

HERCA Workshop

NORM and Building Materials

BERGEN / 24-26 May 2016

REPORT on the HERCA Workshop

*Organised by HERCA with the support of NRPA, CSN, ASN
in the framework of the HERCA Action Plan in relation to the transposition
and implementation of Directive 2013/59/Euratom (Euratom-BSS)*



Background - Workshop objectives

HERCA, with the support of CSN, ASN, and NRPA have organised a Workshop on NORM and Building Materials. This workshop took place on 24-26 May 2016 in Bergen (Norway).

HERCA members' organizations were invited to participate in this HERCA workshop to provide a forum for European countries to exchange points of view on the transposition of the specific requirements of the Directive 2013/59/Euratom (Euratom-BSS) dealing with NORM and Building Materials.

Opening session

Organisation

IAEA

Current NORM Work Programme and Challenges - an IAEA Perspective

As an international consensus on radiation protection, the publication of the revised International Basic Safety Standards (GSR Part 3) brings new challenges to the regulators, operators and workers in implementing the occupational radiation protection requirements in different exposure situations, applicable for different industries such as Naturally-Occurring Radioactive Materials (NORM) under Planned and Existing Exposure Situations.

For the application of the IAEA Safety Requirements on NORM activities, consideration needs to be given to the radiation protection of workers, the public and the environment for a wide range of NORM- industries on a global basis. The IAEA has initiated many activities, such as the development of Safety Standards applicable to the Uranium Mining and Processing Industry, Coal and Coal Ash Industry, Radiation Protection and NORM Residue Management in the Industrial uses of Thorium to complete the library for the industries defined in the Safety Report on Assessing the Need for Radiation Protection Measures in Work Involving Minerals and Raw Materials (IAEA SR-49, 2006).

Overarching issues that need to be addressed are the following;

- Radiation protection experience is lacking in many industry sectors, except uranium mining community. Radiological issues of NORM industries can be generally characterized, but radiological protection management should be site and activity specific.
- NORM radiation protection regulations are often taken from the "normal" nuclear radiation regulatory structure and may not be appropriate for mining operations.
- The criteria of 1 Bq/g (activity consideration) is used as a threshold.
- There is a need to improve the process of sharing radiation protection operational management experience among various mining industries – safety approaches should not be proprietary.
- There is a need to develop a common language for engaging open and transparent dialogues with stakeholders (e.g. decision makers, regulators, the public, industry, etc.).
- There is a need for a structured and graded approach to radiological risk management as indicated in GSR Part 3.
- The focus on conventional worker health and safety issues will assist in addressing radiation protection issues (e.g. ventilation).
- Consideration should be given to systems optimisation.
- There is a need for clarity as to whether a NORM site is an Existing or Planned Exposure Situation. This has a practical significance for Rn, because dose limits only apply to Planned Exposure Situations.
- The social and economic radiological management of NORM sites depends on stakeholder trust – building and/or maintaining trust is a challenge.
- The dialogue with stakeholders regarding the radiological management of NORM sites should consider the prevailing circumstances, benefits and risks. Several countries restrict the amount of radionuclides of natural origin in building materials and reference level of "annual effective dose to the representative person generally should not exceed a value of

about 1 mSv. The Safety Guide SSG-32 proposes the use of an activity concentration index as a screening tool for identifying building materials that may need to be subject to restrictions; such as $I < 1$ for bulk materials or $I < 6$ for superficial materials (e.g. tiles), and then annual effective dose less than reference level of 1 mSv. It should be noted that any actual decision on restricting the use of a material should be based on a separate dose assessment. Such assessment should be based on scenarios where the material is used in a typical way for the type of material in question.

Requirements on NORM and Building Materials in Council Directive 2013/59/Euratom – The Basic Safety Standards Directive

With the publication of the new basic safety standards Directive¹, the European Community modernises and consolidates the European radiation protection legislation based on Articles 2 and 30 of the Euratom Treaty. The new Directive offers in a single coherent document basic safety standards for the protection against the dangers arising from ionising radiation which take account of the status-quo of science and technology, cover all relevant radiation sources, including natural radiation sources, integrate protection of workers, members of the public, patients and the environment, cover all exposure situations, planned, existing, emergency, and harmonise numerical values with international standards.

Following the newly introduced ICRP philosophy, the new BSS Directive applies to any planned, existing or emergency exposure situation which involves a risk from exposure to ionising radiation which cannot be disregarded from a radiation protection point of view. With this, the BSS applies to all relevant radiation sources, including radon, cosmic rays and naturally occurring radioactive material (NORM), with no distinction made between artificial "man-made" radiation and natural radiation. The major challenge in this new approach is the coherent application of the BSS to natural radiation sources, in particular to radon in buildings and in workplaces and to industrial sectors involving naturally occurring radioactive material (NORM).

The Directive introduces a graded approach to regulatory control of practices by way of notification, authorisation and appropriate inspections commensurate with the magnitude and likelihood of exposures resulting from the practice, and commensurate with the impact that regulatory control may have in reducing such exposures or improving radiological safety. Justified practices, if not exempted, need to be notified prior to the practice commencing and, if so decided, authorised. Following the above mentioned philosophy, this system of regulatory control now equally applies to activities involving NORM. In a first step, the Member State shall identify, based on an indicative list given in the Directive, industrial sectors involving NORM which may lead to exposure of workers or members of the public which cannot be disregarded from a radiation protection point of view. For identified sectors, a graded approach applies introducing exemption levels and decision criteria such as doses to workers and effluent releases to the environment.

Another novelty with regard to natural radiation exposure is the introduction of a reference level for indoor external exposure to gamma radiation emitted from building materials of 1

¹ Council Directive 2013/59/EURATOM of 5 December 2013 laying down basic safety standards for protection against the dangers arising from exposure to ionising radiation, and repealing Directives 89/618/Euratom, 90/641/Euratom, 96/29/Euratom, 97/43/Euratom and 2003/122/Euratom

mSv per year. In a first step, building materials of concern need to be identified taking account of the indicative list of building materials provided by the BSS Directive. Before placing on the market of any identified building material, the activity concentrations of Ra-226, Th-232, and K-40 need to be determined. The competent authority must be informed on the results of the measurements. If a type of building material is liable to exceed the reference level, the MS decide on appropriate measures.

