

Strategy of NORM residues management and consideration of long term safety

G. Forsee (U.S., State of Illinois)

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IAEA

International Atomic Energy Agency

Outline

- Strategic approach
- Residue management plan
- Options of long term management
- Recycle and reuse
- Long term management facility
- Safety assessment

Residue management issues


The fundamental safety objective is to protect people and the environment from harmful effects of ionizing radiation.

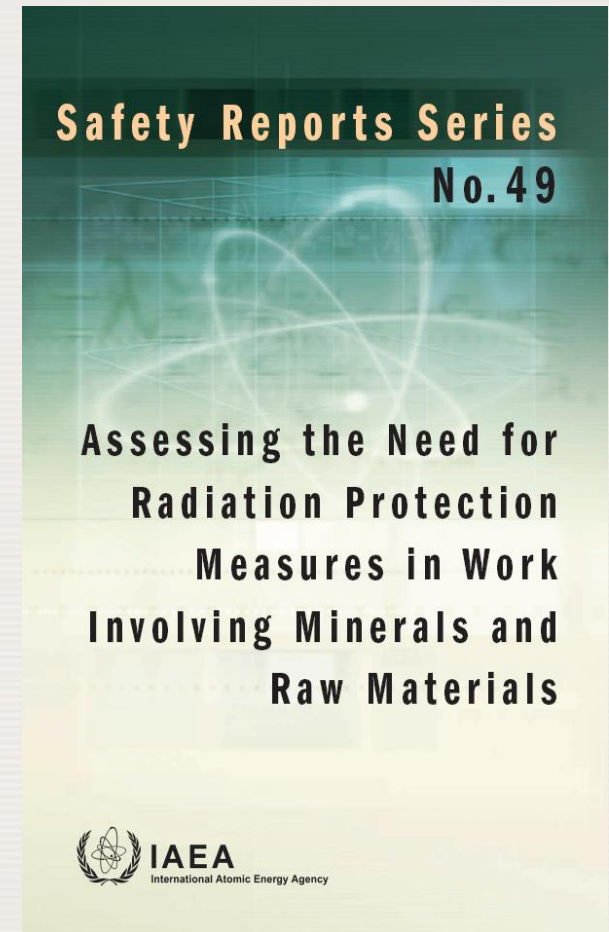
So how do we work to achieve this in residue management?

By establishing a residues management plan according to the Standards



NORM Residues – Concerned sectors

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



NORM Residues/Wastes



NORM Residues/Waste



Gas well pipe contaminated with NORM scale, USA

NORM scale on pumps used in fertiliser manufacturing



Challenges – Categories of NORM Residues

- Origin (12 industries)
- Physical forms
- Radioactivity: Exempted/Cleared, Very low activity, Low activity, Higher activities
- Volume: Small volume, Large volume
- Management options: Generic clearance, conditional clearance, reuse/recycle, Disposal at landfill, Disposal as RW

Challenges – Categories of NORM Residues

	Small volume	Large volume
Cleared		
Very low activity		Waste rock?
Low activity		Uranium milling tailing
Higher activity	Scale	

Challenges – Graded approach

- Graded entry of facility and activity
- Graded clearance
- What are indicators to grade NORM residue?
- What is the criteria of the indicator to grade?
- Indicators: activity concentration of the material, surface dose of the materials, dose of the working environment, dose to the worker, dose to the public

Challenges – Reuse/recycle

- What can be reused and recycled?
- Criteria for reuse and recycle
- Relevant facilities and activities (Process)
- **Constraint from international trade**

Challenges –Disposal

- Dilution/dispersion via isolation/containment
- Long-term management and safety assessment
 - Close to human activities
 - Large volume
 - Long half-lived radionuclide
- Disposal options, **exempted or cleared** as non-radioactive waste

The Residues management plan

Determination :

- a) residue streams/items
- b) quantities
- c) radioactivity concentrations (total and nuclide specific)
- d) physical and chemical form of the residue
- e) other hazardous properties (non-radiological)
- f) residues which have to be designated for disposal as waste.

