IAEA
International Atomic Energy Agency
*Atoms for Peace and Development*

# IAEA TRAINING COURSE ON OCCUPATIONAL RADIATION PROTECTION IN THE MINING AND PROCESSING OF URANIUM

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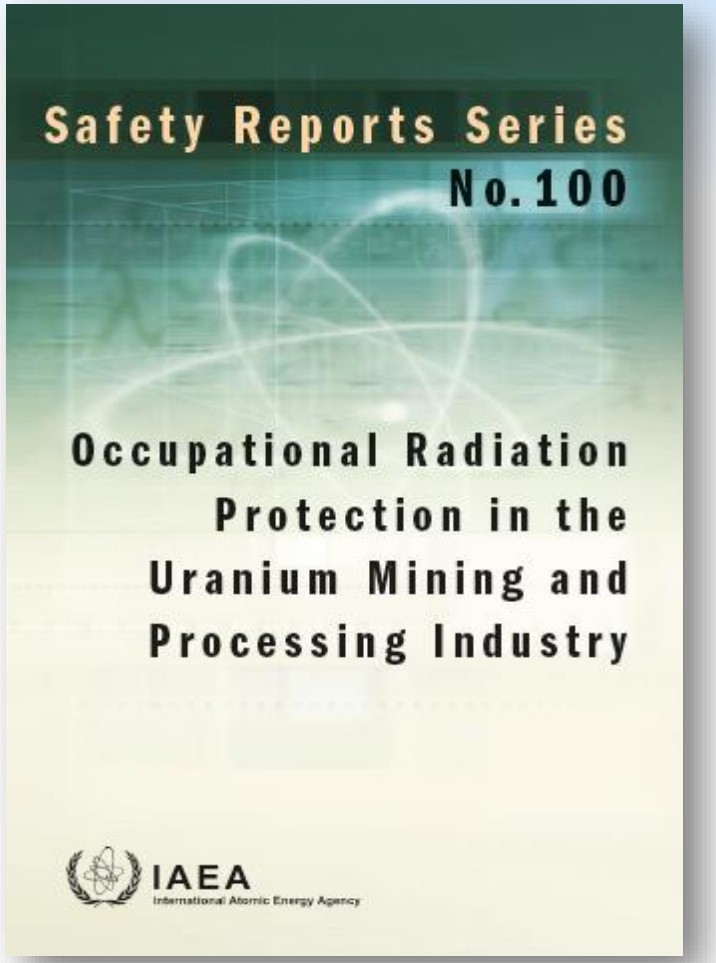
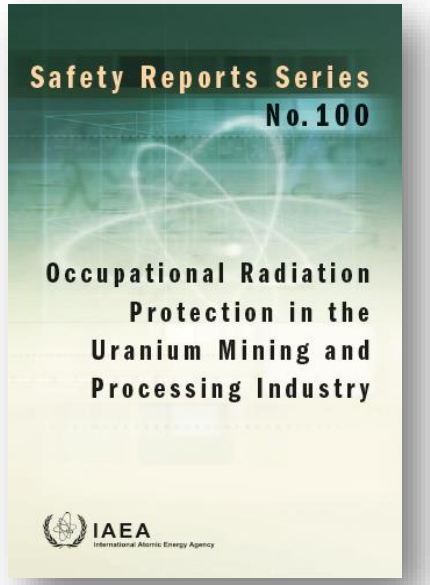



https://www.iaea.org/publications/13401/occupational-radiation-protection-in-the-uranium-mining-and-processing-industry

# Scope (Structure)

- This is a framed course with the Safety Report on ORP in the Mining and Processing of Uranium **(SR-100)**
- Introduces;
  - General industry information (uranium mining & processing)
  - Radiation Protection Management
  - Monitoring & Dose Assessment
  - Specific pathways
    - Gamma
    - Radon and radon progeny
    - Long lived radioactive dust (LLRD)
    - Surface contamination
    - Ingestion, wound contamination and absorption