The transposition and implementation of this comprehensive piece of legislation will constitute a major challenge for national legislators and regulators in the coming years (the transposition deadline being 6 February 2018). The Commission is pursuing a strategy to monitor the transposition of the Directive into Member States' national legislation and to support its implementation. This shall allow, already in an early phase, the detection of issues, an exchange of first experiences, and the identification of good practices. Later in the process, when Member States have already drafted legislation, another evaluation should take place to analyse national legislation of Member States with a view to assess compliance with the BSS Directive.

Country

Norway

Regulation of NORM in industries, waste and building materials in Norway - a NORM Medley

There are two main questions the regulatory authority have to address. First of all, what do we want to achieve by regulating NORM? Namely to allow for the usage of resources with NORM, while making sure the environment and man is adequately protected. Then the second question is how do we achieve this? This presentation gives an overview of how we in Norway are trying to achieve this aim.

In Norway, we mainly regulate radioactive waste and pollution, including NORM through the pollution control legislation. This legislation regulates all kind of waste and pollution, and hence gives us a good tool to regulate NORM waste both for its radioactive properties and for its non-radioactive properties. We focus on cooperation between the authorities who regulates NORM waste as a mean to allow for industrial use of resources with NORM. We are also in the process of identifying NORM industries in Norway and their waste and pollution. NORM industries should have been regulated since 2000, but there are probably more industries or companies that require regulation. In Norway NORM industries are regulated as planned exposure situations, with NORM residues above 1 Bq/g. Graded approach is applied through differentiation in the requirements in licenses, where there are less strict requirements for low activity concentrations, than licenses for higher activities.

The Norwegian Radiation Protection Authority have substantial NORM focused work and projects, for instance in cooperation with other countries, regulation development, international meetings and workshops, work with the IAEA, ICRP and EU, as well as in research and development.

Session 1: NORM Activities – Regulation overview (BSS, art. 23, art. 24,25,26,27 and Annexes VI, VIII

Country

SPAIN

The Spanish experience of regulating NORM industries

NORM industries are regulated in Spain under Title VII of Royal Decree 783/2001 and CSN Safety Instruction IS-33 (issued 2011).

Following IS-33, all industries included on a positive list have to register with the regional industry authority and to conduct a study on their radiological impact to workers and public. If the results of the study show that the dose criteria (1 mSv/y² for workers and 0.3 mSv/y for public) are exceeded, the facility has to notify it, and it will remain subject to regulatory control. The level of control imposed varies in terms of risk and plausibility of protection measures, with additional requirements applying if doses to workers are liable to exceed 6 mSv/y.

Complementary to this legislation, Ministerial Order IET/1946/2013 regulates the control of NORM residues. Clearance levels in Radiation Protection 122 Part 2 are used as a screening tool in order to determine which residues need further consideration from the radiation protection standpoint. For residues exceeding those levels, a case-by-case analysis needs to be performed. Conventional disposal routes are approved provided that requirements in IS-33 (including the application of the optimisation principle) are observed and that specified dose limits are met. These are 6 mSv/y for workers, and 1 mSv/y for public. NORM residues above these limits need to be managed as radioactive waste.

While the existing regulatory framework provides an adequate basis for managing most situations in practice, a large amount of work is needed to achieve a system that works efficiently for both regulator and industries. In particular, CSN is making efforts in the following areas:

- Fostering cooperation among regulators in order to identify synergies and simplify administrative procedures
- Engaging all affected industries
- Developing industry-specific regulation, including mechanisms for exemption in terms of activity concentration and/or volume of material processed
- Consulting and engaging with stakeholders relevant to NORM residues management
- Promoting continuing education and training of the entities authorised by CSN to conduct the radiological studies

² The radon contribution to worker doses is not accounted for, but radon levels must be kept below 600 Bq/m³, which is the current reference level for radon at the workplace in Spain.

The transposition and implementation of Directive 2013/59/EURATOM – ongoing activities on NORM and Building Materials

The directives repealed by Directive 2013/59/EURATOM (BSS) were transposed into the Polish legal system by an Act of Parliament on Atomic Law and regulations issued pursuant to this act. The transposition of the new BSS Directive is intended to be carried out by amending the Atomic Law and other relevant regulations.

On August 8th 2014 the Minister of the Environment appointed the Implementation Team whose main responsibility was to develop the concept of the transposition and implementation of the BSS Directive into the Polish legal system. The Implementation Team have prepared and presented the implementation report to the Minister of the Environment on November 30th 2015.

Since Directive 96/29/EURATOM left up to Member States to decide which work activities involving NORM should be of concern from a radiation protection point of view, Poland as well as many other Member States, has introduced into its legal system cases explicitly mentioned in the directive: coal mines, caves and spas, work activities which lead to a significant increase in the exposure of workers and members of the public. The Implementation Team working on the transposition of Directive 2013/59/EURATOM identified a new catalogue of practices involving NORM which will require notification according to the new BSS Directive. The identification of these practices has been based on the 20-year measurement results of radioactivity in different NORM materials and waste products in the Polish NORM industry, taking into account industrial sectors listed in Annex VI. The Implementation Team proposed to introduce into Polish law a new definition – NORM waste. The NORM waste is not treated as radiological waste. It is managed as any other hazardous waste, when the levels of radioactivity do not exceed 1 MBq/kg for solid materials, and 1 MBq/m³ for liquid effluents.

Regarding building materials, the activity concentration index given in the BSS Directive was introduced into the Polish legal system more than 10 years ago. However, the Implementation Team identified the need for amending relevant regulations, mainly by introducing the list of materials being of concern from a radiation protection point of view in Poland according to Annex XIII.

NORM: the Swiss approach

Switzerland's major NORM issues arise from tunnel excavations, inherited waste at former phosphate fertilizer production sites, building materials, as well as from scaling and sludge accumulating during the production of thermal and mineral waters. Potentially upcoming NORM issues are linked to projected deep geothermal power plants.

Today, NORM are exempt from the requirements of the Swiss radiological protection ordinance (RPO) as long as no effective dose above 1 mSv/year may be accumulated by a worker or a member of the public. An example of the implementation of this rule is the application of dose rate criteria for excavated rocks from tunnel constructions. Depending on the type of valorisation of the material different levels of maximum dose rate apply. Using this scheme,

during the construction of the Nant de Drance underground pumped storage station 13 tons of “hot rock” had been separated containing a total of 50-100 kg Uranium. Since the separated rocks also contain Arsenic the further treatment of this material is now complicated by the sometimes contradicting legislations on radioprotection and on environmental protection, respectively.

