



Statens strålevern  
Norwegian Radiation Protection Authority

# ***NORM – Regulatory context***

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EU COMET course:

***"COURSE ON NATURALLY OCCURRING RADIOACTIVE MATERIAL (NORM) IN THE ENVIRONMENT"***

# Overview

- ▶ Introduction to NORM legislation
- ▶ Recently updated EU BSS and NORM
- ▶ IAEA and NORM
- ▶ The legislative framework and holistic approach to protect the human health and environment
- ▶ Key-points for NORM waste management in Norway
- NRPA experiences, achievements and challenges with applying amended Pollution Control Act

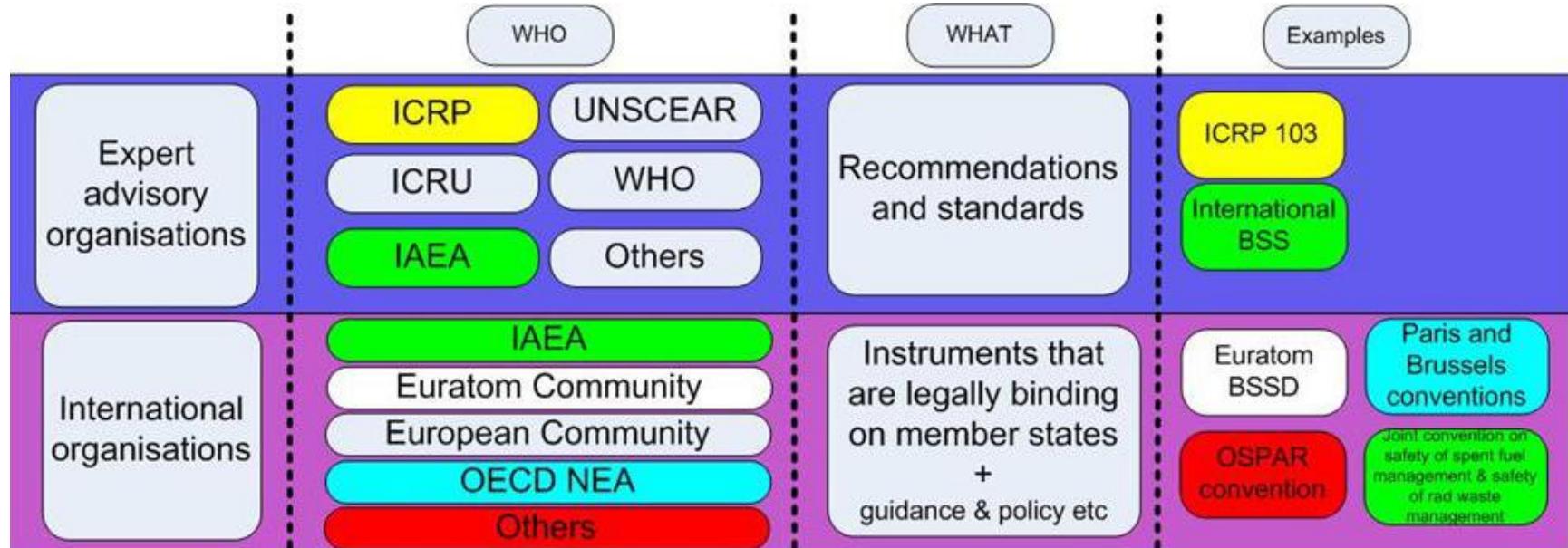
# Some definitions of NORM

- ▶ IAEA: Material (irrespective of whether processed or not) that contains no significant amounts of radionuclides other than naturally occurring radionuclides and is designated in national law or by a regulatory body as being subject to regulatory control because of its radioactivity
- ▶ World Nuclear Association: Radioactive materials which occur naturally and where human activities increase the exposure of people to ionizing radiation
- ▶ EPA: Materials which may contain any of the primordial radionuclides or radioactive elements as they occur in nature, such as radium, uranium, thorium, potassium, and their radioactive decay products, that are undisturbed as a result of human activities. Radiation levels presented by NORM are generally referred to as a component of “natural background radiation

