European Joint Programme
on Radioactive Waste Management

MOBILITY MISSION REPORT

This work has been partially supported by the EURAD project that has received funding from H2020-EURATOM 1.2 under grant agreement ID 847593.

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MISSION TITLE

International Radiological Protection School (IRPS) 2023

DESCRIPTION

Concerned organisations

- OECD Nuclear Energy Agency (NEA)
- Stockholm University
- Swedish Radiation Safety Authority
- VTT Technical Research Centre of Finland Ltd

Concerned infrastructures or facilities

- Laboratory and other facilities from Stockholm University

Concerned phases

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Themes and topics

- Theme 1: Managing implementation and oversight of a radioactive waste management programme
  - Programme planning
- Theme 2: Radioactive waste characterisation, processing and storage (Pre-disposal activities), and source term understanding for disposal
  - Waste handling, characterisation, treatment and packaging
  - Interim storage
  - Transportation between facilities
- Theme 5: Geological disposal facility design and the practicalities of construction, operations and closure
  - Health and safety during transport, construction, operations and closure
- Theme 6: Siting and Licensing
  - Detailed site investigation
  - Licensing

Keywords

radiological protection; decommissioning; clearance; remediation; health risks.

EXECUTIVE SUMMARY

The International Radiological Protection School (IRPS) was organized by the OECD Nuclear Energy Agency (NEA) in co-operation with the Swedish Radiation Safety Authority (SSM) and the Centre for Radiation Protection Research (CRPR) of Stockholm University. The School was held in Stockholm between 14th to 18th August, 2023. It provided a clear understanding of the radiological protection system, its history and development.The programme, held over five days, consisted of professional presentations, illustrative case studies and discussion sessions, in which e.g., current challenges of the radiological protection, remediation of a contaminated environment, environmental monitoring strategies, emergency and recovery management and site release were discussed. The programme also had one practical exercise in observing cell chromosomal damage in the laboratory of Stockholm University.

The key topics of the IRPS were the foundation of the international radiological protection framework, building a system of protection around exposure situations and categories of exposure, evolving issues related to, e.g., ethics, radiological protection of the environment, stakeholder involvement and public communication, and state of the art of the radiological protection underlying science. The learning objectives of the IRPS included understanding how and why the radiological protection system has evolved to take into account the scientific evidence and the lessons learnt from its application, and understanding how the system is incorporated into the national regulatory frameworks, and how its application varies in the international context.

Moreover, it also included putting the radiological protection system into the context of radiological protection culture, and illustrating leadership skills through presentations and case studies. Evaluation and discussing how the radiological protection system could evolve and stay at the state of the art, as well as developing a network of radiological protection excellence among participants from various fields were also the learning objectives of the IRPS. The IRPS was excellently organized and gave participants lots of opportunities to learn, think, discuss, and network over the radiological protection frame.

1. MISSION BACKGROUND

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1.1. R&D background

Over many decades experts in both national and international fora have worked towards establishing the international radiological protection system. The principles of this system have largely been accepted worldwide and they have served as a basis for national regulations and guidelines. However, deeper knowledge on the radiological system, its history and nuances has not been well documented and needs to be understood to apply the system to future´s situations. The OECD NEA decided to establish this International Radiological Protection School (IRPS) to provide a clear understanding of the system and how it is intended to be interpreted. The first school was held in 2018. The experts who contributed to the radiological protection system provide a historical overview of how and why the system evolved and what it is intended to mean.

1.2. Mission objectives

I applied for this IRPS to understand the basis of the recommendations and regulations, to gain competencies on radiation protection, to learn how to involve stakeholders in decision making, to familiarize myself with the international radiological protection system, and to know how optimisation in various situations can be conducted. I performed this mission to gain more knowledge on radiation protection in various different topics, such as nuclear decommissioning and emergency situations. Moreover, I wanted to understand the applications of this radiological protection framework on radioactive waste management, nuclear safeguards, and nuclear waste disposal solutions.

1.3. Mission request

I applied for financial support to participate in the International Radiological Protection School (IRPS), which took place from 14th to 18th August, 2023, Sweden.

1.4. Mission composition

Host organisation

OECD Nuclear Energy Agency (NEA)

Host facility

Stockholm University

Mission dates

August 14th – 18th 2023

2. MAJOR PRACTICES, TECHNIQUES, METHODS, TOOLS OR SYSTEMS OPERATED OR STUDIED

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2.1. Practice, technique, method, tool or system operated or studied during the mission

Case studies related to relevant topics of each day´s lectures

Description

There were four different case studies in the IRPS: 1) managing public and occupational exposure to radon, 2) decommissioning, clearance and site release, with a focus on radiological protection of the environment, 3) clinical accident and biological dosimetry and 4) emergency and recovery management. Each case study was discussed in a small group for over an hour. Each group concluded their solutions to the issues and some groups were invited to present their results. The conclusions were discussed together with lectures and all the participants.

Usage

In one of the case studies, groups had to determine if there were potential risks to the biota from a land contamination of a nuclear research facility and how identify solutions to dispose the contaminated material. The groups had to consider wider risks related to decommissioning, clean-up, remediation, and radiation safety of workers and public. Discussing possible solutions together improves cooperation and creates links between the lectures and practical applications.