Currently, Switzerland is revising its RPO with the goal of aligning as much as feasible with the European Directive 2013/59/Euratom. The scheduled coming into force is beginning of 2018. The revised RPO will thus cover NORM in more detail. Authorisations will be requested for any handling of NORM leading to exposure, which cannot be disregarded from a radiation protection point of view. Workers accumulating an annual effective dose higher than 1 mSv from NORM (excluding Radon) will be considered as occupationally exposed. For members of the public the maximum acceptable annual effective dose due to NORM will be lower, especially if contamination of drinking water should be involved. In this case, remedial measures should be considered if a committed effective dose of 0.1 mSv/year is being exceeded. In addition to these dose criteria, the revised RPO will adopt the values for exemption or clearance for naturally occurring radionuclides in solid materials (1Bq/g) as well as the building material index according to the European Directive 2013/59/Euratom.

The feedback with respect to NORM of a consultation round of a draft of the revised RPO was a general expression of a fear of overregulation as well as some industries refusing to appear on the list of NORM-industries. The claim of overregulation may not be justified, since the revised RPO remains flexible on how to assess the relevant cases, where natural radioisotopes have to be measured and regulated within an authorisation.

Country

IRELAND

Ireland approach to transposition of the EU BSS on NORM and Building Materials

In Ireland, the Department of Communications, Climate Action and Environment is the lead Department for transposition of the EU Basic Safety Standards Directive (BSS). The Department of Health also has a key role in relation to medical exposures. State Agencies, such as the Environmental Protection Agency (EPA), Health & Safety Authority, Health Services Executive and Health Information Quality Authority will have significant involvement. The IRRS mission to Ireland took place in September 2015 and detailed consideration of the BSS was deferred until after the IRRS mission and report. The IRRS Action Plan will be taken into account when Ireland transposes the BSS.

A Gap Analysis is currently underway of each article of the BSS to assess whether its provisions are covered by existing legislation or protocols. This assessment, which is scheduled to be finished by the 31st August 2016, will form the basis of new legislation. Following this the Transposition phase is expected to comprise the setting up of Thematic working groups on specified topic areas as well as a public consultation. The proposed timescale for this phase is from 31st October 2016 to 6th September 2017.

Specifically on Articles 23 – 27 and Article 75 how these articles will be transposed in Ireland has yet to be decided. However, transposition of Article 75 will take account will be taken of the existing regulatory framework, in particular the EU Construction Products Regulation (No. 305/2011) as implemented in Ireland by SI No. 225 of 2013. A starting point for this is to review / update work done to date in Ireland on NORM and Building Materials.

On NORM, an assessment was carried out of the four NORM industries in Ireland. None were found to give rise to doses greater than 1 mSv. That assessment was carried out using criteria used was that published by the Commission at that time, RP 88, 107 and 95, 122 Part 2. A revision of this guidance seems now timely and it is anticipated that a revaluation of Ireland's NORM industries will be done in the context of new Guidance. Article 75 is new as there is no explicit regulation of radioactivity in Building Materials. Guidance from the Commission is needed to advise on the types of Building Materials may be of concern and in what context. For example, when the material is used in a particular building product in what context may that product be of concern. Research was carried out in Ireland on Radioactivity in Building Materials which indicated the majority of Building Materials Ireland had an Activity Concentration Index of less than 1. However, there is now likely to be a need to update this research to take account of the provision of the Construction Products Regulations 2011 and any guidance that may issue from the Commission.

Session 2: NORM Legacy contamination – (BSS, art. 73, 100) Waste management strategy (BSS art. 30.1, 30.2 and 30.4)

Country

BELGIUM

« NORM residues and NORM legacies strategy in Belgium »

In March 2013, FANC published a decree which added the facilities for processing, valorisation and recycling of NORM residues with an activity concentration above generic clearance levels into the list of “*work activities involving natural radiation sources*”. These generic clearance levels were taken out from the European Commission document “Radiation Protection 122 Part II”. This decrees brought the treatment of NORM residues into the scope of radiation protection regulations and gave FANC the possibility to deliver authorizations to non-radioactive waste treatment facilities for processing NORM residues. Since, several landfills and one incinerator were granted an authorization for accepting NORM waste under specific conditions. Parallel to the obligations for NORM industries to characterize their residues, this system allows FANC to ensure the traceability and follow-up of NORM residues in Belgium. Next to the delivery of authorizations for disposal of residues, FANC encourages also initiatives from NORM industries to develop new solutions to decontaminate NORM waste, especially in the framework of decommissioning projects.

Due to past NORM activities, there are also a number of NORM contaminated sites in Belgium, essentially related to the legacy of phosphate industries. FANC addresses the issue of the management of these legacies by combining different initiatives:

- Regulatory development in order to define liabilities and obligations for the characterization and remediation of contaminated sites;
- Institutional control and record-keeping of the sites by publishing the list of contaminated parcels as “anthropogenic radon-prone areas” in the Belgian Official Journal;
- Information and collaboration with stakeholders, especially local and regional authorities;
- Integrating the environmental monitoring of the sites in the national radiological surveillance program.

Country

FRANCE

Overview of legacy contaminated sites in France

The organization in France to deal with the legacy sites contaminated by radioactive substances, included by NORM, is composed of two public authorities (French nuclear safety Authority and the ministry of the Environment) and two public organizations with industrial and commercial activities (Andra and IRSN). Among these missions, Andra (the national radioactive waste management agency) is in charge, on behalf of the state, of the remediation

of the legacy site. A notice assigns a public interest's task to Andra and define the responsibilities of each entity in the management of the remediation process.

The main principles to deal with these situations are:

- Apply the "polluter pays" principle,
- Prevent future pollution,
- Identify, monitor and manage the impact of the pollution,
- Put the polluted sites in a safe state,
- Remediation is as complete as possible,
- Manage the sites in accordance with their future / current uses,
- Retain a record of the pollution and of the remediation done in the past,
- Inform the public about the risks linked to these sites.

These principles are implemented through the legal framework (Environmental Chart in the French constitution and article L.110-1 for the code of the environment) guidance documents and are further developed in the nuclear safety Authority policy for the management of sites and soils polluted by radionuclides.

Legacy sites consist mostly of former radioactive waste disposals and NORM polluted sites and former sites where radium was used. The French government has launched a dedicated mission to treat the sites identified as being hosted with activities that used radium in the first half of the twentieth century (Marie Curie's legacy). This operation has already shown up 30 polluted locations out of 250 diagnosis. Its total estimated budget (diagnosis, health monitoring, public information and rehabilitation) is 15,7 millions of euros.

