IAEA Safety Report On Occupational Radiation Protection in the Mining and Processing of Uranium (SR-100)

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Purpose of Talk

To outline:

• IAEA approach on occupational radiation protection in Uranium mining and processing (part of ORP-NORM programme)
• Potential/Emerging issues for uranium producers
• SR on Uranium mining and processing
• Findings of the Survey of Global Uranium Mining and Processing Occupational Doses
The IAEA, Uranium and Safety

• IAEA has 171 Member States
• Its scope and focus is therefore international (standards applicable to all facilities & activities)
• Major focus area is on radiation protection
• Its main focus is on assisting regulators to implement the requirements of the International BSS (GSR Part 3) with guidance GSG-7
• More than 40 years of experience in applying international radiation safety regulations at uranium mines worldwide
  o Radiation protection and safety regulations are among the most comprehensive and stringent in many uranium producing countries
• There is still scope to enhance protection of occupationally exposed workers
  • in terms of improving mechanisms to reduce occupational exposure,
  • achieving informed personal behaviours,
  • applying best engineering controls and other aspects.
The IAEA, Uranium and Safety

• Voluntarily adopt the most recent international recommendations on dose limits and necessary occupational radiation protection requirements before they become part of the regulations
• Consideration needs to be given to enhancing radiation protection of workers on an *industry-wide and global basis*
• Implementation of internationally consist standards and approaches regarding the protection of workers requires *stakeholder involvement*
• Over the last 15 years IAEA has developed numerous publications related to NORM, including uranium mining and processing
Uranium Exploration and Mining Activities

- Exploration for uranium ores has been carried out in almost every country in the world over the past 60 years.
  - *The combination of experienced uranium mining operators and regulators are limited to a few well developed countries.*
  - Recent activities have focused on numerous countries outside the major uranium producer regions.
- **Numerous Member State regulators particularly in Africa request IAEA assistance**
  - Both operators and regulators are involved in drafting IAEA publications (including Safety Standards), most of the experts are from the major uranium producing countries (e.g. Australia, Canada, USA, Kazakhstan)
  - In the area of uranium mining operators play a major role in drafting publications
  - The Safety Reports and TECDOCS publications are geared to providing both junior operators and regulators with the information to ensure “good practices in operation and regulation”.
Issues and Observations in Emerging Uranium Producers (including newcomers)

- Lack of experience, resources and independence
- Lack of understanding of the graded approach to regulation (control, monitor, record for OE)
- Complain that there are too many publications
- Often remark that Agency publications are complex and dense

What do they want from the SR?

- Simple, clear guidance,
- Cover all types of operations,
- Lifecycle approach,
- Examples, flowcharts and checklists (details in the appendices)
- Examples of simpler alternatives to “state of the art” solutions implemented in the major uranium producing countries
Hierarchy of the Safety Standards

Safety Standards

Safety Fundamentals (Principles)

Safety Requirements – GSR and SSR

Safety Guides – GSG and SSG

Safety Reports

TECDOCs

Supporting publications

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

**IAEA guidance**
- Oil and gas industry – Safety Report No. 34, 2003
- Zircon and zirconia industries – No. 51, 2006
- Rare earths industry – No. 68, 2011
- Titanium Dioxide and Related Industries - No. 76, 2012
- Phosphate industry – No. 78, 2013
- Uranium mining & processing, Coal and Coal Ash industry – advanced stage of publication.
- NORM IV – NORM VIII Symposia – IAEA Proceedings series
- Training course series No. 40 – Oil and gas industries
- Training course
SAFETY REPORTS SERIES
No: 100

Occupational Radiation Protection in the Mining and Processing of Uranium

Please note: This is a final draft version made available as an advance publishing copy for reference only. This version may contain errors and is not an official publication of the IAEA.

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Safety Report on ORP in Uranium in the Mining and Processing of Uranium (SR-100)

Objectives

– Detailed information to assist regulatory bodies and industry operators in implementing a graded approach to the protection of workers against exposures associated with the uranium mining and processing

– Basis for creating a common understanding, based on common knowledge, between the various stakeholders — such as regulators, operators, workers and their representatives, and health, safety and environmental professionals

Scope

– Various methods of production used by the uranium industry and provides practical information on the radiological risks to workers
  • Exploration,
  • Mining and processing of uranium,
  • Exposure assessment,
  • Management of exposure based on the application of the appropriate standards and good working practices.

