



IAEA

60 Years

Atoms for Peace and Development

IAEA Work Programme on NORM – Achievements and Challenges

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Purpose of Talk

To outline:

- NORM related safety requirements and guidance,
- On-going activities of the Agency in regard to NORM, and
- Challenges in regulating NORM industries.

Is NORM a priority for the IAEA?

- Safety for uranium production (i.e., fuel cycle) is a priority for the IAEA, among other things as expressed in IAEA General Conference resolutions. Other NORM is not emphasized as much as uranium.
- Industrial sectors other than uranium production are not routinely amongst the stakeholders the IAEA engages.
- When a group of Member States request assistance for a particular NORM issue we address it (e.g., TC Missions, the Phosphogypsum Working Group).

The IAEA NORM Programme

- NORM is a cross-cutting issue, but the IAEA does not have an across-the-board NORM Programme.
- The Uranium Production Cycle team in NEFW does have an integrated programme for promotion of sustainable U-production.
- Various groups in the Technical Departments of the Agency have NORM-related activities that are coordinated to a greater or lesser degree.
- The IAEA Technical Cooperation Programme implements training events and expert missions and there are various extra-budgetary activities related to NORM residue management and worker protection.

NORM Industry Characteristics

- The regulation of NORM industries often involves multiple regulatory authorities.
- NORM industries are strongly driven by economic viability of individual projects. When profit margins are small the pressures to keep costs low are large.
- With their own technical support or the ability to call for external expertise.
- Generally multi-hazards situations.
- Radiological risk generally not dominant.
- Doses always expected to be below thresholds for deterministic effects.
- Lack of RP culture and difficult to achieve the same level as nuclear industry.
- Clear zoning may be difficult (classification of areas).
- A graded approach is needed.

Safety Requirements – GSR Part 3

An integrated and consistent set of Safety Requirements that establishes the requirements that must be met to ensure the protection of people and the environment, both now and in the future.

IAEA Safety Standards

for protecting people and the environment

Radiation Protection and
Safety of Radiation Sources:
International Basic
Safety Standards

Jointly sponsored by

EC, FAO, IAEA, ILO, OECD/NEA, PAHO, UNEP, WHO



General Safety Requirements Part 3
No. GSR Part 3



- BSS follows ICRP 103 recommendations
- Protection and Safety requirements of the BSS apply to all facilities and activities
- Planned, emergency and existing exposure situations
- Occupational, public and medical exposure categories
- 52 overarching requirements – for governments, regulatory bodies, industry, health and safety professionals, workers and public