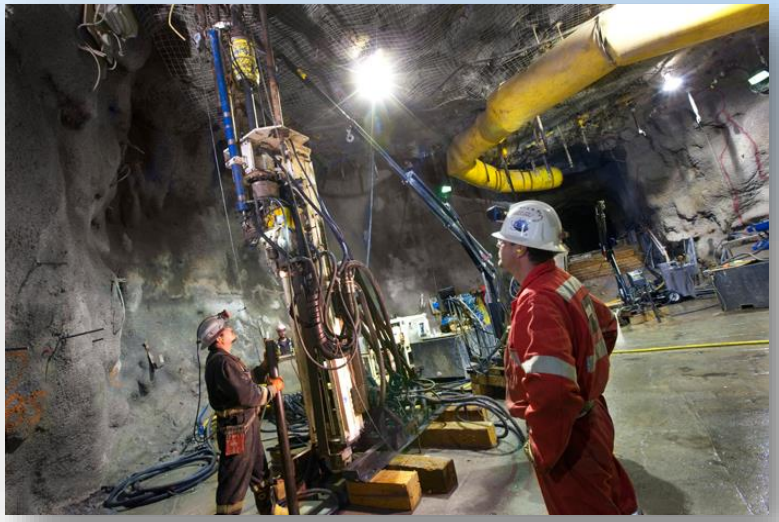


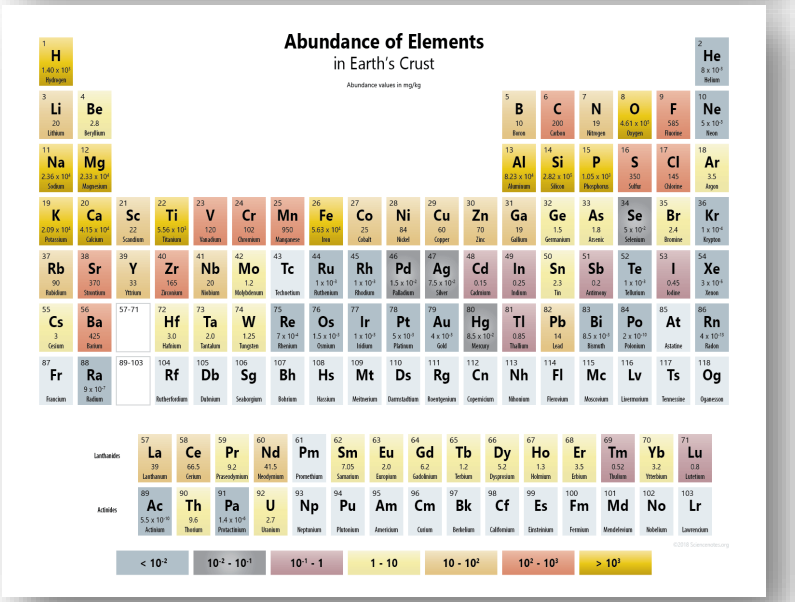
# Scope

- Case studies
  - Exploration
  - Underground mining
  - Surface mining
  - In-Situ Leach (ISL) mining
  - Heap Leaching
  - Processing
  - Non-conventional uranium extraction
  - High grade ore mining and processing
  - Uranium Tailings facilities
  - Transport
  - Decommissioning

# Background

- In the last **60 years** uranium has become the world's most important nuclear fuels.
- Uranium is mined and concentrated in a similar manner to many other metals.
- It is more <u>abundant</u> than gold, silver or mercury, has about the same abundance as tin and is slightly less abundant than cobalt, lead or molybdenum.
- <u>Natural uranium is the dominant fuel for global nuclear power programmes.</u>





# Background

- Conventional mines (underground or open pit mines) are usually associated with a **mill** where the ore is crushed, ground and then leached to dissolve the uranium and separate it from the host ore.
- At the mill of a conventional mine or the treatment plant of an ISL operation, the uranium which is now in solution is then separated by ion exchange before being precipitated, dried and packed.
- The product, uranium oxide concentrates are also referred to as yellowcake and mixed uranium oxides (either $U_3O_8$ and/or $UO_4$).

# Background

- Uranium can be recovered as a **by-product** from phosphate fertilizer production and **from the mining of other minerals** including copper and gold when the ores contain economically exploitable quantities of uranium. In such situations, the treatment process to recover uranium may be more complex.
- During uranium mining and processing, workers may be **exposed externally** to gamma rays emitted from the ores, process materials, products and tailings, and **internally** exposed from the inhalation of long lived radioactive dust (LLRD), radon and radon decay products (RDP), and through ingestion, wound contamination and absorption of contamination.
- Depending on the mineralogy of the ore, various processes including either sulphuric acid or alkaline (carbonate) leach are employed to liberate the uranium from the host ore.

# Objectives

- The objective is to provide detailed information that will **assist regulatory bodies and industry operators** in implementing a graded approach to the protection of workers against exposures associated with uranium mining and processing.

- **Main goal is**
- **To create a common understanding** between various stakeholders (e.g. regulators; operators; workers; their representatives; and health, safety and environmental professionals) of the radiological aspects of the various processes

# References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*Thank you!*