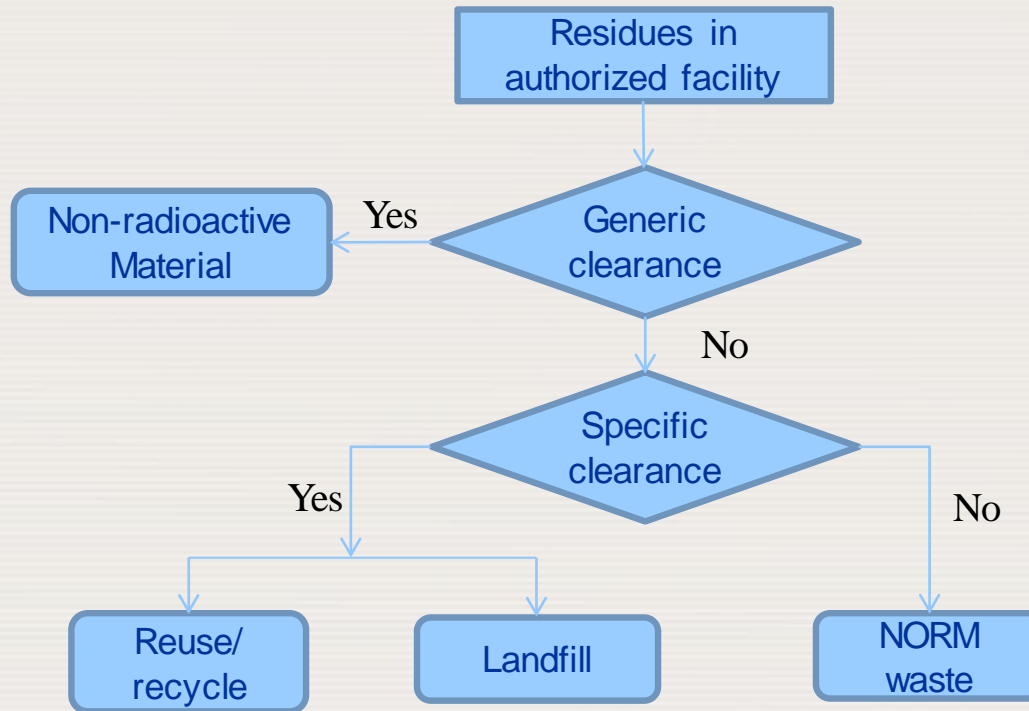


Waste minimisation

Examples may include:

- Clear route before generation
- Careful segregation
- Recycling of contaminated waters in processing
- Salvage and recycling of reagents
- Recycling of contaminated scrap