Regulation of NORM

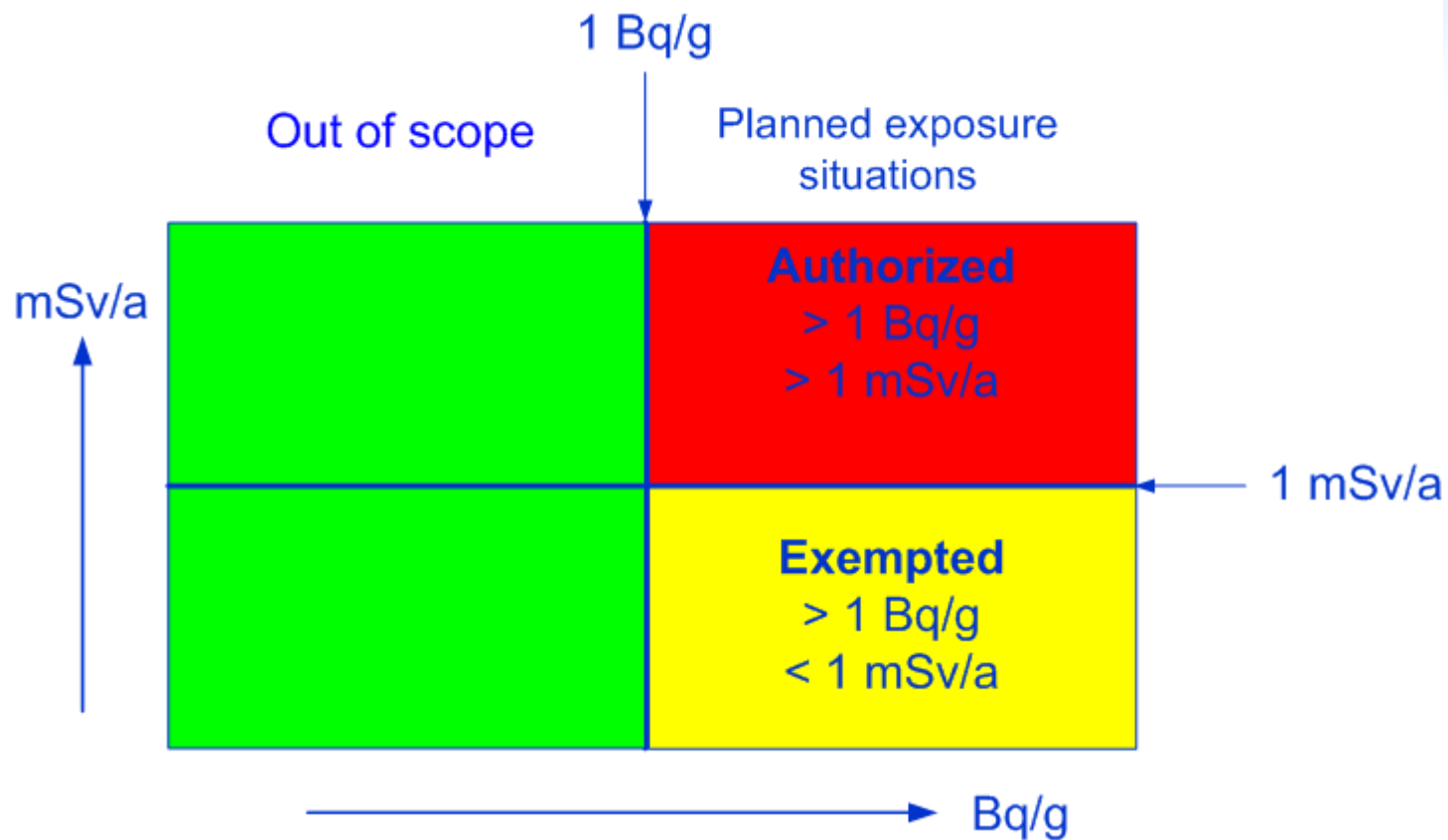
Activity concentrations are specified in the BSS as being values below which it is usually unnecessary to regulate, irrespective of the quantity of material or whether it is in its natural state or has been subject to some form of processing:

- 1 Bq/g for any radionuclide of the uranium and thorium series decay chains
- 10 Bq/g for ^{40}K

These values can also be used as *clearance* levels for release of NORM residues from practices

- Exposure to natural sources – normally considered as an existing exposure situation
- However, with certain exceptions : requirements for planned exposure situations are applied

Scope of regulation for NORM



- Past practices are an existing exposure situation (Section 5 of BSS).
- Exemption dose criterion for NORM residues: of the order of 1 mSv/a
- Generic clearance level <1 Bq/g (U and Th decay chain), 10 Bq/g for ^{40}K
- Specific clearance values derived to meet a dose criterion of the order of 1 mSv/a

Graded approach to regulation

One of the key principles in the BSS

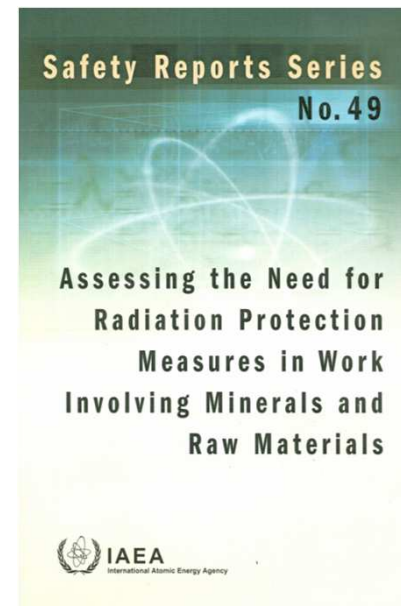
application of the requirements for planned exposure situations “shall be commensurate with characteristics of the practice or source and with the magnitude and likelihood of exposures.”