Session 3: Buildings materials (BSS art. 75.2, 75.3, annexes VIII, XIII)

Country

SPAIN

Questionnaire on transposition of the BSS directive in relation to building materials

Work to transpose and implement Directive 2013/59/Euratom (BSS) into national laws is underway in Member States, with one of the most important aspects being the control of radiation from building materials.

The impact of this regulation will be important for many Member States, as well as for the European construction products industry. A few countries have already mature regulatory systems for controlling radiation from construction products, but even they might require adjustments to adapt to the new Directive.

This presentation summarizes the responses to the questionnaire prepared by CSN and distributed by HERCA with the aim of exchanging information on national approaches to regulate radiation from building materials. This questionnaire sought to be a first step to explore the feasibility of a common understanding among HERCA members on this matter.

As to the Workshop's date, responses were received from seventeen countries. These have revealed practical difficulties on implementation as well as discrepancies in a number of key technical questions. Harmonization will ensure consistent application of regulatory principles and practices, facilitate marketing of the products, and foster a proper understanding by society.

Organization

CEN

Assessing ionizing radiation from construction products under Construction Product Regulation CPR

Aspects like compressive strength or fire resistance are familiar requirements for construction products, and have been addressed by product standard developers for decades. New requirements concerning health and environmental aspects of construction products have appeared gradually during the last two decennia. The EU legislation for construction products has promoted the performance approach. To assess a product's emission performance reliable test methods are needed and any requirements must be backed up with test methods. This article reviews the development and harmonization of assessment methods for the release of hazardous substances and ionizing radiation from construction products and presents the results achieved so far in standardization.

The work of CEN/TC 351 "Construction products: Assessment of release of dangerous substances" addresses also naturally occurring radioactive materials (NORM), which may be used in building materials under radiological constraints. The main task identified in case of

ionizing radiation (WG3 “radiation from construction products”) is to develop a standardized measurement method for determining the activity concentrations of three naturally occurring radionuclides using gamma spectrometry. The activity concentration index (I) is an established screening tool in Europe for identifying materials that might be of concern. For the calculation of the activity concentration index (I) measurements of Radium-226, Thorium-232 and Potassium-40 are relevant.

In addition to the test method for determining activity concentrations a technical report on dose assessment of emitted gamma radiation is prepared. The results are intended to serve as a basis for development of a harmonized European approach regarding dose modelling in order to avoid transboundary issues or inconsistent restrictions for building materials, i.e. construction products under the Construction Products Regulation, (EU)305/2011 and the Basic Safety Standards Directive, 2013/59/Euratom.

Country

FRANCE

Buildings materials: the new French regulatory framework in preparation

France already has a considerable number of regulations regarding the risks linked to the exposure to ionising radiation in some professional activities implementing NORM. In order to improve their application, the Ministry in charge of radiation protection has decided to consider these risks with the same framework as nuclear activities if the risk is significant.

A two-stage graded approach for NORM has been adopted. First, the radioactivity of NORM activities (materials, products, waste materials) is measured by accredited laboratories according to the appropriate ISO standard for gamma spectrometry. Second, the operators have to compare the natural radioactivity of his activities to exemption values of the table A part 2 of the Annex VII of the directive.

Concerning building materials, it has been decided to consider the whole cycle with NORM materials, construction products and building construction, therefore leading to a third stage.

First and foremost, the NORM materials professionals, in particular activities producing these materials, will have to supply the information about the radioactivity of their materials (mass concentrations in natural radionuclides) to every person wishing to acquire them. Besides, if these materials have mass concentrations in natural radionuclides above the exemption values, they are considered as radioactive sources and cannot be distributed or used without a specific prior authorization. This authorization cannot be given within the framework of construction building because this type of use would lead to potential exposure above the level of reference inside these buildings. Derogations may be requested but the authorization will depend on the proposed justification.

Second, the professionals of construction products containing materials NORM, in particular the manufacturers of construction products, will have to supply the concentration index "I" of their activities calculated with the formula of the appendix VIII of the directive BSS to every person wishing to acquire these products. The advantage with numerous construction products is that they are composed of several constituent materials. It is therefore possible for most

manufacturers to make the composition of their products vary so as to reduce the index I below 1 and therefore avoid the potential limitations of use at the third stage.

Third, the building construction professionals such as architects, designers or builders will have to ensure that the activity of their building is below the limit of 1 mSv. They will have to take into account the concentration index "I" of the various construction products they intend to use for the construction of their building in order to avoid exceeding the reference level of 1 mSv. Simply put, if the mass average of the set of construction products used in a building is in an indication "I" lower or equal to 1, the building should not exceed the reference level. Otherwise, this situation will require a declaration (notification) to the control authority and to the Nuclear Safety. As this situation is not really desirable for the builder (manufacturer), he should do what is necessary to stay below the reference level.

To help the implementation of these regulations in the sector of the building professionals little acquainted with the radiation protection field, it has been considered necessary to develop a professional guide introducing and detailing all the stages of NORM materials in the construction of building for the middle 2017. This guide will be the reference in France on this subject.

Country

NETHERLAND

A simplified Dutch approach for the implementation of the EU BSS for building materials

Implementation of the Council Directive 2013/59/Euratom (EU BSS) in national legislation requires that the reference level for indoor external exposure to gamma radiation emitted by building materials shall be set at 1 mSv per year. Furthermore, member states need to identify building materials that are of concern from the radiation protection point of view such as for example alum-shale and phosphogypsum. For these materials the activity concentration should be determined according to annex VIII of the directive using the activity concentration index I.

In the Netherlands, we will strictly implement the reference level of 1 mSv/year for indoor external gamma radiation from building material as well as the list of building materials of concern (Annex XIII) and the activity concentration index (annex VIII) of the EU BSS in our national legislation. However, without additional measures this will result in a high administrative burden for undertakings and a high enforcement burden for the national authority, whereas the dose and corresponding risk are relatively low. Gamma radiation measurements in dwellings in the Netherlands revealed that the gamma radiation emitted from building materials was in the order of 0.3-0.4 mSv per year, which is far below the reference level of 1 mSv per year of the EU BSS.