# Development of requirements

- ▶ The consideration of regulation of NORM has, historically, developed patchily and the need for this issue to be addressed in the radiological protection framework has often been disputed
- ▶ The Euratom 1996 BSS Directive included NORM, but only as an additional separate section to the main radiation protection framework for new and existing practices and interventions
- ▶ With the review of the BSS undertaken over the last few years by the European Commission, protection against natural radiation sources, rather than being addressed separately in a specific title, has been fully integrated within the overall requirements of the current BSS

# Radioactive regulatory regime



- ✓ National governments and regulators
- ✓ Domestic legislation and policy
- ✓ Implementation of law

# International recommendations and laws

- ▶ The International BSS and Euratom BSS are now based on ICRP 103 recommendations
- ▶ The publication recommends radiological protection system categorizing exposures into ‘planned’, ‘existing’ and ‘emergency’ situations
- ▶ Radiation protection principles applied:
  - ✓ Optimization
  - ✓ Justification
  - ✓ Dose limitation

# **Directive EU BSS 2013/59/euratom**

- ▶ Directive EU BSS 2013/59/euratom
- ▶ Non legislative acts laying down basic safety standards for protection against the dangers arising from exposure to ionising radiation
- ▶ Transposition: Member States shall bring into force the laws, regulations and administrative provisions necessary to comply with this Directive by 6 February 2018

# Use of EU BSS Directive

- ▶ Exposure situations
  - existing - NORM
  - emergency
  - planned - NORM
- ▶ Exposure categories
  - occupational - NORM
  - public - NORM
  - medical

# EURATOM BSS

- ▶ The natural radiation sources explicitly incorporated in the new BSS are:
  - naturally occurring radioactive materials used or processed in specific industries (NORM-industries) or used as building materials
  - indoor exposure to radon in dwellings and workplaces
  - exposure of aircrew and space crew to cosmic radiation

# Integration of NORM

- ▶ Protection against natural radiation sources, rather than being addressed separately in a specific title, should be fully integrated within the overall requirements
- ▶ In particular, industries processing materials containing naturally-occurring radionuclides should be managed within the same regulatory framework as other practices
- ▶ Specific requirements will still be made for NORM based on the fact that natural radiation sources are ubiquitous in the environment

# Identification of practices involving NORM

- ▶ Regulatory control - *Article 23*

*'Member States shall ensure the identification of classes or types of practice involving naturally-occurring radioactive material and leading to exposure of workers or members of the public which cannot be disregarded from a radiation protection point of view. Such identification shall be carried out by appropriate means taking into account industrial sectors'*

# NORM industries

- ▶ Extraction of rare earths from monazite
- ▶ Processing of niobium/tantalum ore
- ▶ Oil and gas production
- ▶ Geothermal energy production
- ▶ TiO<sub>2</sub> pigment production
- ▶ Thermal phosphorus production
- ▶ Zircon and zirconium industry
- ▶ Production of phosphate fertilisers
- ▶ Cement production, maintenance of clinker ovens
- ▶ Coal-fired power plants, maintenance of boilers
- ▶ Phosphoric acid production
- ▶ Production of thorium compounds and manufacture of thorium-containing products
- ▶ Primary iron production
- ▶ Tin/lead/copper smelting
- ▶ Ground water filtration facilities
- ▶ Mining of ores other than uranium ore



# Graded regulatory approach

- ▶ Graded approach to regulatory control considered:
  - magnitude and likelihood of exposures resulting from the practices
  - impact that regulatory control may have in reducing such exposures or improving the safety of installations

# Graded regulatory approach

- ▶ Notification
- ▶ Authorization – Registration and Licensing
- ▶ Inspections
- ▶ Responsibilities

# Responsibilities

- ▶ Undertaking – to assess and implement arrangements for the radiation protection of exposed workers, examination and approval of plans for the discharge of radioactive effluents, environmental monitoring, any changes
- ▶ Competent authority – to authorize the discharge by giving the conditions considering optimization of radiation protection (ALARA) and best available techniques (BAT)

