Information System on Occupational Exposure

Expert Group Report: Occupational Radiation Protection in Severe Accident Management

Ellen P. Anderson
Expert Group Chairperson

Senior Project Manager,
Radiation Safety & Environmental Protection
Nuclear Energy Institute, USA

International Conference on Occupational Radiation Protection: Enhancing the Protection of Workers – Gaps, Challenges and Developments
December 2014, Vienna / Austria

ISOE Programme

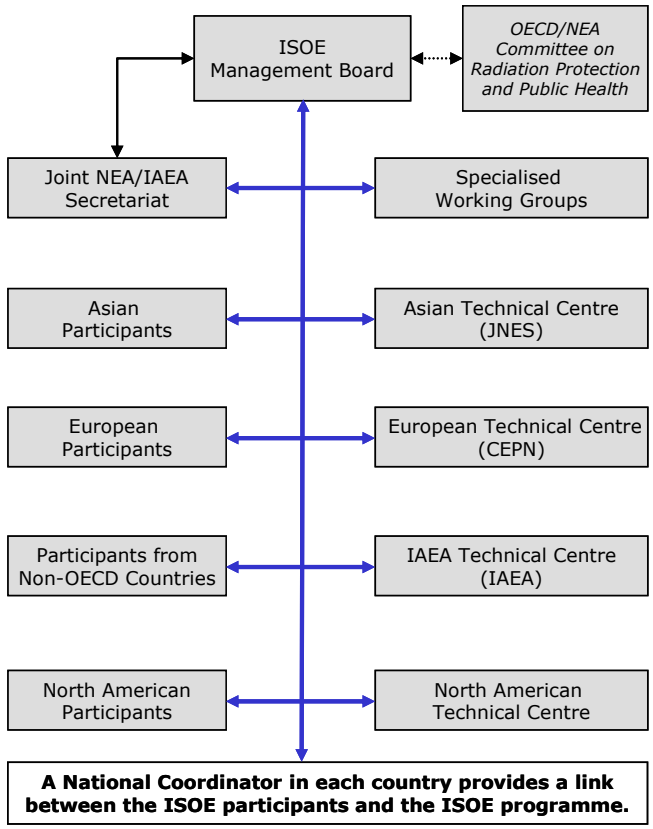
- Created in 1992 by OECD/NEA as a forum for RP experts from utilities and regulatory authorities world-wide to share amongst participants dose reduction information & coordinate projects to improve optimisation of worker radiological protection at NPPs
  - *Promoted and sponsored by NEA and IAEA*

"... the exchange and analysis of information on collective radiation doses to the personnel of nuclear installations and to the employees of contractors, as well as on dose-reduction techniques, is essential to implement effective dose-control programmes and to apply the ALARA principle..."

(ISOE Terms and Conditions, 2012-2015)

ISOE facilitates occupational exposure management at NPPs through the operation of a system for exchanging, storing, and analysing operational information and experience on optimising occupational radiological protection in response to user needs:

- World's largest occupational exposure database for commercial NPPs
- An information exchange programme for sharing dose reduction information and experience
- Four ISOE technical centres support local members (Asia, Europe, North America and IAEA)



Database

TCs leads
NEA IT

WGDA

- Task Team on Decommissioning
- Expert Group on Water Chemistry and Source-Term Management
- Expert Group on ORP in Severe Accident Management EG-SAM

Network

ETC leads

Main communication platform

- RP Library
- Experience reports
- RP Management
- Plant information
- RP Forum

- Each group has specific mandate
- Product oriented
- Time limited

ISOE Products

ISOE Databases

https://www.oecd-nea.org/isoeweb/login.html?cameFrom=%2Fisoeweb%2Findex.html

Technical Support

Annual and Topical Reports

ISOE

INFORMATION SYSTEM ON OCCUPATIONAL EXPOSURE

Technical Analyses

ISOE ALARA Symposia

ISOE Network

http://www.isoe-network.net/

EG-SAM Background

- April 2011: ISOE Bureau launched early response to the Fukushima NPP accident, including
  - management of high radiation area worker doses from previous nuclear power plant accidents
  - effective use of personal protective equipment (PPE) and high-radiation area worker dosimetry for different types of emergency and high-radiation work situations.
- May 2011: ISOE Management Board established the Expert Group on Occupational Radiation Protection in Severe Accident Management (EG-SAM).

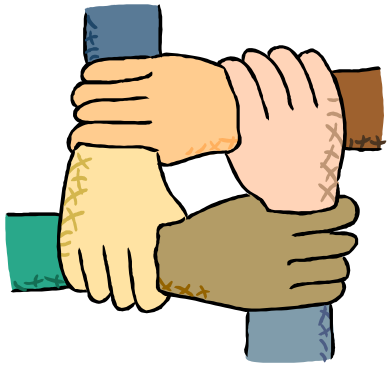
Objectives of EG-SAM

- Contribute to occupational exposure management by providing a view on management of high radiation area worker doses;
- Develop a state-of-the-art ISOE report on best radiation protection management practices for proper radiation protection job coverage during a severe accident; and
- Identify RP lessons learned from previous reactor accidents

Membership: 45 delegates from 19 ISOE Countries

Representatives from:

- Armenia
- Belgium
- Brazil
- Canada
- Czech Republic
- Finland
- France
- Germany
- Japan