We therefore investigated the possibility for a simplified approach. In this approach guidance will be provided to undertakings with general rules regarding the percentage of NORM that can be added to a building material to be able to remain below the chosen dose limit of 0.3 mSv/year (or alternatively 0.5/0.7 mSv/y). For these calculations the more advanced CEN activity concentration formula was used that also takes into account the density and thickness of the building material in its intended use. Using this approach most Dutch commonly used building materials can be used without any restriction without the need for undertakings to calculate the activity concentration for each building material. Since the chosen limit in the guidance remains far below the 1 mSv/year reference level the chance of actually reaching

this level when other sources of components of building materials (like fly ash) are used is limited as far as possible. If an undertaking wants to apply building materials with a higher percentage of NORM than depicted in the guidance, it is the responsibility of the undertaking to prove that the reference level will remain below the 1 mSv per year. And, of course, it is the responsibility of the undertaking to verify his sources. Whether the Dutch guidance will use a cut off level for its exemption of building materials at a dose of 0.3, 0.5 or 0.7 mSv per year is still a matter of political debate.

After implementation of the EU BSS the Dutch approach will be verified by a regular survey of new build, together with a radon survey, to measure the actual gamma radiation dose in Dutch dwellings.

Rapporteurs report for Working Group 1

BSS requirement to NORM activities and waste management strategy

Concerning the transposition of the directive, presentations shows from sessions 1 & 2 that an organization has been implemented in each member state in order to transpose de directive before 2018, that Member States (MS) have already included EC recommendations on NORM in regulatory framework and that no main issue was mentioned. Nevertheless some difficulties or questions were underlined:

- for NORM: several organizations or authorities may be involved for implementing the Directive : a close cooperation between these organization is needed;
- NORM activity will be considered as a practice or a nuclear activity : explanations may be required by these activities;
- A lack of radiation protection culture in these industries is noted: Education and Training, information, etc. are key issues;
- Does the use of the exemption level of 1 Bq/g guarantee an exposure under 1 mSV/y?

From these presentations Working Groups (WG) members discussed the following issues and questions.

1. Identification of classes or types of practices involving NORM (BSS, art 23 and Annex VI)

- Means and criteria for the identification of NORM practices; "*leading to exposure of workers or members of the public which cannot be disregarded from a radiation protection point of view*";
- Consistency on the exemption criteria proposed in Annex VII, part 3, including the radon exposure pathway.
- *Example of practical guidance/standard issued*: Characterization of the radioactivity in the materials: sampling and measurements methodology.

WG Conclusions

- The WG underlined that the terminology and wording should be slightly adapted in order to meet national legal standards and to be consistent with industry terminology;
- Most MS are planning to adopt list of practices involving NORM following Annex VI of BSS. Some MS has planned to include specific practices into the list (e.g. ceramic and glass industries, tunnel excavation...) and practices that are not on the list can be regulated by some MS if considered to be of concern. Nevertheless, some MS use the list as guidance to find practices of concern;
- Some MS has established separated lists for radon in workplaces and for practices where NORM radionuclides are the issue;

- The WG points up that following-up of "itinerant" maintenance workers in different NORM practices is an issue (coal fired plants, ovens, vessel cleaning...)
- The WG considered that consumer products containing enhanced levels of NORM (e.g. China clay) is an issue:
 - × The justification process may be difficult to achieve: in that case, radioactivity is not used or added intentionally;
 - × It may be difficult to control these products (they are often sold over internet). Moreover, it may be more difficult for customs to control and detect NORM material with portal detectors (triggers many false alarms);
 - × Producer / importer needs to notify the competent authority;
 - × Dose assessment - criteria 1 mSv/y should be used;
 - × The WG consider that there is a need for a system to disseminate information to counterparts (e.g. European Rapid Alert System for dangerous non-food products).

2. Graded approach: Notification / Registration / License (BSS, art 24, 25, 26 and 27)

- Implementation of process for the “graded approach to regulatory control”;
- Implementation of the art 25.3 (notification): Practical situations where a practice involving NORM *“lead to the presence of natural radionuclides in water liable to affect the quality of drinking water or affect any other exposure pathways”*.

WG Conclusions

- The WG considered that notification needs to contain a dose assessment for workers and public ; depending on dose assessment results, some corrective measures should be introduced: for some MS, it may take the form of a registration or license;
- Some examples of criteria for authorization were mentioned: e.g. registration or licensing is needed if wastes above 5 Bq/g leaves the plant.
- Concerning general exemption criteria, it appeared that RP 122 part II values are still used for certain radionuclides (based on 300 microSv/year). Furthermore, the WG considers that :
 - × 1 mSv/year criteria – it is not clear that radon from the NORM material should be taken into account (allowing for the prevailing background);
 - × Scenarios where activity concentrations below 1Bq/g can lead to doses exceeding 1 mSv/year should be identified (large volumes of material, concentration of activity in pipes or stacks over time);
 - × For long-term management of industries - potential decommissioning of the installation should be considered.

3. Waste management strategy (BSS, art 30.1, 30.2 and 30.4)

- Waste disposal facility
- Recycling or reuse of wastes from NORM practices: prohibition of practices.
- Dismantling of NORM facilities

WG Conclusions

- Different approaches are planned for the definition/categorization of waste material from NORM (NORM waste, NORM residue, radioactive waste...). How to define a radioactive waste? An activity concentration criteria is needed (e.g. 10, 50 or 1000 Bq/g). The WG considers that a guidance may be needed for harmonization.
- A potential decommissioning of the installation shall be considered.

Rapporteurs report for Working Group 2 BSS requirement to Building Materials

Rapporteurs report for Working Group 2 on BSS requirement to Building Materials HERCA meeting Bergen, 24th to 26th May 2016.

1. Identification of buildings materials (BSS, definition (9), art 75.2 and annex XIII)

- Means and criteria for the identification of building materials; “*leading to exposure above the reference level*”.
- Understanding the requirements of BSS in connection with EU the regulation on construction Products (EU) No 305/2011.
- The WG recommends to consider, as a starting point, the indicative list of Building Materials (BM) as given in Annex XIII, to be implemented preferably through regulation. If the introduction of regulation is not possible then other forms of strong or binding guidance may be appropriate in achieving the aims of the Directive.
- Article 75 (2) appears to offer to Member States (MS) flexibility in the materials it regulates. The WG considers that if in the experience of the MS a particular BM was no longer of concern then overtime this could be dropped from the list of regulated BM within the MS. However, the WG recommends to amend the list until a reasonable period of time and assessment has passed.
- Adding any products to the list is possible but in doing so caution is advised to ensure this does not interfere with the free movement of trade. For example, problems could be foreseen if one MS does not think a particular BM is of concern while another MS does.
- When a MS decides on the Building Materials likely to be of concern then it could be placed on the HERCA or EC website. This will help with transparency and ensure HERCA or EC can give a complete overview.

