



**Conclusions from the  
ISOE International Symposium  
Brussels, 1 – 3 June 2016**

## Radiation Protection Success of Steam Generator Replacement in Blayais unit 3 (2014)

*J. Bonnefon, G. Ranchoux, O. Backes (EDF DIPDE, France), B. Roustit, H. Caullier (Blayais NPP, France), J. Sergeat, K. Hamon, D. Marié (AREVA NP, France)*



## ALARA Program and RP Activities for the Reactor Vessel Head Replacement at CN Vandellòs II

*A. Prim Pujals, J. L. Sarria Gálvez, I. Vildósola Hernandez, A. Ribas Goset (Vandellòs II NPP, Spain)*



## The Way to Optimize Radiation Exposure Index at the Russian Nuclear Power Plants

*I. Doljenkov (Rosenergoatom, Russia), A. Kuchin (Kola NPP, Russia)*



## Lessons Learned from the Failure of Leak Monitoring System of Steam Generator

Moonhyung Cho, Kidoo Kang, Yuho Weon

*Central Research Institute, Korea Hydro & Nuclear Power*



## 138 Participants 24 Countries

- *Armenia*
- *Austria*
- *Belgium*
- *Brazil*
- *Canada*
- *China*
- *Czech Republic*
- *Finland*
- *France*
- *Germany*
- *Hungary*
- *Japan*
- *Republic of Korea*
- *Romania*
- *Russian Federation*
- *Slovak Republic*
- *Slovenia*
- *South Korea*
- *Spain*
- *Sweden*
- *Switzerland*
- *The Netherlands*
- *UK*
- *Ukraine*
- *USA*



- **7 Themes**
  - ISOE System
  - Follow-up of Fukushima Accident
  - Source Term Management
  - Measurement
  - Decontamination
  - Large Job Experience
  - Education and Training
  - Radiation Protection Management
  - Decommissioning
- **34 Oral Presentations, 25 Posters**
  - Soon available on the ISOE-network website
- **10 Vendors**



## Session 1.

- **ISOE System: an active and enthusiastic information exchange network.**
  - 2016-2019 Strategic Plan focus on new topics
    - Refurbishment and plant life extension
    - Education and training
    - Collection of lessons learned from events
  - Major role of ISOE at different levels:
    - Contribution to International organisation providing recommendations and expert view (NEA CRPPH)
    - Contribution at a utility level of a plant
  
- **Follow-up of Fukushima Accident**
  - Major improvement of working conditions were made with the re-zoning of the site, which was possible after the major decontamination



## Session 2. Source Term Management

- Role of **indexes / indicators** (RCS index, RB index, CZT gamma spectrometry,...)
- Use of **new technologies** (in situ gamma spectrometry, CZT gamma camera) to improve measurements, follow-up of source term activity
- Development of **strategies** adapted to the type of circuits: shieldings / chemical decontamination/ hot spot elimination/
- Emerging issues : **Ag-110m or SB-124**
  - Source and cause of pollution?
  - Indicators?
  - Treatment ?
- Proposal to create a **source term reduction indicator** shared at the international level



## Session 3. Measurements

- Promising R&D in progress for the development of **Neutron detector**
- Exploration of the possibilities offered by the use of **Gamma camera**
  - Work area characterization, Emergency, Fuel evacuation,...
- Use of **in-situ gamma spectrometry**
- **Air sampling systems**, with a focus on PSA
- Methodology to **reduce the number of radionuclides** to be taken into account at design stage of systems or buildings



## Session 4. Decontamination

### – System Decontamination for BWRs (Spain & Sweden)

- Collective dose reduction obtained
- R&D analysis to elaborate relevant surface treatment allowing to reduce recontamination
- Issue of alpha active nuclides released from oxide layers
  - Knowledge of plant history important to estimate risk

