Waste Safety Standards Committee
41st Meeting

20 and 23 June 2016

Agenda W 2.1
DS459 Draft Safety Guide on
Management of Radioactive Residues from Uranium Production and Other NORM Activities
- Approval for submission to MS -

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Division of Radiation, Transport and Waste Safety
Outline

• Background
• Finalized draft DS459
  – Status, structure
• Results of the first review by the SSCs
  – SSCs comments
  – Comments’ disposition
  – Issues for advice
• Decision expected
  – Approval for submission to the MS
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)
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
Activities on DS459

• 7 CS meetings on DS459
  • 1st CM: 3-7 September 2012
  • 2nd CM, 15-19 April 2013
  • 3rd CM, 4-8 November 2013
  • Home-based assignment to improve the draft
  • 4th CM 1-4 September 2014 for review of draft text
  • 5th CM 20-24 April 2015
  • 6th CM 20-24 July 2015
  • 7th CM 30 May-3 June 2016
• Progress report – WASSC 38 (November 2014) and RASSC/WASSC (November 2015)
Input considered

• Main input:
  – Recently published Safety Requirements and Safety Guide
  – MS practices and experiences

• But also:
  – Dec. 2013, the 6th EAN-NORM Workshop on "Alternatives in NORM wastes management" and TOPICAL DAY "NORM in new BSS and Radon in NORM", Spain
  – Jan. 2014, NORM and Natural Radiation Management Middle East Conference, UAE
  – Aug. 2014, EM to review the draft national regulation for NORM management, Jordan
  – Dec. 2014, the 7th EAN NORM WORKSHOP on "Disposal of NORM in Member States" and the Topical Day on "Building Materials", the Netherlands
  – Apr. 2013, NORM VII, China
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

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

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

Safety case and Funding Management system
Management scheme for NORM residue
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
### Comments’ disposition (1/6)

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Comments’ disposition (2/6)

- First review of the draft publication by the review Committees
- 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%)
- The revised draft and the resolution tables available on the WASSC web folder “Drafts for comment\DS459\”
Comments’ disposition (3/6) – Main reason for rejections – Annex III. Sampling and determining radionuclide activity concentrations

- Comments:
  - include more sampling methods and information are necessary (Republic of Korea)
  - delete Annex III. It is too detailed and should be moved to a related TECDOC (Germany)
- The knowledge for characterization of NORM residues has not been well developed
- No single existing IAEA publication can serve the need considering the variety of NORM residues
- Development of some thematic documents will be needed to support the use of this Safety Guide, including characterization, safety assessment, reuse and recycle and etc.
Comments’ disposition (4A/6) – Main reason for rejections – Non residues

• Comments:
  ▪ USA: ores and feedstocks (46 and 50), mining of ores (47), large tanks of reagents (55), Yellowcake, loaded ISR resin (59)

• 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
Comments’ disposition (4B/6) – Main reason for rejections – Non residues

- Nuclear fuel cycle (IAEA Safety Glossary)
  - All operations associated with the production of nuclear energy.
    (a) Mining and processing of uranium ores or thorium ores;
    (b) Enrichment of uranium;
    (c) Manufacture of nuclear fuel;
    (d) Operation of nuclear reactors (including research reactors); …

- 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’ disposition (5A/6) – Main reason for rejections – Fraction of 1 mSv

Comments:
- USA: No. 54, 58, 60, 61 and 69
- As elsewhere, should be based on some fraction of the 1 mSv/y 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>
<th>Case by case exemption of radionuclide of natural origin with bulk amounts</th>
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<tr>
<td>0.3 mSv</td>
<td>Dose constraint for public exposure from a disposal facility considered as a single source</td>
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<tr>
<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’ disposition (6A/6) – Main reason for rejections – Safety Requirements for Radioactive Waste (GSR Part 5 and SSR-5)

Comments:
- GSR Part 5, Safety case,
- SSR-5: EU (6), Germany (57), Japan (1, 23, 24, 45, 47)

Challenge for application
Comments’ disposition (6B/6) – Main reason for rejections – Safety Requirements for Radioactive Waste (GSR Part 5 and SSR-5)

- Comment: *We endorse DS459 approach of emphasis on applying a graded approach to regulatory control of radioactive residues from uranium production and other NORM industries.*
- Graded approach (25)
- Application of each of the Requirements in GSR Part 5 (Predisposal Management of Radioactive Waste) and SSR-5 (Disposal of Radioactive Waste) was carefully reviewed
Comments’ disposition (7/7) – Main reason for rejections
– Application of relevant Safety Requirements for Radioactive Waste (GSR Part 5 and SSR-5)

• **Residues of Uranium Production**: SSR Part 5: 2.15(b) a disposal facility (considered as a single source) is so designed that the calculated dose does not exceed a dose constraint of **0.3 mSv in a year** or a risk constraint of the order of **10⁻⁵** per year.

• **Residues of Other NORM Activities**: GSR Part 3: I-12(c) For radionuclides of natural origin in residues that might be recycled into construction materials or the disposal of which is liable to cause the contamination of drinking water supplies, the activity concentration in the residues does not exceed specific values derived so as to meet a dose criterion of the order of **1 mSv in a year**, commensurate with typical doses due to natural background levels of radiation.
• Please note that in residues from uranium mining, especially heaped up waste rock materials, the activity concentrations of all radionuclides in the $^{238}$U and $^{232}$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.
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.
Decision expected

- The comments accepted and accepted with modification have contributed to the improvement of this draft Safety Guide.
- The comments rejected will be promoting future development of relevant Safety Requirements and supporting documents.
- **WASSC approval for submission to the MS for comments**
Thank you!