Web-based Information Exchange Platform on ORP in Industries involving NORM (NORMEX)

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Content

• IAEA’s Occupational Radiation Program and its’ NORM coverage
• Information exchange platforms for occupational exposure
• Rationale to establish NORMEX and the initiative (with progress)
IAEA - Occupational Radiation Protection Program

• **Objective**: To promote an *internationally harmonized approach* to ORP through the *development and application of standards* for optimizing protection and safety, restricting exposures and applying current radiation protection techniques in the workplace.

To ensure an appropriate control of occupational exposure due to external and internal irradiation from both artificial sources and *natural sources of radiation*.

• This is achieved through provision of operational services for radiation monitoring and protection to the Agency’s own operations; and *through assistance to Member States in establishing, maintaining and, where necessary, improving programs for the radiation protection of workers.*

• Activities are targeting workers, employers, regulatory authority staff and radiation protection professionals.
Strategic planning on ORP

- Occupational radiation protection is one of the important milestones for radiation safety.
- ORP related Safety Standards benefits from decades of research and developments.
- Rapid development in the application of radiation technology in the MSs led to the strong needs on ORP in terms of guidance, training and different kinds of services.
- Based on GSR Part 1 & 3, Safety Guide on Occupational Radiation Protection (GSG-7) and Safety Reports specific to industry sectors have been developed or under preparation.

So that today, so that tomorrow, ORP is and shall remain a strategic move (planning & implementation) for safe and secure operation.
Hierarchy of the Safety Standards

Safety Fundamentals
- Principles

Safety Requirements – GSR and SSR

Safety Guides – GSG and SSG

Safety Reports
- TECDOCs

Safety Standards

Supporting publications

Information on the IAEA’s safety standard programme:
http://www-ns.iaea.org/standards/
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.

- 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, public and service providers such as technical support organizations
- 12 requirements for ORP; Control, monitoring and recording
- Regulators, TSPs (authorization or approval of service providers for individual monitoring and calibration services) & Operators
GSR Part 3 coverage for ORP

**Occupational exposure**
- Req 19: Responsibilities of the regulatory body (*Regulatory Infrastructure for Occupational Radiation Protection*)
- Req 20: Requirements for monitoring and recording of occupational exposure
- Req 21: Responsibilities of employers, registrants and licensees
- Req 22: Compliance by workers (*Responsibilities of workers*)
- Req 23: Cooperation between employers, registrants and licensees
- Req 24: Radiation protection programme
- Req 25: Assessment of occupational exposure and workers’ health surveillance
- Req 26: Information, instruction and training
- Req 27: Conditions of service
- Req 28: Protection and safety for female workers and for persons under 18 years of age

**Exposure of Emergency Workers**
- Req 45: Protection of emergency workers (arrangements for controlling the exposure)

**Occupational exposure**
- Req 52: Protection of workers in existing exposure situations (remedial actions, Rn in workplaces, exposure of air crew)
Graded approach to regulation

One of the key principles in the GSR Part 3 (Req 6) application of the requirements “shall be commensurate with characteristics of the practice or source and with the magnitude and likelihood of exposures.”

- Not limited with regulation

Particularly relevant for industries involving NORM

- Economic importance of industries
- Doses are generally (but not always) moderate (exposure pathways; Gamma exposure – external, Radon/thoron and progeny nuclides – Inhalation, Long-lived alpha emitters – Inhalation, Ingestion and Skin contamination)
- Potentially high cost of regulation in relation to reduction in exposure (exposure levels are already low)
- The graded approach optimizes the use of regulatory and operator resources
- Regulation (and strategy) required when above certain levels
Safety Guide on ORP (GSG-7)

- Implementation of the Requirements on ORP in GSR Part 3
- Updates of previous safety guides in the field of ORP (Occupational Radiation Protection in the Mining and Processing of Raw Materials, RSG 1.6)
- It is applicable to all areas concerning occupational exposure, including medicine, nuclear fuel cycle, industries involving NORM, radiation application industries and scientific as well as educational facilities.
- Provides information on ORP framework, exposures of workers in different exposure situations, protection of workers in special cases, dose assessment, management system for service providers. Occupational exposure control measures as well as health surveillance are also included.
- Promoted: in all regions with regional workshop with ILO (TC support, 2016-2018)
Safety Guide on ORP (GSG-7)

• To determine the optimum regulatory approach
  – consider, particular types of operation, process and material in more detail
  – a prior radiological evaluation of possible exposure
  – consideration of the costs of regulation in relation to the benefits achievable
  – consideration of arrangements on control, monitor and record of occupational exposure

• Exemption, notification, registration or licensing
• Consider in addition;
  – Other regulations
  – Non-radiological risks
Safety Guide on ORP (GSG-7)

• Planned exposure situations: Exposure of workers due to natural sources
  – Applicability of requirements
  – Graded approach
  – Prior radiological evaluation
  – Control of exposure of workers
  – Awareness and training of workers

• Existing exposure situations:
  – Protection strategies, Justification, Optimization
  – Exposure arising from remedial actions in areas with contaminated residual radioactive material
  – Exposure due to radon

• Monitoring of exposure:
  – Assessment of internal exposure

• Workers health surveillance
Monitoring programme conducted in the relevant workplace (as with other occupational exposures) is the only reliable way of assessing the effective dose received by a worker exposed to NORM

- **Reasonable knowledge** of the characteristics of the material and the work situation in which the material is used (for exposure to gamma radiation and exposure due to airborne dust, it is possible to establish in advance)

**Dose is quite strongly influenced by the activity concentrations of radionuclides in the material**, reflecting the underlying linear relationship between these two parameters.