Particularly relevant for NORM industries

- the exposures are generally (but not always) moderate with little or no likelihood of extreme radiological consequences from accidents.
- The graded approach optimizes the use of regulatory and operator resources

National regulatory approaches

- Adopt BSS directly or with some modification
- Wide acceptance of the Industry sectors most likely to require some form of regulatory consideration
 - Uranium mining and processing
 - Rare earths extraction
 - Thorium extraction & use
 - Niobium extraction
 - Non-U mining – incl. radon
 - Oil and gas
 - Production and use of TiO₂
 - Phosphate Industry
 - Zircon & zirconia
 - Metals production (Sn, Cu, Al, Fe, Zn, Pb)
 - Burning of coal etc.
 - Water treatment – incl. radon
- Still differences between countries or even within a country



IAEA SAFETY STANDARDS SERIES

Occupational Radiation Protection in the Mining and Processing of Raw Materials

JOINTLY SPONSORED BY
IAEA AND ILO



SAFETY GUIDE

No. RS-G-1.6



National regulatory approaches

- General acceptance of the 1 Bq/g criterion
- Need for an evidence based approach for regulatory decisions
- Uncertainties in worker and public dose assessment
- Conservative modelling and prediction of exposure scenarios far from real situations

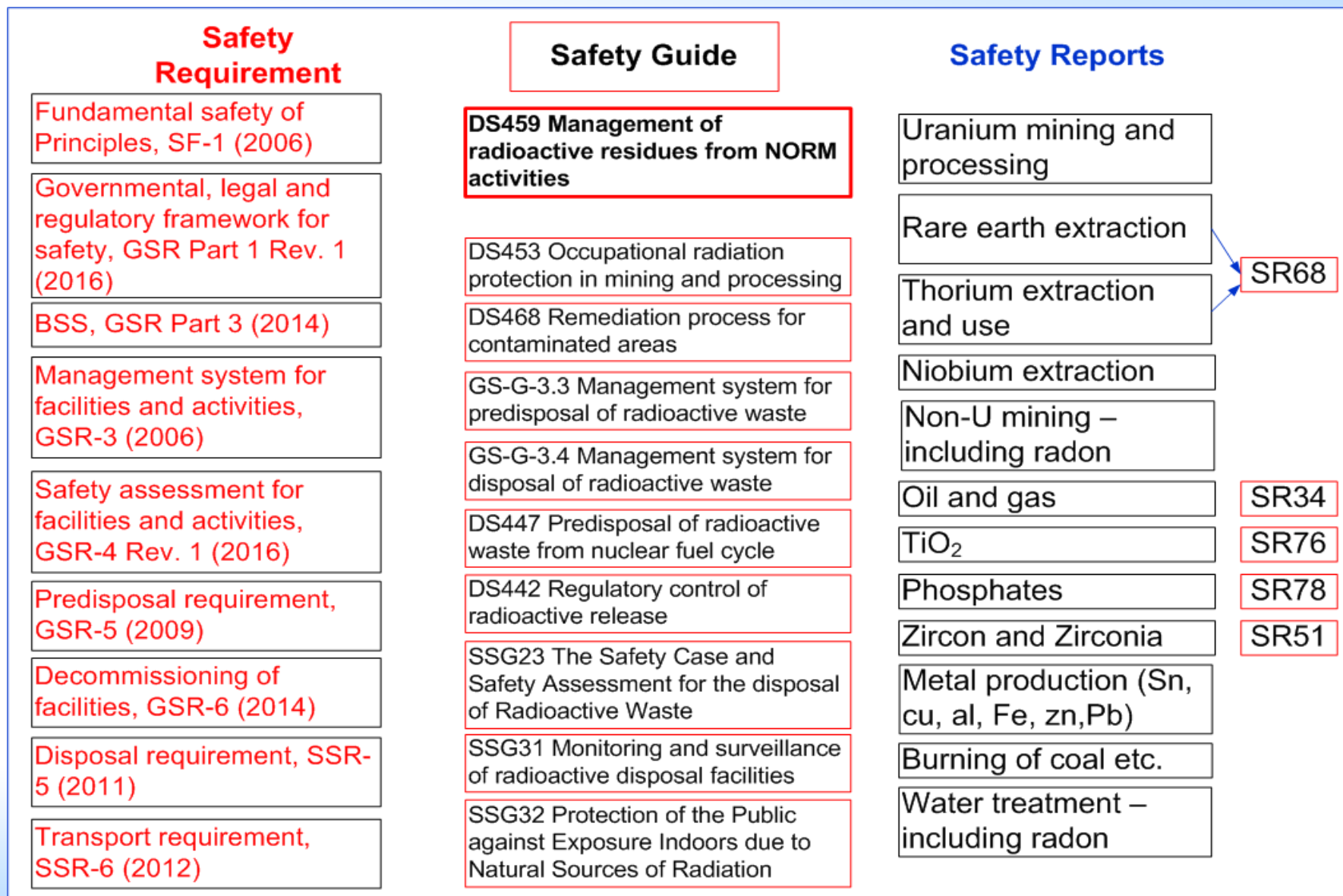