### – Analysis of the impact of the CANDU Purification System:

- Based on the inventory of radionuclides present in the resins and filters



## Session 5. Large Job Experiences

- **Steam Generator Replacement – Reactor vessel head replacement**
  - Several RP Actions : shielding – decontamination – hot spot management – water level – cold shutdown procedure,...
  - Role of planning stage to identify main ALARA actions but also necessary to plan the follow-up & implement a specific organisation to ensure implementation of these actions.
  - Role of ALARA WG, ALARA teams integrated to the projects
    - collaboration of all SHs focussing on the same radiation protection objectives.
  - Difficulties to predict the exposed man-hours (overestimation)
  - Issue of Transport and Storage
- **Development of Integrated Drain Information System to find easily a leak at a NPP**



## Session 6. Education and Training

### – European Guidance for RPO & RPE

- A necessary harmonization – specially for transient workers
- Need for mutual recognition of RPO

### – Ageing – Safety Authority Brazil

- Anticipation; training various forms; importance of continuing education

### – Integration of human factors within the design of a training tool

- Integration of ergonomic criteria to go from a training tool to a whole training package

### – Importance of RP Planning in education & training

- Use of scenarios, places the person in a realistic work situation.



## Session 7. RP management

- **"Simplification" – workers, RP staff -**
  - Tools (Radiobox, distribution of radioactive sources,...), Documents, Procedures (road map)
- **Demonstrating ALARA from the point of view of Authorities**
  - An interesting list of ALARA criteria
- **Illustrations of "Work Management to reduce occupational exposure"**
  - Comprehensive set of actions and dose reduction Measures in Russian NPP – Organization, Technologies, Decontamination,
  - Nearly 10 years of dose reduction programme in CANDU, Plant radiological condition (reducing leaks, use of dryers, personal protective equipments, ...)
- **Site under construction : issue of managing radiographic control**
  - Need for a clear delineation of responsibilities, a coordination between all stakeholders, a precised planning and organisation



## Session 8. Decommissioning

### – ISOE WG on Decommissioning

- Creating a dedicated network under ISOE headings, Benchmarking visits, lessons learned

### – Lessons learned from three Decom Projects

- A waste producing operation, Not planned at the design, Loss of knowledge, One shot operation, also non radiological risks,...
- Development of a Global Safety Culture

### – Decommissioning of Spent Fuel Channel

- Use of remote handling, shielded boxes

### – Jose Cabrera

- Full System Chemical Decontamination
- Status of work





**Next ISOE symposia**

# **ASIAN REGIONAL ISOE SYMPOSIUM**

**Fukushima, Japan**

**7 – 9 September 2016**

**Organised by the Asian Technical Center**





**Next ISOE symposia**

**INTERNATIONAL ISOE SYMPOSIUM  
ISOE 25<sup>th</sup> Anniversary**

**Fort Lauderdale, USA**

**9 – 11 January 2017**

**Organised by the North American Technical  
Center**





**All information on:**

**[WWW.ISOE-NETWORK.NET](http://WWW.ISOE-NETWORK.NET)**

***Do not hesitate to ask for your password to  
access the ISOE members areas***



# ISOE INTERNATIONAL SYMPOSIUM

June 1-2, 2016 • Brussels

## CONGRESS DINNER

Thursday 2 June – 19h00

sponsored by ENGIE Electrabel at Hotel Metropole

Address: 31, place de Brouckère - 1000 Brussels

Metro:

'de Brouckère' Station

Do not forget your badge !!





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## SCK•CEN TECHNICAL VISIT

### Friday 3 June

- Underground research facility | HADES
- Radiobiology and Dosimetry labs

**08:30 Bus Departure ("Mont des Arts – Kunstberg"  
street left side of Square)**

**Do not forget to bring your ID / passport**

- Programme Committee Members
- Speakers and Authors of Posters
- Exhibitors
- Sponsors:
  - ENGIE Electrabel
  - FANC/AFCN
- Organisation staff:
  - CEPN: Lucie d'Ascenzo, Laure-Anne Beltrami
  - ENGIE Electrabel: Benoit Lance & colleagues
  - FANC/AFCN: François Henry
  - Square Team
- All Participants





**We are looking forward already to seeing you**

**at the next European ISOE Symposium**

**to be held in 2018**