Agenda Item W5.1
Draft Safety Guide DS459: Management of Radioactive Residues from Uranium Production and Other NORM Activities (Revision of WS-G-1.2)
– For information and discussion –

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Outline

• Background
• Draft DS459 after first review by the SSCs
  – Status, structure
• Summary of Member States Comments
• Issues for advice
• Way forward
Background

- WASSC 31 (June 2011) concluded WS-G-1.2 to be revised at the light of the new requirements and developments
- WASSC 32 (November 2011) and CSS 31 (March 2012) endorsed the DPP
- Proposed title: Management of Radioactive Residues from Mining, Mineral Processing, and other NORM related Activities
- New working title: Management of Radioactive Residues from Uranium Production and Other NORM Activities (Endorsed at WASSC 38)
- WASSC 41 (June 2016) endorsed for 120 day MS comments until 7 December 2017
Background

- Focus on residues generated from uranium production and other activities
- For residues of new generation and new facilities, including from operation, decommissioning and remediation
- New audience with weak awareness of radiation and radiation safety
- Less developed knowledge and experience to NORM residues compared with those for radiation sources and nuclear fuel cycle
Scope covered

Uranium mining and processing
Rare earth extraction
Thorium extraction and use
Niobium extraction
Non-U mining – including radon
Oil and gas
TiO₂
Phosphates
Zircon and Zirconia
Metal production (Sn, Cu, Al, Fe, Zn, Pb)
Burning of coal etc.
Water treatment – including radon

Safety case and safety assessment
Funding Management system

Decommissioning and closure
Operation
Storage
Construction
Reuse/Recycle
Design
Treatment
Siting
Characterization
Planning
Generation

Liquid waste
Manufactured items containing NORM
Contaminated items
Higher activity waste
Uranium mill tailings
Bulk minerals processing residues other than uranium mill tailings
Waste rock, mineralized waste rock and similar residues
Comments’ disposition for the first review by the Review Committees

• First review of the draft publication by the review Committees in June 2016
• Large majority of the comments were clear and well justified, based on the practices in the Member States
• Committee involved: WASSC, RASSC
  – 260 comments from 5 MSs and EC:
    – 206 (80%) accepted
    – 24 (9%) accepted with modifications
    – 30 (11%) rejected
    – Editorial + Clarification + Terminology = 178/260 (68%)
• WASSC 41 (June 2016) endorsed for 120 day MS comments until 7 December 2017
Management scheme for NORM residue

- **Protection strategy**
  - Planned exposure situations
  - Regulated:
    - > 1 Bq/g
    - > 1 mSv/a
  - Exempted:
    - > 1 Bq/g
    - < 1 mSv/a
  - Out of scope:
    - < 1 Bq/g
    - < 1 mSv/a

- **mSv/a**
- **1 Bq/g**
- **Bq/g**
Structure of DS459

1. Introduction
2. Overview of NORM Residues
3. Governmental, legal and regulatory framework
4. Protection of people and the environment
5. System for regulatory control
6. Strategies for NORM residue management
7. The safety case and safety assessment for NORM residues management
8. Safety consideration for long term Management of NORM Residues

Appendix A. Special considerations of residues from uranium production
Appendix B. Residue management plan for uranium production
Appendix C. Decommissioning plan for uranium production facility

References
Annex I. Residue be assessed for possible regulatory control
Annex II. Reuse and Recycling of NORM Residues
Annex III. Sampling and determining radionuclide activity concentrations
Annex IV. Bibliography
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Comments on Scope to include other materials

- Comments on including ores and feedstock etc., that are not considered as residues
- This Safety Guide “Management Radioactive Residues from Uranium Production and Other NORM Activities” focuses primarily on residues.
- The Safety Guide is more a thematic document, rather than a facility specific document
- Safety of Nuclear Fuel Cycle Facilities, No. NS-R-5 (Rev. 1)
  - This Safety Requirements publication applies to processing, refining, conversion, enrichment, fabrication of fuel (including MOX fuel), spent fuel storage, spent fuel reprocessing, waste conditioning and storage, and fuel cycle research and development facilities.
Comments on Scope to specify sectors to be covered (1/2)