2. Standardized assessment of radioactivity and calculation of the activity concentration index

- The default mechanism to assess if BM complies with the 1 mSv Reference Level (Article 75 (1)) is to use the Activity Concentration Index (as a screening tool). This could be made clear in the regulations. However, it should also be made clear that it is proper to strengthen this calculation (assessment) with additional parameters.

This parameter could be the density or thickness of the material as well as the intended use of the material (bulk or superficial). As by doing so it improves the accuracy of the risk assessment for BM (as described by the Netherlands). **There is a need for a harmonised dose assessment as proposed by CEN in a TR, which could be further developed into an EN.**

As the calculation of the Activity Concentration Index is specified in the BSS, the WG recommends to also set it out in the transposing regulations. However, it should also be made clear that it is proper to strengthen this calculation with additional parameters, such

as the density or thickness of the material, as by doing so it improves the accuracy of the risk assessment for the Building Material.

The method used for the measurement of the activity concentration of a particular BM should be done by an accredited Laboratory, accredited also to perform the method. Laboratory accreditation is on MS responsibility.

- Inclusion of gamma radiation into the framework of CE standardisation is an important and useful aim. In doing so, radiation will be regarded like other building parameters (e.g. formaldehyde) and become an "every day" parameter (as a declared characteristic under CE marking) in the future (but not unusual). Manufacturers shall have to show compliance with above mentioned standards (measurement of gamma radiation and assessment of dose) for purposes of CE marking. Nevertheless, this is likely to take time; all the "tools" provided by CEN shall not be available by February 2018.
- In order to address these identified issues, cooperation between EC DG Energy, CEN and EC DG GROW is necessary. This cooperation is on-going but should be speeded up.

3. **Does Article 75 (2) apply to new buildings or existing buildings**

- The WG interprets the intent of Article 75 (2) as preventing BM, which may be of concern, being used in new buildings and as it does not apply to existing buildings. Art. 100 (programmes for existing exposure situations) is more appropriate to apply to existing buildings when such a building is identified with materials that may give rise to a dose of 1 mSv/yr.

4. **Information to users/ consumers**

- The WG believes there is no need for specific information on radioactivity in BM. However it could be included in more general public communication on radiation. By including radioactivity in BM, it is hoped that radiation could become familiar to the public like other everyday risks.

Common understanding of the BSS requirements and Recommendations

A. NORM activities and legacy contamination

The BSS include wide-ranging requirements for the control of NORM industries and legacy contamination. Among them, the following topics were selected for discussion during the workshop:

- The identification of classes or types of practices involving NORM (BSS, art 23 and Annex VI);
- The application of the graded approach (BSS, art 24, 25 and 26, and Annex VII);
- The definition of "NORM waste";
- The application of the Justification (BSS, art 19) and Optimisation principles (BSS, art 6)
- Occupational exposures (BSS, art 14);
- Consumer products containing enhanced levels of NORM (BSS, art 100 and annex XVII);
- Legacy contamination (BSS, art 100).

Classes or types of practices involving NORM

Annex VI of the BSS is considered relevant and useful for establishing the national lists of practices involving NORM. The terminology and the wording of the classes or types of NORM practices in national regulations can be slightly adapted, and specific industries can be added (e.g. tunnel excavation) or specified under any of the items in the list included in Annex VI (e.g. ceramic and glass production under zircon and zirconium industry).

Graded approach

Exemption can be regarded as the first step in a graded approach regulation. Practices can be exempted from notification either on the basis of exemption levels (in terms of activity concentration) established by the competent authority, or on the basis of an assessment demonstrating that: i) workers should not be classified as exposed workers and ii) that members of the public do not receive annual doses above 1 mSv.

Nevertheless, using 1 mSv for public exposure as the exemption criterion for all practices involving NORM may not be acceptable for specific situations identified by MS. This is consistent with article 6, which requires Member States to ensure that, where appropriate, dose constraints are established for the purpose of prospective optimisation of protection (see the paragraph below on “justification and optimization”).

For example, the releases from mining activities to surface or ground water or to the air (dust) may be under regulatory control at much lower level (e.g. 0,1 mSv).

On the other hand, there are scenarios where activity concentrations in material below 1 Bq/g may lead to doses exceeding 1 mSv/year (for instance, where there is a concern that drinking water or other relevant exposure pathways may be affected). For such situations, notification may be required (BSS, art. 25.3).

For the use of the general exemption criteria, as defined in Annex VII, it is not specified whether radon exposure from the NORM material should have to be taken into account or not (allowing for the prevailing background) in the dose calculation (1 mSv/year criterion).

Nevertheless, for HERCA members or their representatives, radon should have to be treated separately on irrespectively of its origin. This is why the BSS directive introduces the concept of reference levels for radon. Measures to reduce radon concentrations are needed where the concentration is above the reference level. It would not be appropriate nor practicable to regulate separately the exposure to radon originating from NORM material and using a separate criterion (1 mSv) for that purposes. It seems that this has never been the intention of the BSS directive

A clarification from the European Commission on radon issues from NORM practices, based on the opinion of the article 31 group of experts, should be useful.

Recommendation 1: HERCA recommends to seek clarification from the European Commission on radon issue from NORM practices.

Recommendation 2: (see the HERCA report related to radon in workplaces) - HERCA strongly recommends the issue of an international guideline, and associated tool, to calculate annual effective doses from time-integrated radon concentrations for different situations such as mines, caves, spas, NORM activities as well as ordinary workplaces.

The notification procedure (BSS, art 25) may contain a dose assessment (worker, public), depending on national regulations.

Notification may be followed by registration or by a licensing requirement on the basis of the information provided.

For the purpose of clearance, the possibility is opened to establish specific clearance levels, allowing disposal to landfill or other conventional waste management routes, on the base of a specific dose assessment.

Definition of “NORM waste” (Vs radioactive waste)

The BSS does not specify a certain level above which residues or waste produced by NORM practices are qualified as radioactive waste. Consequently, MS have to decide how to deal with such waste:

- 1) there is no obligation to define it as "radioactive waste" at any level so they can be just called "NORM waste" or any other term if so desired (the definition is different from one country to another one);
- 2) the possible definition could be based on activity concentration (e.g. 1, 10 or 50 Bq/g), but and/or on any other parameter (e.g. volume, mass, form, origin, etc.).

If NORM waste are considered as radioactive waste, they should have to be taken into account in the national programme for the management of radioactive waste required by the Council Directive 2011/70/EURATOM of 19 July 2011.

