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Summary of the Working Group on AI for Radiation Protection

WG Coordinators

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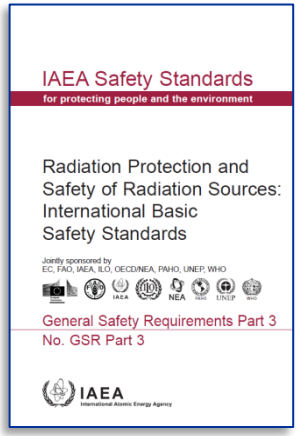
Technical Meeting on Artificial Intelligence for Nuclear Technology and Applications
#AI4Atoms Virtual Event
25–29 October 2021

Generic processes in NSRW

- Safety standards and supporting guidelines
- Other publications (safety reports, TECDOCs)
- Technical meetings and expert groups
- Promotion of safety standards through Technical Cooperation projects
- Webinars and self-education material

International Basic Safety 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

Safety Standards & Supporting Guidelines

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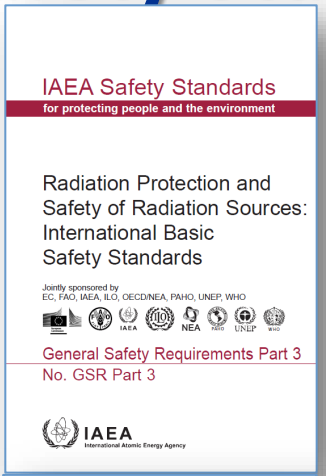
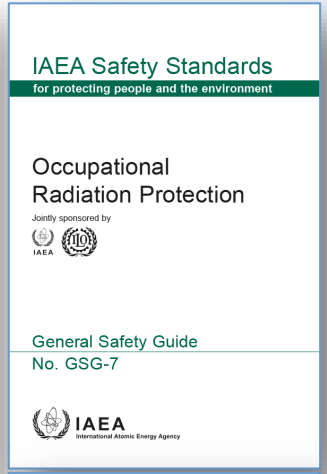
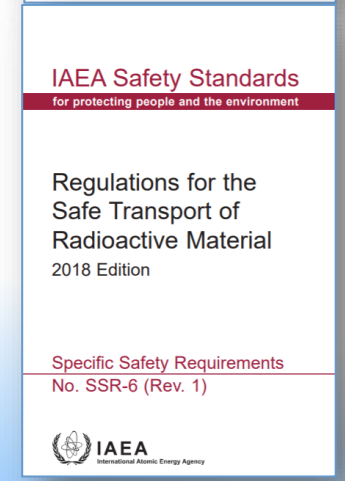
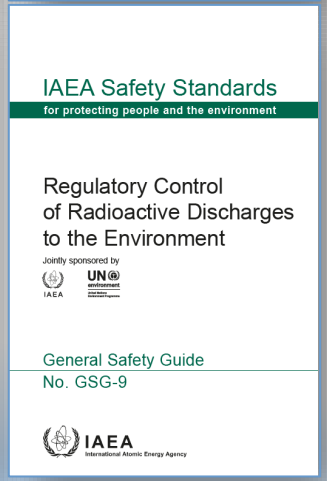
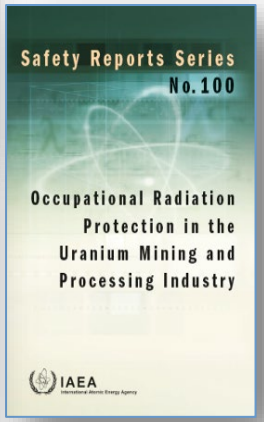
Motivation/Application

