during the 13th IRPA[26] International Congress (2012) [3].



Denmark: permit is required if Ra-226 > 0.5 Bq/g or if Ra-228 > 1 Bq/g

No exemptions or restrictions on what may be permitted

[26] International Radiation Protection Association

Appendix 2 Industrial activities according to UK legislation[27]

Radioactive material
Material which is used in or arises from industrial activities in Table 3 (Part 1) and in which the radionuclide concentrations exceed the values given in Table 4 is regarded as radioactive material and thus falls under the UK legislation (RSA93 and EPR10).

Radioactive waste
Waste which arises from the industrial activities in Table 3 (Parts 1 and 2) and in which the radionuclide concentrations exceed the values given in Table 4 is regarded as radioactive waste and thus falls under the UK legislation (RSA93 and EPR10).

Table 3: NORM industrial activities

NORM Industrial Activities (Part 1)
Production and use of thorium, or thorium compounds, and the production of products where thorium is deliberately added
Production and use of uranium or uranium compounds, and the production of products where uranium is deliberately added

NORM Industrial Activities (Part 2)
Extraction, production and use of rare earth elements and rare earth element alloys
Mining and processing of ores other than uranium ore
Production (but not storage, distribution or use) of oil and gas
Removal and management of radioactive scales and precipitates from equipment associated with industrial activities
Any industrial activity utilizing phosphate ore
Manufacture of titanium dioxide pigments
The extraction and refining of zircon and manufacture of zirconium compounds
Production of tin, copper, aluminium, zinc, lead and iron and steel
Activities related to coal mine de-watering plants
Water treatment associated with provision of drinking water
China clay extraction
The remediation of contamination from other NORM industrial activities

[27] DEFRA, *Guidance on the scope of and exemptions from the radioactive substances legislation in the UK.* Guidance Document, 2011 (Version 1.0).

Table 4:Concentration of radionuclides: NORM industrial activities

Concentration of radionuclides: NORM industrial activities			
Radionuclide	***Solid or relevant liquid concentration in becquerels per gram (Bq/g)***	***Any other liquid concentration in becquerels per litre (Bq/l)***	***Gaseous concentration in becquerels per cubic metre (Bq/m^3)***
U-238sec	0.5	0.1	0.001
U-238+	5	10	0.01
U-234	5	10	0.01
Th-230	10	10	0.001
Ra-226+	0.5	1	0.01
Pb-210+	5	0.1	0.01
Po-210	5	0.1	0.01
U-235sec	1	0.1	0.0001
U-235+	5	10	0.01
Pa-231	5	1	0.001
Ac-227+	1	0.1	0.001
Th-232sec	0.5	0.1	0.001
Th-232	5	10	0.001
Ra-228+	1	0.1	0.01
Th-228+	0.5	1	0.001

Appendix 3 Application for shipment of NORM waste

The annexes to the Guidance Document published by SEPA examine in some detail the information that should accompany an application for shipment of NORM waste[28]. Broadly speaking this involves:

1. An assessment of all practicable waste management options
2. Quantities of NORM waste involved

1. An assessment of all practicable waste management options

This ensures that the best possible waste management option is utilized for the radioactive waste. It is difficult to give a precise description of the information required as shipment of NORM waste can encompass a wide range of scenarios. These might include a consignment of liquid waste which is all considered to be radioactive, radioactivity-contaminated equipment such as tubulars or pumps, or a mixture of radioactive and non-radioactive waste such as a decommissioning offshore installation. The information should, however, include:

a. A description and justification of the chosen radioactive waste management methodology/treatment and subsequent storage.
b. Justification for the waste management location being outside the UK.

2. Quantities of NORM waste involved

The application must contain sufficient information on the quantities of NORM waste involved so that the relevant environment agency can assess the application. This information is also important for enabling the authorities abroad to determine how the NORM waste needs to be assessed within their own policy frameworks. As a minimum requirement, the information must therefore include:

a. The mass of the NORM waste
b. The volume of the NORM waste
c. The total activity of each of the major radionuclides (e.g. Ra-226, Ra-228, Pb-210, Po-210)
d. The expected typical radionuclide concentration
e. The expected maximum radionuclide concentration
f. Details of any other properties of the material that may influence the treatment of the NORM waste

The methodology that has been used in deriving the above data must also be provided, along with a consideration of possible uncertainties in the data. For an estimate, one can use data from previous sampling operations, data from previous shipments of NORM waste, etc.
The document itself is always formulated with shipments of NORM waste in mind. In the annex a clearer picture is given of what constitutes waste under normal circumstances within the offshore industry and therefore which materials require waste shipment controls. These are:

- Offshore installations that are being sent for dismantlement

[28] SEPA (Scottish Environment Protection Agency), *Guidance on the Shipment of Wastes which contain Naturally Occuring Radioactive Material (NORM).* 2017. **Issue 1 - January 2017**

- Contaminated equipment (tubulars, pumps) which have been sent for scrapping
- Produced water
- Sludge

Appendix 4 Industries where residues are generated – Germany

Appendix XII (to §§ 97 to 102)
Recycling and disposal of residues requiring surveillance
Part A: List of residues to be taken into account

1) Sludge and sediments from the recovery, processing and reprocessing of oil and natural gas;
2) Unconditioned phosphoric plasters, sludge from their preparation as well as dust and cinder from the processing of raw phosphate (phosphorite);
3)
   a) country rock, sludge, sand, cinder and dust
      - from the extraction and preparation of bauxite, columbite, pyrochlore, microlyth, euxenite, copper shale, tin, rare earths and uranium ores
      - from the processing of concentrates and residues that occur with the extraction and preparation of these ores and minerals as well as
   b) minerals corresponding to the above specified ores that occur with the extraction and preparation of other raw materials;
4) Dust and sludge from the smoke gas filtering with the primary metallurgic processes in the raw iron and non-ferrous metallurgy.

Residues within the meaning of § 97 are also

a) materials in accordance with the subparas. 1 ff., when the occurrence of these materials is deliberately produced,
b) Castings from the materials specified in subparas. 1 ff., as well as
c) excavated or cleared ground and demolition waste from the dismantling of buildings or other structures when these contain residues in accordance with the subparas. 1 ff. and are removed in accordance with § 101 after completion of the work activities or in accordance with § 118, para. (5) or from properties.

No residues within the meaning of § 97 are materials in accordance with subparas. 1 to 4,

a) if their specific activity is below 0,2 becquerel through gram (Bq/g) for each radionuclide of the nuclide chains U-238sec and Th-232sec, or
b) if they are introduced into technological processes specified there as raw materials.

The daughter nuclides to be considered with the nuclide chains U-238sec[29] and Th-232sec as well as with the Pb-210++ are listed in Appendix III, Table 2.

[29] Exposure through radionuclides of the U-235-de-composition sequence shall be taken into considera-tion and do not need to be considered separately.

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