– Information has been compiled from published literature, from unpublished data provided by contributors to the report and from numerous experts with extensive experience, notably in the various sectors of the uranium mining and processing industry.
Safety Report on ORP in Uranium in the Mining and Processing of Uranium (SR-100)

- **Introduction**
  - Background, Objective, Scope and Structure

- **Overview of the U-Industry and General Radiation Protection Aspects**
  - World Uranium Production, Worldwide Occupational exposure, Uranium mining and processing stages & techniques
  - Exploration, Underground mines, Surface mines, In-situ leaching mines & processing, Heap recovery, Processing, Non-conventional uranium extraction, Tailing facilities, transport and decommissioning

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**Average dose (mSv) with respect to different types of mining and processing**
Safety Report

- General Radiation Protection Considerations in Uranium Mining and Processing
  - Application of the International Standards, Scope of Regulation, Basic radiation protection principles, Graded approach, Specific aspects of radionuclides in the uranium series

- General Methodology for Control
  - Occupational Health and Safety considerations, Hierarchy of control, RP principles, exposure pathways (exposure to gamma, inhalation of radon and progeny, inhalation of LLRD, ingestion, injection, absorption
Safety Report

• Monitoring and dose assessment
  – Requirements, General dose considerations, gamma, surface monitoring, radon and thoron, progeny detectors, measurement methods, LLRD monitoring, internal dosimetry

• Radiation Protection Programs
  – Exploration, Underground mines, Surface mines, In-situ leaching mines & processing, Heap recovery, Processing, Non-conventional uranium extraction, High Grade ore mining and processing, tailing facilities, transport and decommissioning
  – Process description, design and operation, principle exposure pathways, control mechanisms, monitoring and dose assessment
Safety Report

• Annexes
  – Survey of UMEX
  – External exposure to Gamma
  – Radon and radon progeny
  – Inhalation of LLRD
  – Surface contamination
  – Ingestion, wound contamination and absorption

  – In the process for publication (SR-100)
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
Training package based on SR-100

- This is a framed course with the Safety Report on ORP in the Mining and Processing of Uranium (SR-100)
- Totally 8 modules including 11 case studies (22 lectures)
- Typical Agenda for 5-days course is prepared and agreed (based on durations) and alternative agenda is available to accommodate the priority areas of the host (in case of a national event) or regional event (major practices)
New ORPNET & Newsletter

- Web-based network with an ultimate goal to promote optimization of the ORP since 2010
- Worldwide comprehensive knowledge / information exchange,
- Global, regional and national networks (targeted to systems for radiation protection of workers)

https://nucleus.iaea.org/sites/orpnet/home/SitePages/Home.aspx

Registration:
https://mailchi.mp/8dc89d5e14d3/orpnet
Webinars in ORP

Webinars in occupational radiation protection

Participate in our free webinars on occupational radiation protection topics and take the opportunity to learn from the world's leading experts.

What is a webinar?
A webinar is a live interactive webinar transmitted over the web, allowing for remote attendance by many participants using their own computer or mobile devices. In addition to the listening and viewing of the presentation, participants have the opportunity to submit their questions or comments in real-time.

Recordings are available after every broadcast.

Who may attend?
The target audience includes practitioners in national or local governments, healthcare, or industry professionals, and all others who are interested in the topic.

How to attend?
Click on an upcoming webinar for more information and a registration link. See guidelines on how to join webinars.

- **3 September 2019**
  ORRMS: Means to Assess the Occupational Radiation Protection Programme in Your Country

- **18 June 2019**
  The role of industry in policy and decision-making related to Naturally occurring radioactive material (NORM) – a practical perspective

- **12 February 2019**
  Realistic dose assessment in industrial activities involving NORM

- **27 November 2018**
  Development of a regulatory framework for Naturally occurring radioactive material – experience of the United States

[https://www.iaea.org/topics/radiation-safety/webinars](https://www.iaea.org/topics/radiation-safety/webinars)
The role of industry in policy and decision making related to Naturally occurring radioactive material (NORM) – a practical perspective

About the webinar

With awareness of naturally occurring radionuclides and radiation levels increasing, more attention is being paid to the safe management of NORM and the protection of workers. Many countries are in the process of strengthening their regulations.

The IAEA General Safety Requirements: Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards (GSR Part 3) establishes requirements for industrial operations involving NORM under planned and existing exposure situations. Regulatory bodies and operators must ensure radiation safety, and industries must devote resources to control actual radiation risks.

Related resources

- Presentation: The role of industry in NORM policy and decision making – a practical perspective
- The Ninth International Symposium on NORM (NORM IX)
Thank you!

IAEA ORPNET: https://nucleus.iaea.org/sites/orpnet/home/SitePages/Home.aspx
IAEA ORPAS: https://gnssn.iaea.org/main/ORPAS/SitePages/Home.aspx
IAEA ORP Webinars: https://www.iaea.org/topics/radiation-safety/webinars