Industry-specific approach

- No single approach is appropriate for all industrial processes – a challenge in deriving a uniform approach
- The nature and level of the radiological risk varies considerably from one industrial process to another
- Most of the actions taken to comply with regulation is situation specific and hard to generalise
 - Examples – Oil and gas industries,
 - Mining industries
- Need for industry specific approach
- IAEA - industry specific safety reports – widely recognized.

Exposure of workers

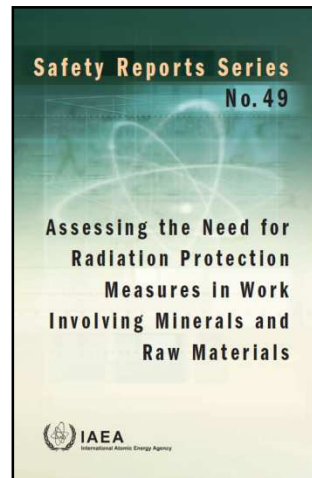
- Methodologies for realistic assessment of worker doses suffer from non-standardised approaches
- Worker doses < 1 mSv in most workplaces of NORM industries with few exceptions of U/Th mining and processing, rare earths extraction etc.
- Potential for higher exposures if adequate control measures are not implemented.

Relevant Safety Publications



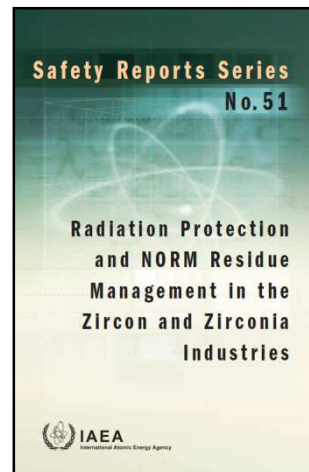
Previous Agency work on NORM

Safety Reports Series 49 addresses the question under what circumstances does it become necessary to regulate?

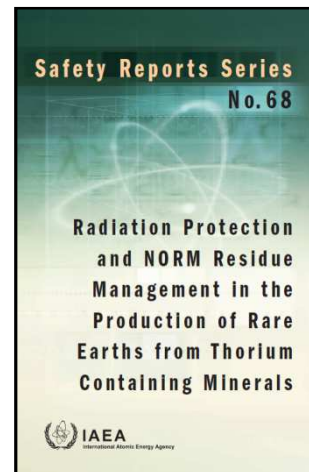


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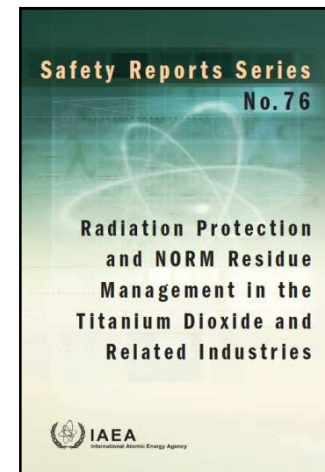
The characteristics of NORM and the implications for their management are specific to the industrial process.