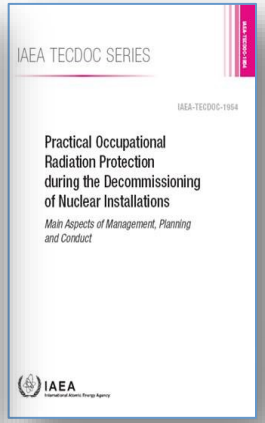


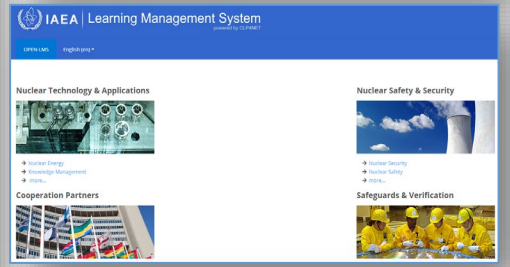


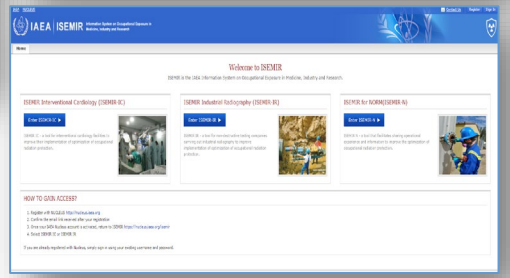












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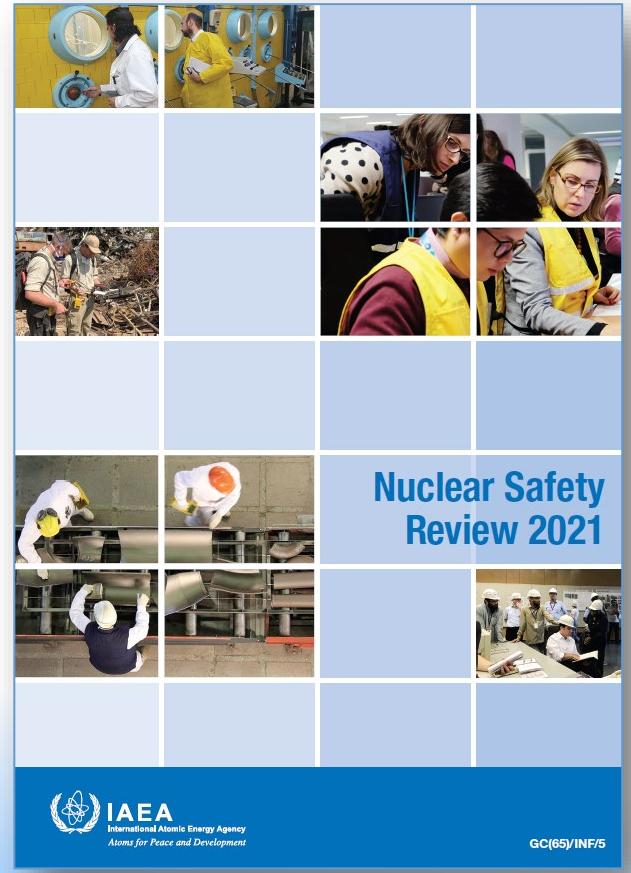


TRENDS

Radiation Protection of Patients, Workers and the Public

There is a ...

- Greater awareness of the importance of justification of medical exposure, optimization of radiation protection, and safety of associated exposures to protect patients from risks related to ionizing radiation;
- Growing awareness among Member States of the effects of exposure to radon in homes and workplaces.

Need for ...

- Agency support to Member States with little experience in regulating the management of residues containing NORM in establishing regulatory and safety infrastructure;
- Revised guidance regarding the application of regulatory flexibility in exemption and clearance.

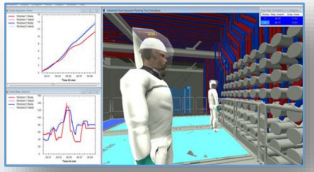
Related Activities

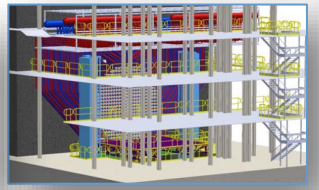
37. The Agency will assist Member States in the application of the Agency's safety standards, in particular the International Basic Safety Standards (GSR Part 3), in radiation protection of people and the environment for applications such as energy production, research, and medical and industrial uses of radionuclides. The Agency is planning to undertake the following activities:

- Provide assistance to the OSPAR Commission for the Protection of the Marine Environment of the North-East Atlantic on a methodology for deriving environmental assessment criteria for radioactive substances in the marine environment for the OSPAR maritime area and adapt it for the Baltic Marine Environment Protection Commission;
- Continue providing guidance and support to Member States in radiation protection of patients, workers and the public through capacity building activities and the development of computer-based guidance and webinars. This will be a priority for the Agency;
- Continue to support Member States in the field of occupational radiation protection with specific focus on innovative new tools and techniques (e.g. artificial intelligence and virtual reality) for utilization in workplaces for the radiation protection of workers and work planning.
- Based on the experience gained with the Information System on Uranium Mining Exposures, extend the Information System on Occupational Exposure in Medicine, Industry and Research; and
- Hold a Technical Meeting of the Regulatory Forum for Safety of Uranium Production and Naturally Occurring Radioactive Materials.

AI in the field of RP (ML &VR)

- Online dosimetry
- Computer simulations including work simulations
- Processes including radiation exposure with algorithms
- Health and safety in workplaces
- Radiological data across machines
- Radiation protection programmes
- Optimization
- Planning and training
- Instrumentation
- Robotics
- Narrowing the scope (!)





WG Programme

- **Personal Online Dosimetry Using Computational Methods**
  Filip Vanhavere (Belgium)
- **Use of AI, Digitalisation and Robotics in Radiation Protection**
  István Szőke (Norway)
- **ADEPT- Innovative Tool to Reduce Worker Exposure**
  Yury Verzilov (Canada)
- **AI-based Radiation Detection for Safe Nuclear Transport**
  Thomas Chen (United States of America)

Driving Qs / Focus for the WGRP

- How adequate is AI for Radiation Protection of workers, members of the public and environmental protection ?
- What AI applications already exist? What should be expected in the next years?
- When is its use recommended? (under which conditions)
- What could be the best approach to reflect in the Safety Standards? (Integration by the NSRW)

Applications /Experience

- Online dosimetry application based on the use of modern technology such as personal tracking systems
- Innovative new tools and techniques for utilization in workplaces, direct impact on RP of workers (work planning, training)
  - State- of- the-art applications in visualization of work environments to provide planning options for optimization (not only reducing the worker's dose) and evaluation of the impact of working in different configurations and scenarios with associated training

Experience with Challenges

- Development of AI& VR applications for simulation/job planning in regards of dose calculations for workers (verification)
- Monte Carlo simulations in low doses and applications in internal dose distribution
- Dose optimization during design of facilities and activities including nuclear facilities (to comply with regulatory requirements)
- Use of data mining and Al to create algorithms for predicting radiological accidents
- Low dose dosimetry

Outcomes

- The computing industry is amongst the fastest growing industries and AI is undoubtedly the future
- Use of computational methods (both chemo- and bio-informatics) for analysing large data sets is nothing new and the large number of software available (tool for radiation biology)
- Innovative technologies and tools in instrumentation, computing and information technology (Workplaces)
- Multiple applications of nuclear technology in medicine, electricity production, agriculture, and industry
- Tool to enhance radiation protection
- Complex algorithms and software to emulate human cognition in the analysis, interpretation and comprehension of complicated work processes including radiation exposure
- Technological transformation: to gather and analyse radiological data across machines, enabling faster, more flexible, and more efficient processes for the establishment of radiation protection programmes

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Thank you!

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