- Broad indication of the dose from exposure to gamma radiation and exposure due to airborne dust can be used during the prior radiological evaluation
  - Prioritization tool to identify, on the basis of activity concentrations in process materials,
  - Types of industrial process and scenarios of exposure
For nuclear industry workers there are a number of databases of occupational doses at both international and national level (Information System on Occupational Exposure, ISOE)
- http://www.isoe-network.net/

Similar systems have been developed for medical exposures and industrial workers (ISEMIR)
- Industrial radiography (ISEMIR IR)
- Interventional cardiology (ISEMIR IC)

The Information System for Uranium Mining Exposures (UMEX), designed to examine global occupational exposures in uranium mining and processing
- https://nucleus.iaea.org/sites/orpnet/worldwide/umex/SitePages/Home.aspx
NORMEX – Background

• Very large numbers of workers in the world may be exposed to NORM.
  • Based on some NDRs, the data are more limited than those for occupational exposures to man-made sources.

• The annual collective effective dose has been estimated to be approximately twice as large for some industries (e.g., U/Th mining and processing, minerals production, rare earth extraction, etc.)
  • The quantities of NORM, and hence the resulting exposures to workers, differ widely from field to field.

• Lack of real data (as opposed to theoretical assessment) regarding actual exposure of workers in NORM activities – especially regarding internal exposure
  • ORP data is the key for decision making (current approach; data from literature or with a survey)

• Occupational exposure control is the backbone for any regulatory regime and most countries have not been particularly concerned with assessing occupational exposure to NORM (and data is limited for some industries).
NORMEX – Proposal

• To develop on overview tool (or a database) through a Working Group to better share RP operational management experience among various industries involving NORM

  • Web-based
  • Based on the same type of methodology, although the quantities of NORM, and hence the resulting exposures to workers differ widely from field to field
  • Measurement of activity concentrations of NORM in any field, and generic modelling of the behaviour of workers, will allow average exposures to be assessed.
  • Modification of the UMEX survey
NORMEX – Requirements

• Important requirements and information to collect:
  – Capture as many of the NORM workers as possible across a wide number of jurisdictions
  – Need to know the type of operation and nature of the work being performed
  – Need to understand the key assumptions used to monitor and calculate exposure and dose
  – Collect dose information based on individual pathways
  – Ideally wish to know the underlying dose distribution
  – Record primary control mechanisms to optimise dose

• Current System of NORM worker doses:
  – Some countries have central dose registers
  – Dose data may be held by multiple bodies across different jurisdictions
  – High variability in how doses are monitored and calculated
  – High variability in how workers are classified
NORMEX – The Design Requirements

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RSM/ORPU

• Consultation period (with stakeholders)
• Continuing literature search (e.g., UNSCEAR EGOE work)
• Discussed during ZIA annual session in September 2018 and NORM Meeting in Katowice, Poland (November 2018)
  1st ENA Workshop & IAEA NORM Project Technical Meeting
  – Round-table discussion on the need for a Web-based Information Exchange Platform on Occupational Radiation Protection in Industries involving NORM (NORMEX)
  – Consultancy meeting on methodology for acquiring and validating relevant ORP data & establishment of a web-based information exchange platform (March 2019)
Katowice- ENA Workshop (Nov 2018)

- What information is available in relation to measured occupation radiation exposures of workers in different industrial activities including NORM - operations (e.g. oil and gas, titanium dioxide, mining)?
- Consideration to set up a dose information exchange platform
- Looking for real measurements rather than estimated exposures (with all personal information removed)
- Collection of dose information for classified workers
- There may be dosimetry for some employees even though they are not classified workers
- If dose information is shared then different companies/countries can benchmark themselves and if doses are higher than average it would suggest there might be measures that could further reduce exposures.
NORMEX— the Questionnaire

• The final questionnaire developed was EXCEL based (to ease data merging and structure data entry) and covered the following key areas:
  
  – Background information
  – Operation information
  – Monitoring approach
  – Dose calculation
  – Radiation controls
  – Auxiliary controls
  – Workgroup dose data
## Corporate Information
- Country*
- State*
- Organisation Name*
- Address*
- Contact Details*
- Person completing*
- Position
- Email contact*
- Phone contact*