Recommendation 3 – HERCA recommends to seek clarification between the terminology and definition of waste from NORM practices introduced by the Council Directive 2013/59/Euratom and the terminology and definition of radioactive waste introduced by the Council Directive 2011/70/EURATOM.

Application of the Justification and Optimisation principles

Even if there is no point of misunderstanding of the BSS requirement related to justification (BSS, art. 19), the effective application of this principle to a new class of NORM practices, but also to the review of existing NORM practices, does not seem to be trivial (no national experience has been identified in the frame of the workshop).

The application of the optimisation principle to occupational exposure in NORM practices does not raise any specific issues. For the protection of the public, in case of discharges into the environment, a dose constraint can be used (BSS, art. 6) where doses are liable to exceed a relevant fraction of the dose limit. For airborne discharges which generally lead to very low doses, dose constraint seems not to be appropriate, except perhaps for an incinerator burning NORM residues.

Looking at risk factors related to NORM, the chemical risk could sometimes exceed the radiation risk. And within the optimization process, other protective measures related to chemical or other risks, could/should be taken into account.

Recommendation 4 - Basically, the management of risk in NORM practices needs a global approach for the management of the chemical risk and the radiation risk, and collaboration between competent authorities (to be considered in the guidance mentioned in recommendation 6).

Occupational exposure

The general requirement on education, training and information (BSS, art. 14) applies to workers involved in NORM practices, including outside workers in charge of maintenance (coal fired plants, ovens, vessel cleaning, etc.).

Recommendation 5 – HERCA considers that the NORM field is relatively new to radiation protection knowledge, and therefore education, training and information of exposed workers need to be improved for NORM activities. In particular, improvements should be focused on early declaration of pregnancy or the intention to breastfeed an infant. The attention of the Radiation Protection Authority should be drawn on this point. In addition, the "follow up" of outside workers needs to be ensured.

Commodities containing enhanced levels of *NORM*

Exposure to commodities containing naturally-occurring radionuclides can be ensured by considering the result of a dose assessment (doses often far below 1 mSv/y) and the possibility to disregard the exposure from a radiation protection point of view (art. 100.1).

Nevertheless, the general principle of justification (art. 100.2) prevails, particularly if the radionuclides are used or added intentionally, irrespective of the assessed dose. Consequently, for specific type of commodity, the decisions of national authorities could be different from one country to another.

It does not seem to be quite realistic to require the notification of such a situation by the manufacturer or the supplier to the competent authority, as foreseen by the BSS (art. 100.3).

**Recommendation 6 – HERCA is recommended to look into radiation protection issues regarding commodities containing enhanced levels of *NORM*, for which deeper investigation should be necessary for a greater understanding. A new task force could be set up. The possible dissemination of information within Europe related to commodities containing enhanced levels of *NORM* could also be investigated.
(This recommendation does not cover the use of *NORM* residues within building materials)**

Legacy contamination

The management of *NORM* legacy contamination is a common challenge in many Member States.

NORM residues from site remediation or facility decommissioning may come to represent the largest part of the national *NORM* waste inventory.

Moreover, stakeholder perception of radiation risk is often heavily disproportionate, making it difficult to adopt an optimal solution in terms of risk and socio-economic cost. This calls for stakeholder involvement in the early stages of the process and for transparent and readily accessible information.

Conclusion (*NORM*)

Some issues of possible misunderstanding of the BSS requirements have been raised during the workshop. Furthermore, because of the flexibility introduced in the BSS, different approaches seem to be allowed, particularly in the implementation of the graded approach and the waste management strategy.

In this framework, an effective and practical implementation of this regulation remains challenging: MS need a European guidance for providing them with clear orientations for BSS requirement implementation.

Recommendation 7 - On the basis of the best practices in place in terms of efficiency, HERCA would welcome the publication of a European Guidance, focused on practical implementation of BSS directive requirements on *NORM*, along with an update of the RP122- Part II European Guidance.

B. Gamma radiation from Building Materials (BM)

During the workshop, the following topics, all in relation with article 75 and the Annexes VIII and XIII of the BSS, have been discussed:

- The reference level (art. 75.1)
- The identification of buildings materials (art. 75.2 and Annex XIII)
- Building materials not submitted to regulatory control (art. 75.2 and Annex XIII)
- Measurements and calculation of the activity concentration index (art. 75.2 and Annex VIII)

Reference level

The Reference Level of 1 mSv/y is defined for the purpose of the “placing on market” of BM used for new building construction (the intent of Article 75.2 being to prevent BM to be used in new buildings).

Upon indication or evidence of a high level of exposure due to gamma radiation emitted by BM in existing buildings, MS can apply the art. 100 requirements related to existing exposures (Programmes for existing exposure situations).

Identification of building materials

The list as given in Annex XIII seems to be very well accepted as a starting point, preferably to be implemented through regulation. Adding materials to the list is possible from a legal point of view. However, it should be ensured this does not interfere with free movement of goods (avoiding creation of barriers to trade).

Recommendation 8 – HERCA recommends to share national BM lists, when available, on HERCA or EC websites. This will ensure transparency. Moreover, the lists would enable HERCA or EC (1) to provide a comprehensive overview on national regulations - which is useful for users and manufacturers – (2) to work on any experience feedback and on any possible evolution on the directive implementation.

Possibility to withdraw Building Materials from regulatory control

A BM category, a priori identified as being of concern from a radiation protection point of view, could be withdrawn from the national list, on the basis of dose assessment demonstrating a very low dose for the public ($\ll 1$ mSv/y). But, because of potential imports of product (belonging to the same category) with higher radioactivity, the use of the concepts of compliance *without testing* and *without further testing* should be explored rather than withdrawing a product from the list.

Measurements and calculation of the activity concentration index

A conservative approach to assess whether a BM complies with the 1 mSv Reference Level (art. 75.1) is to use the Activity Concentration Index (art. 75 (2) defined in Annex VIII).

For certain types of construction products (such as light concrete, mineral wool or wall and floor coverings), it is appropriate to amend this calculation (for the dose assessment) with additional parameters, such as the density or thickness of the material as well as the intended use of the material, bulk or superficial (Annex VIII).

Point on standardization works under CPR/CEN/TC, in progress

Inclusion of gamma radiation from BM into the framework of CE standardisation is an important and useful aim ; in preparation :

- **An harmonised EN related to the measurement of gamma radiation from BM : as a 1st step , a draft Technical Specification TS will be issued Autumn 2017**
- **A technical report on dose assessment methodology (2017), possibly issued later as an EN**
- **And therefore, harmonized products standards defining (in annex) "radiological characteristics" (activity concentration and index I).**

In doing so, radiation will be regarded like other building chemical parameters and become an "every day" parameter (a declared characteristic under CE making).