# Exemption from regulatory control

- ▶ As a starting point, the following dose criteria for the exemption of NORM industries from regulatory control: 1 mSv/y for workers or 0.3 mSv/y for members of the public, are proposed. Above these values protective actions should be considered to reduce the doses, bearing in mind that as for all other practices the principle of optimization should always be applied
- ▶ However, assessing doses from NORM activities can be complicated, in particular doses to members of the public

# Exemption from regulatory control

Values for natural radionuclides in secular equilibrium  
in solid materials:

- ✓ Natural radionuclides from the U-238 series 1 Bq/g
- ✓ Natural radionuclides from the Th-232 series 1 Bq/g
- ✓ K-40 10 Bq/g

# Protection of humans and biota

- ▶ Updated EU BSS Directives call for a policy protecting the environment against the harmful effects of ionising radiation – not only the protection of humans as it has historically been seen

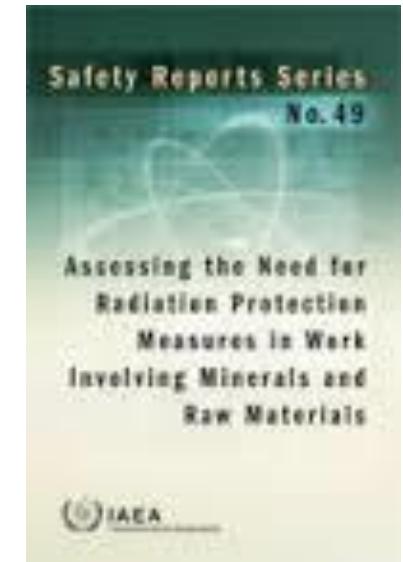
# IAEA and NORM

- ▶ **Hierarchy of the safety standards**
  - Safety Fundamentals
  - Safety Requirements – The International BSS, The Transport regulations
  - Safety Guides
  - Safety Reports
  - TECDOCS

# IAEA main areas of work – NORM

- ▶ The Agency's main areas of work with respect to NORM:
  - Assessing the need for radiation protection measures in work involving minerals and raw materials
  - Safety publications for industry sectors
  - Training packages for industry sectors
  - Remediating Sites and Regulating NORM residues

# Assessing the need for radiation protection measures in work involving minerals and raw materials



- ▶ Identifies the industry sectors and process materials most likely to require regulatory consideration
- ▶ Provides further information to assist regulatory bodies in assessing the need for radiation protection measures
- ▶ Discusses the considerations involved in determining the most appropriate regulatory approach