Management options for NORM residues under authorized activities

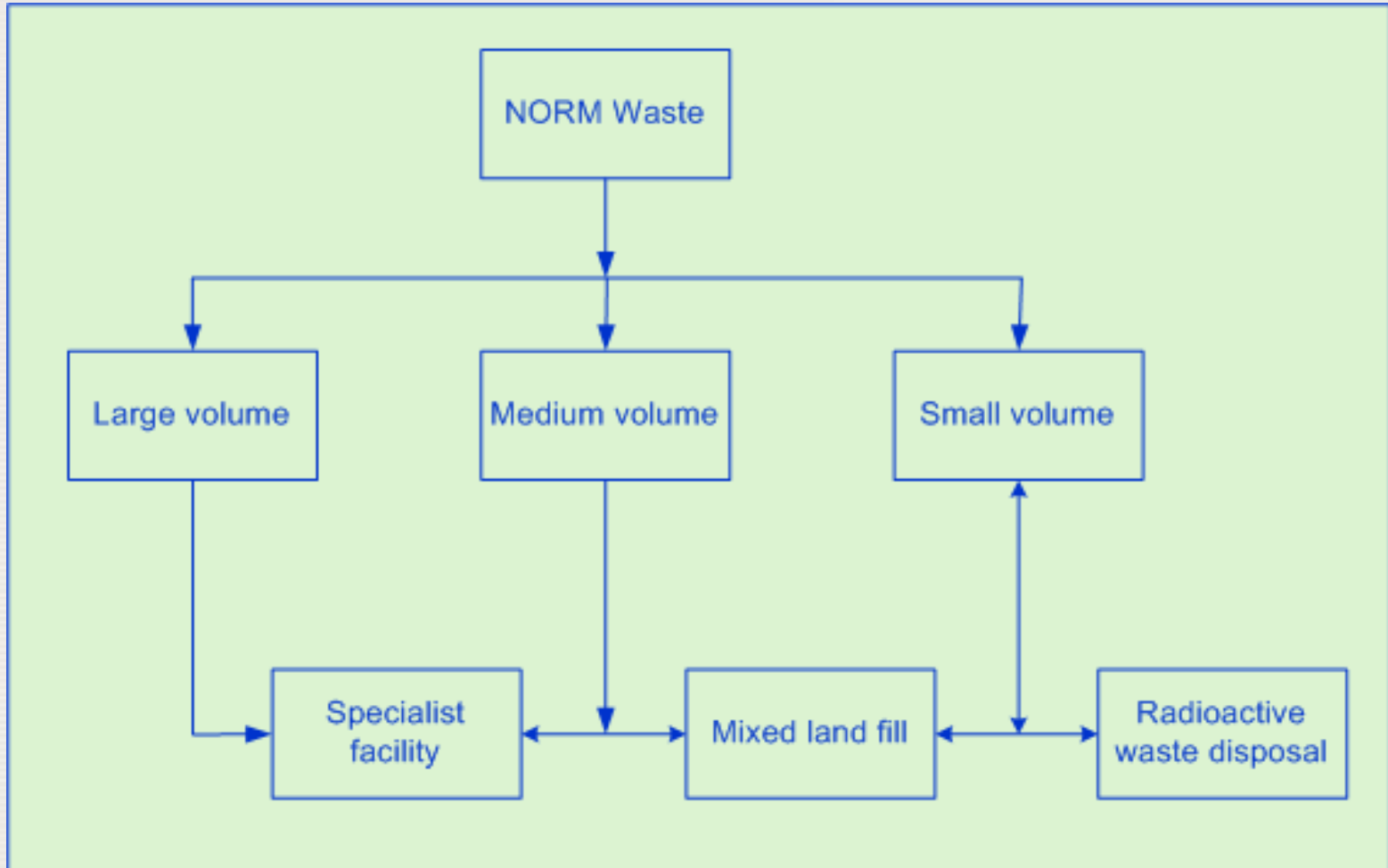


Remains under regulatory control

Clearance options



Strategic approach for long term management of NORM waste



Criteria for long term management of NORM residues

- *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.*
- *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.*

TYPES OF DISPOSAL FACILITIES



LLW disposal trench, USA



Engineered vaults (El Cabril, Spain)



Sillamäe Tailings Management Facility

Developing National Safety Framework for NORM Residues Management

- Establishing inventory
 - Survey
 - Identification
 - Characterization
 - Categorization with connection to subsequent management options
- Reuse/recycle
 - Internal (one operator)
 - Cross sectors (various operators)
 - Cross borders
- Disposal
 - Municipal landfill
 - Hazardous waste landfill
 - RW near surface disposal
 - RW sub-surface disposal (injection of contaminated liquid is one of the example)

Regulatory Forum for Safety of Uranium Production and NORM (REGSUN)

- To help build capacity in all Member States undertaking or considering uranium production or the management of NORM residues.
- To promote good regulation and safe and environmentally responsible practices, through the application of IAEA Safety Standards.
- To promote and increase the exchange of information and expertise among its participants, including regular updates on best practice approaches, targeted assistance in review and provision of expertise, and identification of gaps in guidance and support.
- To support the utilization of IAEA tools and training materials. And
- To provide strategic input for future IAEA work in areas related to safety of uranium production and NORM residues management.

Thank you very much!