Benefits

The case studies were beneficial for the participants to think together how to solve issues and focus on the relevant information. They had to also think the consequences of their solutions and consider other opinions from other groups.

Limitations

Case studies are usually simplified examples of real-world situations, thus not providing all the information related to the situation. There were enough time to discuss the issues presented, yet participants should have studied the topics and familiarized themselves with the relevant materials beforehand. There was not enough time to go through all the materials provided.

Applicability

Case studies can be used to simplify problems and direct scientists to focus on key elements of the case or certain topic. They can be used in radiological protection training in VTT, Finland.

2.2. Practice, technique, method, tool or system operated or studied during the mission

A self-assessment quiz at the end of the International Radiological Protection School

Description

Poll Everywhere -mobile application was used to create a short multiple-choice quiz to provide participants with a self-assessment of their learning progress.

Usage

The self-assessment quiz was used on the last day of the IRPS to assess the knowledge of the participants. The results of the test were anonymous and the answers were explained.

Benefits

The self-assessment quiz was a great way to involve participants to a joint activity. The questions also raised questions, which were discussed together.

Limitations

The self-assessment quiz does not replace a conventional exam. However, a quiz can involve challenging questions, where specified knowledge is needed.

Applicability

Quizzes can be used to easily test the knowledge of the participants. They can be used various trainings in VTT, Finland.

2.3. Practice, technique, method, tool or system operated or studied during the mission

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Description

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Usage

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Benefits

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Limitations

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Applicability

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2.4. Practice, technique, method, tool or system operated or studied during the mission

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Description

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Usage

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Benefits

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Limitations

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Applicability

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3. MISSION FINDINGS AND CONCLUSIONS

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3.1. Lessons learned and conclusions

The International Radiological Protection School (IRPS) at Stockholm University provided participants the key aspects of the international radiological protection system in relation to regulation and practice. Introduction to justification, optimisation, dose limitation and related dose criteria formed the base on which lectures on ethics, public exposure to radon, radiological protection constraints and reference levels were built. Topics on health risk estimates, dose criteria, the use and limitations of the effective dose as well as the development of the radiological protection system since ICRP Publication 103 were highly relevant to the case study 2 on decommissioning, clearance and site release, with a focus on radiological protection of the environment.

Furthermore, the IRPS provided lectures on decommissioning and waste management from the radiological protection perspective, radiological characterisation and environmental monitoring strategies, overview of occupational radiological protection at a nuclear power plant, risk communications and the importance of stakeholder involvement among other topics.

Each day was concluded with a case study, which presented a simplified example of a practical challenge related to the topic of that day. The case studies varied from managing radon exposure, disposing radioactively contaminated soil, to clinical accident and biological dosimetry, and nuclear emergency and recovery management. Case studies were discussed in small groups and the findings were concluded together with the class.

The key lessons learned from the IRPS 2023 was the understanding of the term "radiological protection system" and how it affects NEA, IAEA, national legislations and regulations, and also any research related to nuclear and radiological protection. The IRPS also emphasized that radiological protection is always a sum of multiple decisions from various expertise and constraints, such as time, resources, knowledge and stakeholders.

3.2. Relevant findings and conclusions for home organisation

The International Radiological Protection School provided my home organisation, VTT, critical knowledge and competencies on radiation protection, recommendations, stakeholder involvement and application of dose limits under different circumstances. These topics are relevant when, e.g., a nuclear research reactor is decommissioned, radioactive waste is handled and transported and when nuclear safeguards procedures and industrial risk assessments are considered.

Understanding the international radiological protection system is highly relevant when research is being conducted with international partners and partnerships are created. As VTT is taking part in multiple EU-level programmes and international organizations, it can benefit from the IRPS network of future radiological protection leaders and use the knowledge gathered from the IRPS to train scientists on radiological protection issues. Furthermore, it can encourage its employees and partners to participate in the coming IRPS to gain knowledge on certain relevant topics.

The topics and relevant issues presented in the IRPS provide interesting pathways to conduct research and contribute to the international scientific community though VTT.

3.3. Relevant findings and conclusions for host organisation

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3.4. Relevant findings and conclusions for other organisations

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4. POTENTIALS FOR IMPROVEMENT OR DEVELOPMENT

4.1. Generic potentials

4.2. Potentials for home organisation

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4.3. Potentials for host organisation

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APPENDICES

Mission journal

13th August: Arriving to Stockholm and registration at the Stockholm University. Networking with participants and discussing with one lecturer, professor Kathryn A. Higley, on radiochemistry.

14th August: The programme began with welcoming words from NEA, SSM and Stockholm University. General NEA -presentation was followed by by the essentials of the international radiological protection framework. Practical application of justification, optimisation, dose limitation and dose criteria was given. Lecture on ethics and moderated discussion with regulators were in the afternoon. First case study covered different aspects of radon exposure and minimizing it.