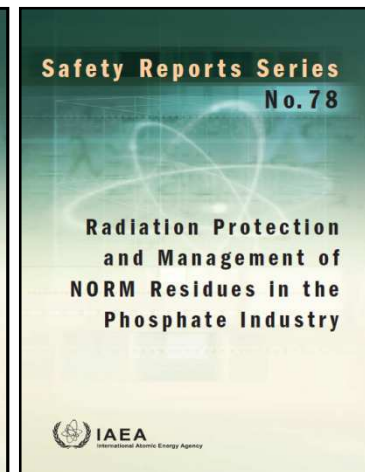
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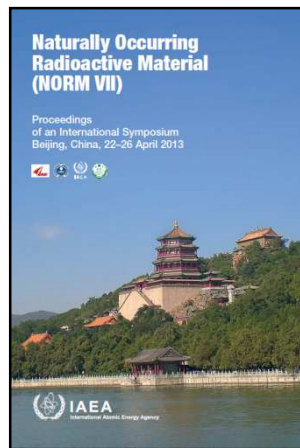


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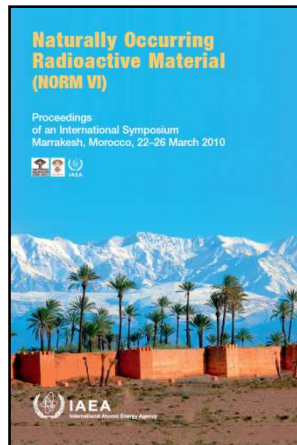
Previous Agency work on NORM management

The NORM VIII symposia – Rio de Janeiro, Brazil, 18-21 Oct 2016.

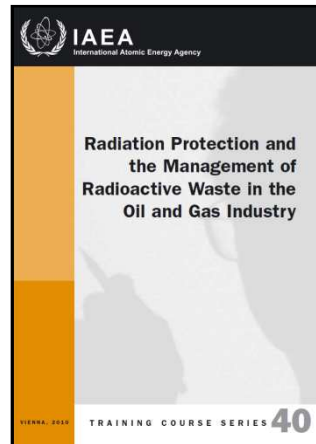
The Agency also develops many topical reports on aspects of NORM Management



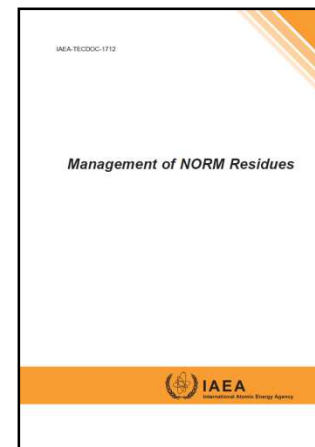
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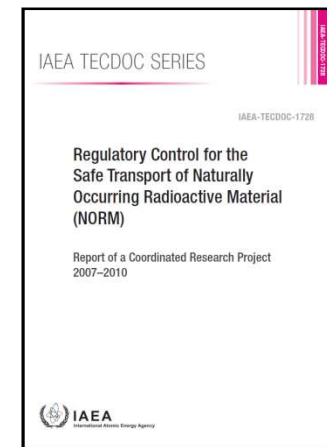
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Documents under development

Safety Standards:

- Management of Radioactive Residues from Uranium Production and Other NORM Activities (DS459), revision of WS-G-1.2.
- Remediation Process for Areas with Residual Radioactive Material, (DS468), revision of WS-G-3.1.

Safety Reports and other supporting documents:

- Safety Infrastructure for Uranium Production
- Safety of In-situ Recovery for Uranium Production
- Uranium mining & processing,
- Coal and Coal Ash industry,
- RP and NORM Residue Management in the Industrial Uses of Thorium
- Decision Making of Remediation Activity (DD792);
- Remediation guidelines for regulators (9 Vols).
- TECDOC: Interim measures for protection of the public;
- TECDOC: Review of remediation plans.

