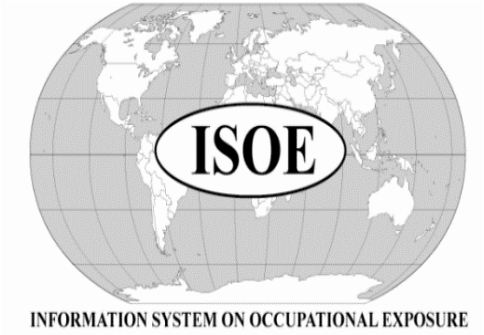

ISOE Working Group on Radiological Protection Aspects of Decommissioning Activities at Nuclear Power Plants (WGDECOM) – Outcomes and feedback

Gilles RANCHOUX, WGDECOM Chair

Laure-Anne BELTRAMI, WGDECOM Vice-Chair

on behalf of WGDECOM

Background and objectives of WGDECOM

- Decommissioning of NPPs is a subject of growing importance for the nuclear industry and meets some economical, technical and organizational challenges
- WGDECOM was created in 2014 and had its kick-off meeting in 2015
- Initial membership (2015): 30 members from 13 countries from NPPs in decommissioning or in preparation for decommissioning
- Objective : improve sharing of operational RP data and experience collected through benchmarking visits (1 to 2 per year) in NPPs under decommissioning
- Topics of interest :
  - Areas of RP most relevant for management of occupational exposure
  - Collection of operational data
  - Create a **network** of operational RP experts for decommissioning activities
  - Factors and aspects that play key roles in achieving good RP practices in decommissioning

WGDECOM current membership (2022)

Chair : Gilles RANCHOUX - EDF/DP2D – France

Vice-Chair : Laure-Anne BELTRAMI – CEPN (ETC) - France

20 members

Belgium ENGIE Electrabel

Brazil Angra NPP

France ASN
IRSN
CEPN (ETC)
EDF/DP2D

Germany GRS

Italy SOGIN

Korea KHNP

Russia Rosenergoatom

Spain CSN

Sweden SSM
Vattenfall
Ringhals NPP Vattenfall

Switzerland Mühleberg NPP

USA University of Illinois (NATC)
Kewaunee Nuclear Station

WGDECOM Outcomes and Feedback

PoW for 2020-2023. Key activities.

- Conduct Technical visits to decommissioning sites
- Maintain networking of WGDECOM experts
- Exchange Information between ISOE members
- Explore possibility to create decommissioning exposure DB
- Develop new service – Technical Support Missions
- Cooperate with Research Reactors in decommissioning
- Collect radiological Operating Experience
- Cooperate with international bodies
- Provide radiological expertise for NEA Publications

WGDECOM Outcomes and Feedback

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Technical benchmarking visits onsite

- Prior to each technical visit, preparation of questions to be asked to the site in decommissioning
- Several technical visits ;
  - **USA** : Zion (decommissioning completed) and Kewaunee (safe storage – Dormancy period until 2069) NPPs
  - **Sweden** : Barsebäck (pre-decommissioning phase : defueled characterization)
  - **Spain** : Jose Cabrera (decommissioning completed)
  - **Switzerland** : Mühleberg (preparation to decommissioning)
  - **France** : Bugey 1 (decommissioning in progress)
  - **USA** : San Onofre (preparation to decommissioning)
- Due to the Covid-19 pandemic: no technical visit in 2020 and 2021
- 1 physical meeting planned in 2022 at GRS in Cologne (Germany) but no visit onsite
- Possibly to organize a technical benchmarking visit in 2023

WGDECOM Outcomes and Feedback

Topics addressed during benchmarking visits

- Regulatory context and strategy of decommissioning
- Collective doses analyses for high doses works
- Management of risk of internal exposure
- Radioactive waste management
- Integrated risk management

WGDECOM Outcomes and Feedback

Technical benchmarking visits onsite

SONGS
May 2019

WGDECOM Outcomes and Feedback

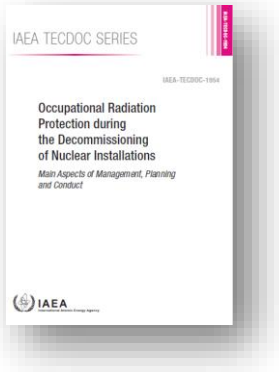
Technical benchmarking visits onsite

SONGS
May 2019

WGDECOM Outcomes and Feedback

Meetings with technical topics

- Example of the latest meeting in November 2021
- Technical topics addressed :



a. Overview of IAEA-TECDOC-1954 (April 2021) *"Occupational Radiation Protection during the Decommissioning of Nuclear Installations";*

b. Case studies on the ALARA decommissioning challenges and progress at San Onofre Nuclear Generation Station (SONGS) (USA).

c. Use of monetary value of person.Sv in decommissioning

- 1 general presentation from L. Vaillant (CEPN – ETC) on the determination method of the "alpha value".
- 5 presentations: Feedback and opinion from Belgium, France, Spain, Sweden and USA.
- General discussion

Meetings with technical topics

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Available online at:
www.radioprotection.org

The values and the uses of the reference monetary value of the man.sievert. Results of an international survey

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Abstract – For complex radiation protection project, decision-aiding techniques, such as Cost-Benefit Analysis can be used. In 1973, the International Commission on Radiological Protection introduced the "reference monetary value of the man.sievert" to convert the benefit of a radiation protection option (averted exposure) in monetary term for comparison with it is cost. In 2017, an international survey has collected the reference monetary values of nuclear utilities and regulatory authorities. This article presents the data collected and analyzes them. Over the 220 reactors who answered, 176 (80%) are using the concept, expressing its longevity and relevance for optimization purposes. The utilities can use single value or set of reference values varying with the level of exposure. This survey also highlights the emergence of mixed and flexible systems. The collected values are largely spread (ratio 1:10 at least) and this is the opportunity to discuss the influence of the method used to calculate the reference value and notably the related concept of the Value of a human Statistical Life (VSL).