15th August: Lectures on radiological protection constraints and reference levels, areas of significant evolution since ICRP Publication 103 and health risk estimates, dose criteria and the use and limitations of the effective dose were provided. Radiological protection of the environment, decommissioning and waste management from an radiological protection perspective, and post accident food safety management were taught. After roundtable with ICRP, EC, IAEA, NCRP and NEA, the second case study was launched. Its topic was decommissioning, clearance and site release, with a focus on radiological protection of the environment.

16th August: The day started with practical exercise on observing cell chromosomal damage in the laboratory. This was followed by radiation epidemiology, discussions on low-dose effects on population, UNSCEAR and overview of occupational radiological protection at a nuclear power plant. In the afternoon, social science and sound communication to support radiological protection, and radiological protection in diagnostic and therapeutic healthcare were covered. Third case study covered the 2001 Bialystok accident and biological dosimetry. The day ended with a guided tour to the Vasa Museum and dinner.

17th August: Lectures on radiological characterization and environmental monitoring strategies, the importance of stakeholder involvement, experience from former accidents, and emergency preparedness and response in practice were provided. Lecture on risk communication was followed by the fourth case study. This covered the nuclear emergency and recovery management in practice. After the case study, participants were given time to network and discuss.

18th August: The programme was focused on wrapping up the key lessons learned and providing mini workshops on challenges related to practical issues. Three participants presented their challenges and the solutions were discussed together. Keynote speakers from World Nuclear Association and European Commission had their presentations. Self-assessment quiz was organized well and it brought up fruitful discussions on topics related to the IRPS. The school ended with an open discussion and closing speeches from the organizers. Leaving Stockholm on the same day.

Mission bibliography

MISSION BENEFICIARY

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PARTNER EXPERTS CONTRIBUTING TO THE MISSION

Host organisation experts

- Jacqueline Garnier-Laplace, Deputy Head, Division of Radiological Protection and Human Aspects of Nuclear Safety, Nuclear Energy Agency (NEA)

Home organisation experts

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- Petri Kotiluoto, Vice President, Nuclear Energy, VTT

Other organisations experts

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- Catarina Rydin, Professor of Plant Systematics and Section Dean of Biology, Stockholm University
- Richard Wakeford, Honorary Professor in Epidemiology, University of Manchester
- Kimberly Applegate, retired Professor of Radiology and Paediatrics, University of Kentucky
- Borislava Batandjieva-Metcalf, Secretary of UNSCEAR
- Greg Lamarre, Head Division, Radiological Protection and Human Aspects of Nuclear Safety, Nuclear Energy Agency (NEA)
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- Peter Bryant, Radiation Protection Professional, EDF New Nuclear Build Project, Sizewell C
- Michael Boyed, former Director, Center for Science and Technology, United States Environmental Protection Agency's Office of Radiation and Indoor Air / Radiation Protection Division
- Simon Carroll, Senior Adviser, Vattenfall
- Christopher Clement, Scientific Secretary and Chief Executive Officer, the International Commission of Radiological Protection (ICRP)
- David Copplestone, Professor of Environmental Radioactivity, University of Stirling
- Mark Foy, Chief Executive and Chief Nuclear Inspector, United Kingdom's Office for Nuclear Regulation (ONR)
- Kathryn A. Higley, Professor and former Head of the School of Nuclear Science and Engineering, College of Engineering at Orean State University
- Toshimitsu Homma, Technical Advisor, Nuclear Regulation Authority of Japan (NRA)

- Jie Hou, Regulatory Standard Specialist, Department of Nuclear Safety and Security, International Atomic Energy Agency (IAEA)
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- Nicole Martinez, Associate Professor, Department of Environmental Engineering and Earth Sciences, Clemson University
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- Chris Mogg, Radiological Protection Specialist, OECD Nuclear Energy Agency (NEA)
- Stefan Mundig, Radiation Protection Team Lead, Radiation Protection and Nuclear Safety Policy Unit, European Commission
- Deborah H. Oughton, Professor in Radiochemistry / Environmental Chemistry and Director of the NFR Center of Excellence for Environmental Radioactivity (CERAD), Norwegian University of Life Sciences
- Guy Renn, Radiation Protection Adviser, Sizewell B Power Station
- Thierry Schneider, Director of Nuclear Protection Evaluation Centre (CEPN)
- Ferid Shannoun, Scientific Officer of UNSCEAR
- William Small, Jr, Professor and Chair of the Department of Radiation Oncology and Director of the Cardinal Bernardin Cancer Center, Stritch School of Medicine, Loyola University Chicago
- Noboru Takamura, Professor, Department of Global Health, Medicine and Welfare of the Atomic Bomb Disease Institute, Nagasaki University
- Jack Valentin, Independent Radiological Protection Consultant
- Rumina Velshi, President and Chief Executive Officer, CNSC
- Andrzej Wojcik, Head of the Centre for Radiation Protection Research, Department of Molecular Biosciences, the Wenner Gren Institute, Stockholm University

REPORT APPROVAL

Date	Beneficiary	Home mentor/supervisor	Host mentor/supervisor
Date of last signee 12 Sep 2023	Jenna Järvenpää	Anna Korpinen	Jacqueline Garnier-Laplace
	Visa	Visa	Visa