# Aplication of different concepts in International BSS (IAEA)

- ▶ Exclusion
- ▶ Exemption
- ▶ Clearance

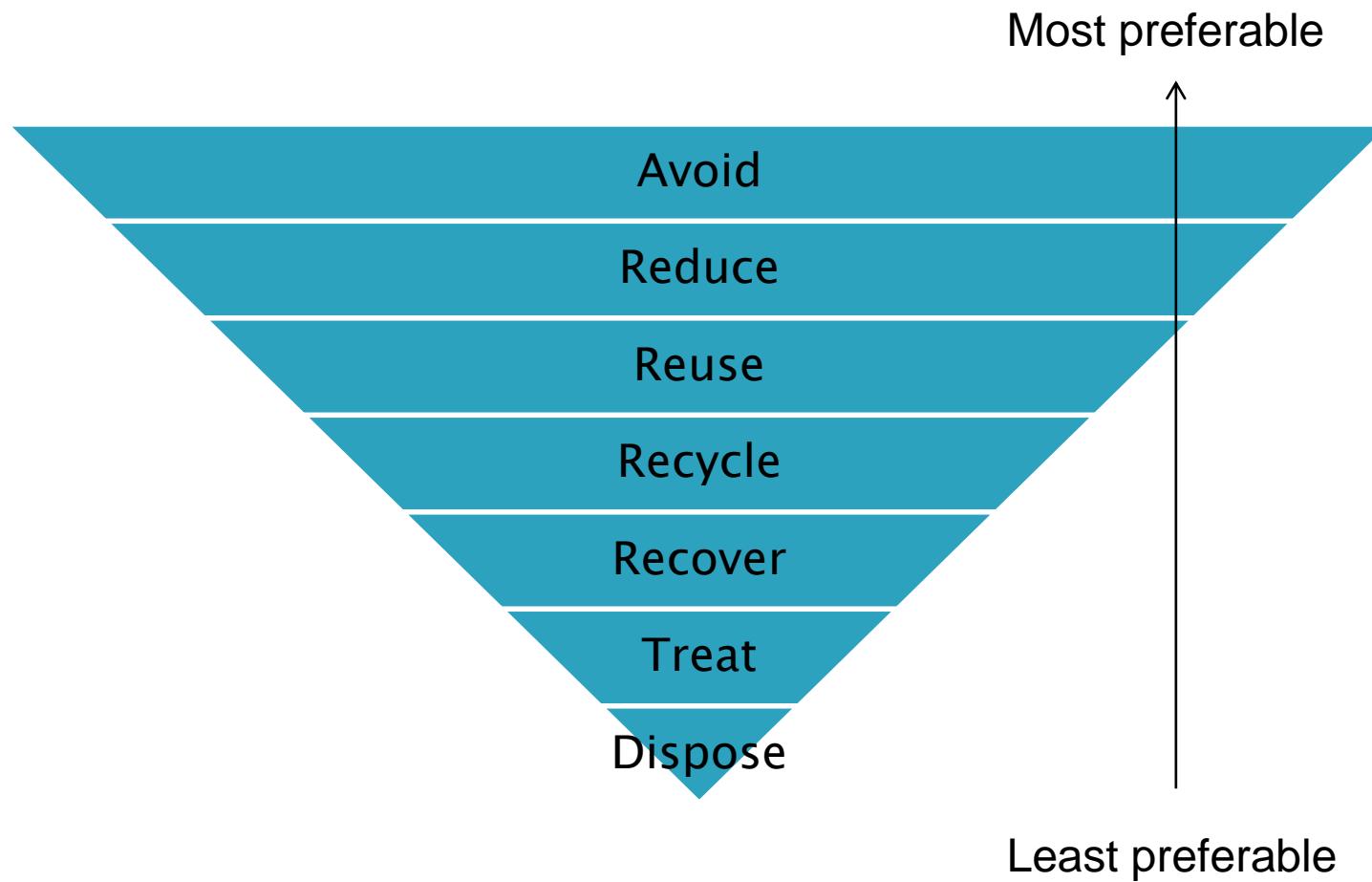
# Radioactive waste and hazardous waste – fundamental similarity

- ▶ Both radioactive (including NORM waste) and hazardous wastes have the potential, if not managed appropriately, to cause environmental harm and to damage human health
- ▶ For both waste types disposed to a repository, the primary concern is the risk presented by transfer to the biosphere through water transport

# Traditional view



# Hazardous waste management hierarchy



# Radioactive waste management



**Concentrate and contain**



**Delay and decay**



**Dilute and disperse**



# Regulation

- ▶ Both radioactive (including NORM) and hazardous wastes are regulated and safely managed at international and national levels

## Basel convention

- Source reduction
- Precautionary
- Integrated pollution control
- Standardization
- Least transboundary movement
- Polluter pays
- Public participation
- **London Convention**
- **OSPAR Convention**

## IAEA Safety fundamentals

- Protection of human health
- Protection of the environment
- Protection of future generations
- Protection beyond national borders
- National legal framework
- Safety of facilities
- Control of waste generation

# Regulatory practice

- ▶ **Holistic approach** – ecosystem based approach in regulative framework – Few countries
  - but in most of countries still
  - **Separate institutional control**
  - **Separate Acts, regulations, institutions, even working groups**

# Protection objectives

- ▶ Radioactive waste – **humans and the environment** (ICRP, IAEA, UNSCEAR);
- ▶ Hazardous waste – clear policy objectives – **keep it safe for humans and environment**; numerous Directives and related standards
- ▶ Mixed waste – No issue of radioactivity within hazardous waste nor issue of chemicals within radioactive waste is properly addressed nowadays due to complexity of both

Contaminant group	Metals	VOC	Inorganic	PAH	Pesticides
% occurrence with radioactive waste	99	77	73	67	54

(Brit Salbu, Bioprotá workshop 2015)