- Comments on “better defined, clearly outlining with sectors to be included and which to be excluded”
- The recommended list is just a starting point to develop national list of sectors under national circumstance
- Direct copy of the recommended list should be avoided
Comments on Scope to specify sectors to be covered (2/2)

- SRS 49 Assessing the Need for Radiation Protection Measures in Work involving Minerals and Raw Materials
- DS453 Occupational Radiation Protection (3.162)
- Draft DS459
- The list is not exclusive
- Characteristics of residues in the same sector are of great variety

1. Rare earths extraction
2. Thorium extraction & use
3. Niobium extraction
4. Non-U mining – incl. radon
5. Oil and gas
6. TiO₂
7. Phosphates
8. Zircon & zirconia
9. Metals production (Sn, Cu, Al, Fe, Zn, Pb)
10. Burning of coal etc.
11. Water treatment – incl. radon
Comments on Fraction of 1 mSv (1/2)

Comments:

- Constraint of a fraction of 1 mSv as the 1 mSv/y is defined as limit for public dose

GSR Part 3

- I-4. For radionuclides of natural origin, exemption of bulk amounts of material is necessary considered on a case by case basis by using a **dose criterion of the order of 1 mSv in a year,** commensurate with typical doses due to natural background levels of radiation.

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<th>1 mSv</th>
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<td>0.3 mSv</td>
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<td>10 μSv</td>
<td>Exemption of source and practice with artificial nuclide</td>
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• 3.22. For some planned exposure situations, the regulatory body should set dose constraints or source constraints, where appropriate.
• 4.16. If several radiation facilities and activities are located at the same site, the dose constraints for public exposure should take into account all sources of exposure that could be associated with activities at the site, leaving an appropriate margin for foreseeable future activities at the site that may also give rise to exposure.
• 4.19. The potential for public exposures in excess of the dose constraint arising from possible future re-development of, or unplanned intrusion into, closed NORM residue management facilities, should always be considered, and appropriate institutional controls prepared.
Comments on application of graded approach

Technical Meeting on Application of the Graded Approach to Safety for Management of NORM Residues, Vienna, Austria, 19-23 June 2017

- Methodology for grading, including categorization of residues and relevant facilities and activities;
- Methodology for regulatory control, license, registration, notification and exemption;
- Options for clearance, disposal and long term management; and
- Consideration of grading of safety assessment.
For residues from uranium mining, especially heaped up waste rock materials, the activity concentrations of all radionuclides in the $^{238}\text{U}$ and $^{232}\text{Th}$ decay series are, in most cases, less than 1 Bq/g. Nevertheless, there is a potential health risk for which a safety assessment is mandatory.

In the international practice, the activity limit requiring a radiological risk assessment was set to 0.2 Bq/g for each of the radionuclides mentioned above.

Consideration of volume for clearance as ‘bulk” is not clear. The term moderate quantities means quantities that “are at most of the order of a tonne” of material. Anything greater than this amount is considered bulk quantities. (Footnote 4, p.2, IAEA RS-G-1.7)
Issues for advice (2/2) – Is new construction materials and agricultural fertilizer existing exposure situation?

• p. 30 Footnote 17: A situation of exposure due to radionuclides of natural origin in food, feed, drinking water, agricultural fertilizer and soil amendments, construction materials and residual radioactive material in the environment is treated as an existing exposure situation regardless of the activity concentrations of the radionuclides concerned.

• p. 109 Footnote 64: Regulatory control of construction materials is addressed in Section 5 as an existing exposure situation.
Way forward

• The draft DS459 will be further reviewed and revised to incorporate Member States’ comments and feedback of the TM on graded approach
• The draft DS459 will be submitted for the second review by the WASSC and RASSC
Thank you!