Producers shall have to show compliance with above- mentioned standards for the purposes of CE marking.

Nevertheless, this is likely to take time: all the "tools" provided by CEN will not be available in February 2018.

Recommendation 9 - There is a real and urgent need for a harmonised methodology for the measurement of the radionuclides concentration within Building Materials which shall have to be approved by EC. These measurements should be performed by Accredited Laboratories recognized by MS. A common protocol for dose assessment should also be very useful (for the purposes of the internal market). In addition, the development of a harmonised methodology for dose assessment, approved by the EC is really desirable.

Conclusion (BM)

Very few issues of misunderstanding of the BSS requirements has been raised during the workshop: in 2018, the national regulatory frames will have to be defined but the practical implementation of this regulation (which will be new for several Member State) will have to wait for the issue of the European standards produced under the Construction Product Regulation.

Recommendation 10 – Pending the issuance of an appropriate EN standard, the existing European guidance RP 112 needs to be updated, taking into account the technical report on dose assessment methodology prepared under the Construction Product Regulation.

Annex 1

Programme

24 May 2016	
Topic	Contact
Opening Session	Chair: Augustin Janssens Sec./Rap.: Jean-Luc Godet (ASN, FR)
Welcome and introduction	Solveig Dysvik (NRPA, NO)
HERCA Work	Jean-Luc Godet (ASN, FR)
IAEA: "Current NORM Work Programme and Challenges - an IAEA Perspective"	H. Burcin Okyar (IAEA)
EC: "Requirements on NORM and Building Materials in Council Directive 2013/59/Euratom – the Basic Safety Standards"	Stefan Mundigl (EC)
Presentation on dispositions implemented in Norway in relation to NORM and building materials	Mette Nilsen (NRPA, NO)
Discussions	
Session 1: NORM Activities - Regulation General Overview (BSS, art 23, art 24, 25, 26 and 27, and Annexes VI, VII)	Chair: Solveig Dysvik Sec./Rap.: Pierrick Jaunet (ASN, FR)
Introduction	
Spain: "The Spanish experience of regulation of NORM industries"	Marta Garcia-Talavera (CSN, ES)
Poland: "The Transposition and Implementation of Directive 2013/59/EURATOM in Poland – ongoing activities on NORM"	Iwona Matujewicz (PAA, PL)
Switzerland: "NORM, the Swiss Approach"	Philipp Steinmann (FOPH, CH)
Ireland: "Ireland's approach to implementing the EU BSS Directive"	David Fenton (EPA/ORP, IE)
Discussions on session 1	
Session 2: NORM Legacy contamination (BSS, art. 73; art.100) Waste management strategy (BSS, art 30.1, 30.2 and 30.4)	Chair: Jean-Luc Godet (ASN, FR) Sec./Rap.: Augustin Janssens
Introduction	
Belgium: "NORM legacy contamination in Belgium : overview and FANC approach" & "NORM residues management strategy in Belgium"	Stéphane Pepin (FANC, BE)
United Kingdom: The UK's Experience of Trans-frontier Shipment of NORM Wastes.	Adam Stackhouse (SEPA, UK)
France: Overview of legacy contaminated sites in France	Amel Mellouk (ASN, FR)
Round table on additional/complementary national dispositions and practices	
Discussions on session 2	
Conclusions and outcomes on NORM	

25 May 2016	
Topic	Contact
Session 3: Building Materials (BSS art. 75.2, 75.3, annex VIII, XIII) Introduction	Chair: Marta Garcia Talavera (CSN, ES) Sec./Rap.: Mette Nilsen (NRPA, NO)
Questionnaire on transposition of the BSS directive in relation to building materials.	Francisco López-Acevedo (CSN, ES)
CEN: "Assessing Ionizing Radiation from Construction Products under Construction Product Regulation CPR".	Pekka Vuorinen. (CEN TC/351/WG 3)
France: "Building Materials : the new French Regulatory Framework in preparation"	Benoît Bettinelli (MSNR, FR)
The Netherlands: "A simplified Dutch approach for the implementation of the EU BSS for building materials"	Barbara Godthelp (ANVS, NL)
Round table on additional/complementary national dispositions and practices	
Discussions on session 3	
Working Group sessions Common Understanding of BSS Requirements and Challenges to Implementation WG 1: BSS, art 23, 24, 25, 26, 27, 30.1, 30.2, 30.4, Annexes VI, VII WG 2: BSS, art. 75.2, 75.3, annexes VIII, XIII	(Sec./Rap.: Stefan Mundigl) (Sec./Rap.: David Fenton)
Closing session Introduction	Chair: Augustin Janssens Sec./Rap.: Jean-Luc Godet (ASN, FR)
Reports from the 2 working groups	
Conclusions	
End of the Workshop	
26 May 2016	Visit of a NORM Repository (Sløvåg)

25 May 2016 (cont.)

11:35	13:05	1:30	Working Group sessions Common Understanding of BSS Requirements and Challenges to Implementation WG 1: BSS, art 23, 24, 25, 26 and 27, and Annexes VI, VII WG 2: BSS, art 30.1, 30.2, 30.4, 73, 100 and 102.4(d) and Annex VII WG 3: art. 75.2, 75.3, annexes VIII, XIII	(Sec./Rap.: Stefan Mundigl) (Sec./Rap.: Stéphane Pepin) (Sec./Rap.: David Fenton)
13:05	14:35	1:30	Lunch	
14:35	14:45	0:10	Closing session Introduction	Chair: Augustin Janssens Sec./Rap.: Jean-Luc Godet (ASN, FR)
14:45	15:45	1:00	Reports from the 3 working groups	
15:45	16:15	0:30	Conclusions	
16:15			End of the Workshop	

26 May 2016

Location: Stangeneset NORM Repository in Sløvåg (Wergeland-Halsvik).

From	To	Dur.	Topic
07:30			Hotel departure by bus
07:30	9:00	1:30	Bergen - Leirvåg
9:15	9:35	20	Leirvåg – Sløvåg (Ferry)
9:45			Arrival at Stangeneset NORM Repository
10:00	11:15	1:15	Presentation of the repository and lunch
11:15	12:30	1:15	Repository visit
12:45	13:05	20	Sløvåg - Leirvåg (Ferry)
13:10	15:00		Leirvåg - Bergen (Airport)

Annex 2

Participants

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