Keywords: reference monetary value of the man.sievert / ALARA / Cost-Benefit Analysis (CBA) / Value of a human Statistical Life (VSL)

Data collection – Benchmarking template

➡ Establishment of a benchmarking template to collect data

- Station description and status
- D&D Scenario used
- RP Staffing Description
- Duties assigned to your R/P Organisation before definitive shutdown
- Site Characterization
- ALARA Goals
- Rad Material Shipping and Handling
- RP Performance Indicators
- Waste management
- Personnel Contamination Events
- Dry Fuel Storage
- Equipment Disposal Options Used
- RP Training Strategies Changes through D&D phases
- Buildings Dormancy Strategy
- Alpha Monitoring/Dosimetry
- Emergency Preparedness
- Environment Monitoring
- Equipment kept running at Safe Storage for use further at Dismantling Phase
- Chemistry Control Operating Experience
- License Termination/Transfer Scenario
- Contractor Supervision /Training Strategy
- Radiological Control Area
- Doses Monitoring/Control changes through D&D Timeline

Decom Database Subgroup Progress

- 5 meetings (teleconferences) from March 17th to now.
- *Update of the data collection template to integrate better adapted dose data labels (estimated, measured, for different tasks, …);*
- *Template sent to members on 24th September;*
- *Current status: Filled templates received from*
  - *Germany (Stade, Gudremmingen);*
  - *Italy (Caorso, Latina, Trino Vercellese, Garigliano);*
  - *Spain (Jose Cabrera);*
  - *Russia (Novovoronezh);*
  - *USA (Kewaunee)*
- *Dose Database for comparison is not relevant because data is:*
  - *Not sufficiently available;*
  - *Not comparable;*
  - *Not unique / not unambiguous.*

Dose Estimation
Estimated Collective Dose for Decommissioning in total (planned)
Cumulated Collective Dose during Decommissioning (measured)
Target-Actual Comparison (for the ongoing project)
Notable Aspects/Reasons/Findings for Deltas from Target-Actual Comparison
Job Related Exposure (planned or measured) e. g.
Plant Modification
Fuel Pond
Ventilation
Water
Civil Engineering
Operation Service
Fire Protection
Drain System
Reuse of Areas with other Purpose (i.e.Turbine hall)
New Installation
Ventilation
Water
Civil Engineering
Waste (Material) Treatment / Conditioning / Packing Center
Specific Dismantling Equipment (Cutting/decontamination(mechanical or chemical) facilities)
Maintenance
Instrumentation
Electric, Mechanic
Surveillance
Radiation Protection
Security
Fire protection
Industrial Safety
Dismantling Preparatory Work
Characterisation
Decontamination
Equipment Preparation

Operating Experience Collection

- First draft of an OE collection procedure presented to members during the 11th WGDECOM meeting for comments and discussion:
  - *WGDECOM opinion: Procedure ready to be engaged in 2022.*
- Next steps :
  - *Communicate the OE collection procedure to decommissioning operators: 12/2021;*
  - *Start OE collection in 2022;*
  - *First synthesis to be presented at the next WGDECOM meeting: 12/2022.*

Example of event description

Event	*Unplanned dose to contractor worker during dismantling of SG*
Year	*2019*
Description	*Worker was exposed to high dose rate from activated particles during vacuuming contamination at the working area*
Radiological consequences	*Maximum dose rate received by the worker was 33.4 rem/h*
Cause(s) of the event	*Use of improper tools and equipment*
Human failure	*Lack of procedural adherence*

Example of summary table for radiological events in the year 2017

№	Event	Causes
1	EXPOSURE OF WORKER TO HIGH DOSE RATE FROM ACTIVATED PARTICLES DURING VACUUMING CONTAMINATION AT THE WORKING AREA	Use of improper tools and equipment Lack of procedural adherence
2	INTERNAL CONTAMINATION OF SEVERAL WORKERS DURING THE REMOVAL OF A THERMAL SLEEVE ON THE VESSEL HEAD	Personnel work practices Questioning attitude RP culture
3	RADIOACTIVE CONTAMINATION OF THE ROAD DURING TRANSPORTATION OF CASKS WITH RADIOACTIVE SLUDGE	Self-verification practice Training of contractors Supervision and control
4	HEAVY WATER LEAKAGE TO THE CONTANIMENT AND ENVIRONMENT DUE TO AN OPERATOR ERROR	Verification/self-verification practices Questioning attitude
5	ENVIRONMENTAL AND TRANSPORT CONTAMINATION FROM HEAT EXCHANGER ELBOW	Installation workmanship Engineering of modification Procedure use
6	UNPLANNED DOSE TO WORKER DUE TO DEBRIS FOUND ON TUBE PLATFORM FLOOR	Poor root cause investigation Organizational failure Lack of design ownership

WGDECOM Outcomes and Feedback

Thank you for your attention !

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