- Republic of Korea
- Romania
- Russian Federation
- Slovak Republic
- Spain
- Sweden
- Switzerland
- Ukraine
- United Kingdom
- United States of America
- ISOE Joint Secretariat

Report Topics

- **RP Management and Organisation**

  Emergency Response Plans, Command Facilities, Response Organisation,

  Decision making and Prerequisites for On-site Radiation Protection Decisions

- **RP Training and Exercises related to Severe Accident Management**

  Preparedness program activities, development of training instructions, Types, Qualification, RP aspects for SAM, and Management of the Administrative Aspects

- **Facility Configuration and Readiness**

  Design features, Portable ER requirement and supplies

- **Overall Approach for Worker Protection**

  Reference levels, Protective measures, Planning, Permits and Execution and Control, Exposure control, non-radiological health aspects and health surveillance

- **Monitoring and Managing the Radioactive Releases and Contamination**

  Radiological releases (gaseous, liquid), on-site and off-site contamination monitoring, management of contamination

- **Key Lessons Learned from Past Accidents**

  Chernobyl, Three Mile Island-2 and Fukushima

International Workshop

- 66 participants from 17 countries
- Four plenary session and five break-out sessions were organized to capture global *(ICRP, IAEA, USNRC, CNSC),* utility *(TEPCO, Electrabel, EDF, Exelon)* and regulatory authority *(CNSC, ASN, USNRC, KINS, STUK)* perspectives.
- The workshop provided suggestions for improvement and some additional points to extend the view of interim report.

EG-SAM perspective

- EG-SAM classification for emergency workers /responders with two groups:
  - The first group comprises **personnel forming the special technical, medical and health intervention teams readied in advance to deal with radiological emergency situations** (for example: firemen from public services with specific skills in radiological interventions, workers from the plant, etc.)
  - The second group comprises **persons not belonging to special teams but intervening as part of the tasks within the scope of their competence** (for example: firemen from public services, experts in the field of measurements, medical assistance, etc.).

Report Conclusions

- Extensive ERPs should be developed for protecting emergency workers/responders and the public.
  - These plans should thoroughly address emergency worker/responder staffing, command and control, emergency facility design, emergency response procedures, enhanced radiological controls including dose reference levels and instrumentation, on-site decision making, emergency worker/responder training and communications.
- The development of anticipatory training related to severe accident management is imperative for all emergency workers/responders.
  - This includes development of a SAM training and qualification program that addresses emergency worker/responder actions within elevated radiation fields and response during stressful situations.
  - Emergency drills and exercises should be routinely conducted to evaluate emergency worker/responder performance.
  - These activities should be critiqued, and if applicable, lessons learned incorporated into training programmes, procedures and guidelines, as well as organizational aspects of accident management.

Country Specific Reference Levels

Country	Reference Levels	Life Saving Actions
Belgium	50 - 250 mSv	250 mSv (incl. prevent catastrophic evolution)
Brazil	100 mSv	Consider the thresholds related to the deterministic effects.
Canada	500 mSv	
Czech Republic	100 mSv	200 mSv
Finland	500 mSv	
France	Group 1: 100 mSv during the time of their missions. Group 2: 10 mSv	Group 1: up to 300 mSv for protecting people. Group 1 & 2: exceeding reference values can be accepted for saving human lives.
Germany	100 mSv	> 250 mSv
Japan	100 mSv	
Pakistan	100 mSv	500 mSv
Republic of Korea	< 500 mSv	
Slovak Republic	100 mSv	500 mSv
Spain	Group 1: 500 mSv Group 2: 50 mSv	> 500 mSv
USA	100 mSv	250 mSv

Report Conclusions

- Effective implementation of a RP programme during a severe accident may be significantly impacted by the plant's facility configuration and access controls.
  - Properly designed and operated habitability controls such as facility shielding and filtered ventilation systems, effective communications systems, installed radiation monitoring instrumentation, portable radiation detection equipment, radiochemical analytical laboratory capability for high activity samples, and a variety of worker PPE are essential for response to a severe accident.
- RP of the emergency worker/responder, including the establishment of individual exposure reference levels, extensive work controls, and thorough radiological exposure controls are necessary to maintain emergency worker/ responder radiation exposures ALARA.
  - State-of-the-art radiation detection equipment must be properly used to effectively detect external and internal exposure to emergency workers/responders.

Report Conclusions

- During the emergency and post-accident mitigation phases, radioactive and contaminated materials released internally and externally from the affected facility require extensive radiological controls to avoid or minimize radiation exposures to emergency workers/responders and the public. Radioactive releases must be monitored and controlled within the plant and offsite using robust monitoring equipment and engineering controls as necessary.

- The lessons learned from past accidents such as TMI, Chernobyl and Fukushima Daiichi *(annex in the report)* teach us that comprehensive emergency plan development, routine training and exercising (including stressful, time-limited activities) of emergency all workers/responders, remote radiological monitoring, high dose detection equipment and robotic equipment are imperative when responding to a severe accident at a nuclear power plant. Continuing the collection and analysis of feedback experience from the past accidents is an essential source of improvement of the preparedness of severe accident management.

Thank you for your attention

Ellen P. Anderson
Nuclear Energy Institute
1201 F Street, N.W., Suite 1100,
Washington, DC, 20004 USA
Tel: +1 (202) 739-8043
Fax: +1 (202) 533 0144
E-mail: exa@nei.org

More information @

http://www.oecd-nea.org/jointproj/isoe.html
http://www.isoe-network.net