Training Materials

- Recently developed a seven module remediation training course, including manuals, e-learning materials for U sites.
- Training course series No.40 – Oil and gas industries.

Publications on Exposure to Radiation from Natural Sources (<https://www-ns.iaea.org/publications/norm-publications.asp>)

Networks/ information exchange

- OPRNET (web based): including the Information System on Uranium Mining Exposures (UMEX)
- RSLs: International Forum for Regulatory Supervision of Legacy Sites .
- CGULS: Coordination Group for Uranium Legacy Sites
- ENVIRONET: Network on Environmental Management and Remediation

Challenges in regulating NORM

- Continuing to provide appropriate standards for management of NORM residues, and
- providing for the application of these standards presents the Agency with many challenges.
- It cuts across many broad industrial sectors (e.g., mining and minerals production, energy, chemical industries).
- Management of NORM residues it is just one of many issues for most of these industrial sectors.
- Explaining the Agency standards as they apply to NORM to such a broad range of interested parties is a challenge.

Challenges in regulating NORM

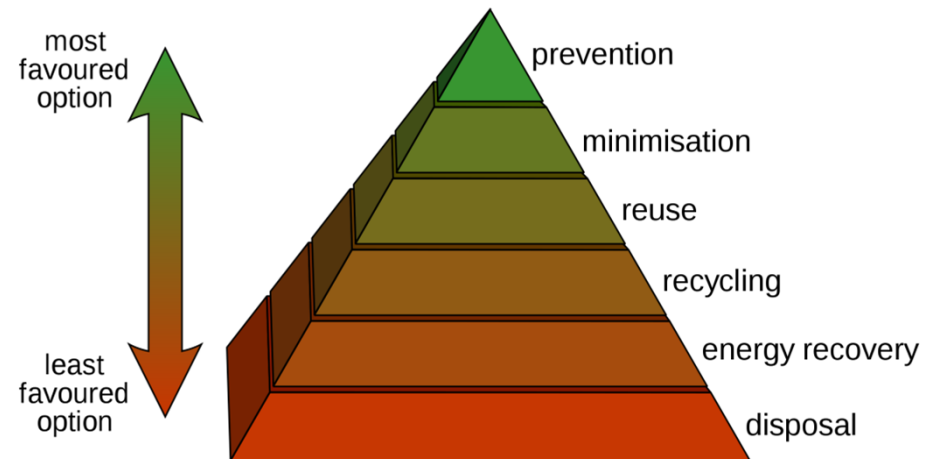
Recommendations in regard to reuse/recycle and blending of NORM residues with other materials.

The “waste hierarchy” – familiar to many industrial sectors - promotes reuse/recycle as a means to avoid disposal.

Blending of radioactive waste is a practice that has long been discouraged because it involves dilution.

Blending of NORM residues is practiced in some Member States.

Additional information on reuse/recycle of NORM residues (including blending) would be of value for Member States.



The waste hierarchy

Challenges in regulating NORM

- Remediation of sites contaminated by NORM residues.
 - There are many legacy sites that have NORM residue contamination.
- Providing for long term safety of NORM residues.
 - Due to the combination of long half-lives of radionuclides and large volumes of residues.
 - Long term stewardship is a fact of life for NORM residues.
- Special attention to the graded approach to regulation
 - Regulatory measures and resources commensurate with the risk) based on good knowledge and understanding of the diverse industrial sectors involved
 - It is needed for regulation of NORM industries including their residues.

Challenges in regulating NORM

- Radiation protection experience is limited in many industry sectors, uranium mining being an exception.
- Industry specific guidance is needed to address the radiological issues of NORM industries.
 - There is a need to improve the process of sharing RP operational management experience amongst various industrial sectors
- 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.).
 - In this regard, a new network for NORM community should be considered.
- Synergies with the conventional worker health and safety issues should be strengthened.
- Consideration should be given to systems optimization.
- Building stakeholder trust is important for management and operation of NORM sites.



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Thank you!