## Operation Information
- Operation Name*
- Location*
- Product Produced**
- Type of Mining**
- Processing Methodology 1**
- Processing Methodology 2**
- Cause of Occupational Exposure 1**
- Radionuclide of Concern**
- Cause of Occupational Exposure 2**
- Radionuclide of Concern
- Production*
- Operational stage**
- Environment
- Staff Numbers
  - Occupationally exposed workers*
  - Occupationally exposed contractors not already included in above*
  - Non-designated workers
- Total

\[1\]
**Monitoring Approach**

**External Exposure - Gamma**
- Monitoring Approach
- Minimum Detectable Level
- Monitoring Methodology
- Background subtracted

**Inhalation of Radon Decay Products (RDP)**
- Monitoring Approach
- Minimum Detectable Level
- Monitoring Methodology
- Background subtracted

**Long Lived Radioactive Dust (LLRD)**
- Monitoring Approach
- Method for determining radioactivity
- Minimum Detectable Level
- Radon retention in sample if appropriate
- Monitoring Methodology
- Background subtracted
- Biological monitoring/Internal Dosimetry

**Dose Calculation**

**Occupancy time**

**External Exposure - Gamma**
- Conversion factor if used

**Inhalation of Radon Decay Products (RDP)**
- Determination of RDP directly or equilibrium factor
- Particle sizing of RDP if used

**Long Lived Radioactive Dust (LLRD)**
- Particle size
- Solubility factor
- Respiratory Protection Factor used for PPE
## Radiation Controls

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<thead>
<tr>
<th>Radiation Exposure - Gamma</th>
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<tbody>
<tr>
<td>Mining controls (select major controls) **</td>
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<tr>
<td>Processing controls (select major controls) **</td>
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<tr>
<th>Special Controls in the Event of an Incident</th>
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<tbody>
<tr>
<td>Mining controls/actions (select major controls) **</td>
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<tr>
<td>Processing controls/actions (select major controls) **</td>
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## Auxiliary Controls

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<th>Radiation induction¹</th>
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<td>Radiation Training¹</td>
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<td>Designated vs non-designated¹</td>
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<td>Supervised and controlled areas¹</td>
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<td>Contamination controls¹</td>
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<td>QA systems¹</td>
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<tr>
<td>Record keeping¹</td>
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<td>Radiation Staffing¹</td>
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<td>Emergency Response Plan¹</td>
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<td>Restricted release Zones¹</td>
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Consultancy meetings (2019)

• Consultancy meeting on development of a Training Package on Occupational Radiation Protection in Uranium Mining and Processing Industry, 4 – 8 March 2019
  
  To review the Safety Report on Occupational Radiation Protection in Uranium Mining and Processing Industry, make decision on the content of the training package based on the report and prepare the training material

• Consultancy meeting on review and re-design of the global survey on Information System on Occupational Radiation protection in Uranium Mining (UMEX), 11-13 March 2019
  
  To review the UMEX questionnaire and make necessary modifications to reconduct the survey on a web platform
Conclusions

• Based on the IAEA experience, new web-based platform has been planned to collect necessary occupational exposure data to understand the trends and dynamics in each industry, and compliance with international safety standards for occupational exposure data from industrial activities involving NORM
  – Web-based Information Exchange Platform on ORP in Industries Involving NORM-NORMEX platform
• For information exchange for routine collection and maintenance of data on occupational exposure,
  – To analyse the trends of collective occupational doses (or individuals) in different NORM industries
  – Global and regional perspectives
  – Harmonization of the RP programmes for different industrial operations (where possible)
• Design has been completed by March 2019 & IT development is needed (all interested parties are invited to support the initiative)
International Conference on Radiation Safety

**When?**
9-13 November 2020

**For whom?**
regulators, operators, radiation protection professionals, young scientists

**Topics**
- Challenges with the SRP
- Dose constraints, reference levels, dose limits
- Optimization
- Existing exposure situations
- Dose limit for the lens of the eye
- Implementation challenges
- Radon
- Food and drinking water
- Industrial operations involving NORM
- Aircrew and space crew
- Non-medical human imaging
- Justification of medical exposures
- And others...
Preparatory Regional Workshops on Lessons Learned in Applying the IAEA General Safety Requirements Part 3

- Cyprus: 18–22 March 2019
- Singapore: 15–18 April 2019
- Argentina: 7–11 October 2019
- Tanzania: 4–8 November 2019

Purpose

- To obtain feedback from Member States on the challenges they face in applying the system of radiation protection

• General requirements of GSR Part 3
• Planned Exposure Situations - occupational exposure
• Planned exposure situations - public exposure
• Existing Exposure Situation - occupational exposure
• Existing Exposure Situations - public exposure
• Emergency Exposure Situations - occupational and public exposure
# International Conference on Management of Naturally Occurring Radioactive Material (NORM) in Industry

**19–23 October 2020**
**Vienna, Austria**

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## Key Deadlines

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<tr>
<th>Date</th>
<th>Event</th>
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<tr>
<td>28 February 2020</td>
<td>Submission of abstract <em>(including Forms A and B)</em></td>
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<tr>
<td>28 February 2020</td>
<td>Submission of grant applications <em>(Form C)</em></td>
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<tr>
<td>26 June 2020</td>
<td>Notification of acceptance of abstract</td>
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<tr>
<td>25 September 2020</td>
<td>Deadline for revised paper</td>
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