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Welcome from Tae-Won Hwang, ISOE Chair, Republic of Korea

2016 has been a very busy year for ISOE members. The ISOE Terms and Conditions are now extended for the next 4 years, until 31 December 2019, and the Strategic Programme Plan for the same period was issued in March. The North American, European, and Asian Technical Centres conducted valuable ALARA Symposia in January, June and September, respectively. We are now preparing for the 25th ISOE Anniversary celebration to be held from 9 to 11 January 2017 in Ft. Lauderdale, Florida, USA. I am looking forward to seeing you there. Please feel free to provide your country coordinator, ISOE Technical Centre or me any suggestions for the global ISOE information exchange programme committed to reducing occupational exposure at nuclear power stations.

2016 ISOE International Symposium – Brussels

The 2016 ISOE International Symposium was held in Brussels, Belgium, on 1 - 3 June 2016.

It was organised by the ISOE European Technical Centre, in collaboration with and the support of ENGIE Electrabel and the Federal Agency for Nuclear Control (FANC). The Symposium was co-sponsored by the OECD Nuclear Energy Agency (NEA) and the International Atomic Energy Agency (IAEA).

Around 140 participants from 24 countries attended the Symposium. The accompanying Technical Exhibition with 10 Vendors gave participants the opportunity to see the latest developments from industrial and commercial companies active in fields of radiation protection.

Through 34 oral presentations and 25 posters, the following topics were covered:

- ISOE System
- Follow-up of Fukushima Accident
- Source Term Management
- Measurement
- Decontamination
- Large Job Experience
- Education and Training
- Radiation Protection Management
- Decommissioning

Four distinguished presentations were selected by the programme committee:

- 1. Radiation Protection Success of Steam Generator Replacement in Blayais unit 3 (2014)**
By 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)

The SGR in BLAYAIS unit 3, scheduled in July 2014, was the 27th of the French fleet, and the 21th of the CPY fleet. The oral presentation showed the specific ALARA organisation as well as the main radiation protection actions adopted to reduce the source term and optimise the radiation protection

of the operation, including the transport and storage of the old steam generator. The methodology adopted by the dedicated ALARA Working Group (gathering representatives from EDF Study / EDF Power Plant / Subcontractor) to define practical ways to reduce the collective and individual dose based on the following actions:

- Calculation of the accumulated forecast dose for the implementation, made using the estimated time for each individual task and the workplace local dose rate,
- Control of the radiological level of sources: precautions during the shutdown phase, purification of the primary circuit, resin changes and filtrations to minimize dose rates,
- Setting up biological shielding management process,
- Water level management of the loops,
- Chemical decontamination of primary pipe ends,
- Awareness on the radiological protection of staff,
- Other good radiation protection practices.

The resulting SGR collective dose (455 man.mSv) in Blayais unit 3 is the new world record for 3-loop SGR.

2. ALARA Programme and RP Activities for the Reactor Vessel Head Replacement at CN Vandellòs II

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

The reactor vessel head replacement of Vandellòs II NPP took place in 2015. This oral presentation highlighted the RP programme adopted to reduce exposure for the whole maintenance operation, including the transport and storage of the old vessel head. The main activities with significant dose impact were the following: removal of the un-welded elements of the former head, transportation of the old vessel head to the Spent Fuel Building through outdoor areas, cutting the control rod drive mechanisms (CRDM) to be reused, and a second transport to the disposal building. The ALARA plan and specific RP procedures were issued. Optimization practices were implemented, among which were the use of shielding and remote dosimetry. The work associated with the design modification lasted ten months, with a total operational collective dose of 120.4 man.mSv.

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

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

This oral presentation showed the main actions implemented to reduce occupational exposures in Russian NPPs from 2010 to 2015 as well as the action plan for the years 2015 to 2019.

The main measures undertaken can be classified in three fields:

- Organisational: Setting a control level for individual doses at 18 mSv/year, optimization of the outage time, development of a Dose Risk Management software ARMIR, programmes of dose exposure optimisation, setting dose budget for specific work, EPD threshold assignment at the minimally sufficient level for the work execution.
- Improvement of radiation conditions: Usage of protective screens; high pressure decontamination; modernization of the equipment.
- Reduction of the exposure time: use of remote supervision systems, video-endoscopes, manipulators, simulation stands, quick-detachable heat insulation.

For the future, the action plan will continue with a focus on reducing exposures in RBMK NPPs, as this type of plant presents the highest individual and collective doses of the Russian Fleet.

4. Lessons Learned from the Failure of Leak Monitoring System of Steam Generator

By Moonhyung Cho, Kidoo Kang, Yuho Weon (Central Research Institute, Korea Hydro & Nuclear Power, South Korea)

This poster presented the issue of improper calibration of Steam Generator Leakage Monitors. These monitors are used to detect leakage from primary to secondary cooling systems by measuring 6.13MeV gamma rays emitted from N-16. A Cm-244/C-13 sealed radioactive source,

which emits gamma rays of 6.13MeV, is used to calibrate the N-16 Channels. The Steam Generator Leakage Monitors use a scale factor to convert count rates of the N-16 channel to leak rate. In October 2014, approximately 20 l/hr of leakage of the primary to secondary cooling system took place at Hanbit Unit 3. However, all of the N-16 monitors didn't work properly during the leakage, while other monitors except those worked well. Therefore, its root cause was analysed and proper actions were taken to prevent the recurrence of the same events. The main cause of the event was found to be an improper calibration procedure regarding N-16 monitors and the failure of a temperature sensor of a detector. The normal N-16 channel range is from 4.5MeV to 7.5MeV, but the spectrum was shifted so that it could not detect 6.13 MeV gamma rays. Korea Hydro and Nuclear Power Central Research Institute (abbreviated KHNP-CRI) analysed the cause of the spectrum shift and revised the calibration procedure. It was confirmed that all Steam Generator monitors in domestic nuclear power plants work properly by recalibration in accordance with the revised calibration procedure, and their reliability was shown by inter-comparison tests.

Specific Meetings on 31 May 2016

- Radiation Protection Managers Meeting

This meeting, organised and chaired by Benoit Lance from ENGIE Electrabel, gathered 18 participants. Several practical topics were discussed, such as:

- Research to improve reactor cavity decontamination
- RP planning processes and implementation of ALARA approach
- Lessons learned from RP events,
- Management of alpha risk.

A specific discussion was organised on the issue of preparedness for accident management from the RP point of view, including a presentation of the "Nuclear Logistic Support Cell" created at the corporate level of ENGIE Electrabel and a visit to the support trailer.



Photo #1: Attendees of the 2016 International ISOE ALARA Symposium in Brussels touring the ENGIE Electrabel Emergency Radiological Response Truck



Photo #2: Symposium Dinner, sponsored by ENGIE Electrabel, at the Hotel Metropole

- Regulatory Body Representatives Meeting

This meeting took place in the premises of the Belgium Authority FANC. It was organized and chaired by Swen-Gunnar Jahn (ENSI), ISOE Vice-Chair. It gathered 17 participants from 12 countries. The topic discussed was the legal rules and regulatory requirements regarding determination of eye lens dose and other special types of doses from external exposure, based on the result of a specific survey launched before the meeting among ISOE regulatory bodies.

Proceedings of the Symposium are available on the ISOE Network website with public access. The presentations of the specific meetings are also available, with a restricted access to ISOE utilities (for the RPM Meeting) or ISOE Members (for the Regulatory Body Representative Meeting).

Technical Tour

On 3 June 2016 a technical visit took place at the SCK•CEN Mol. Two guided visits were organised: the underground research facility | HADES and the Radiobiology and Dosimetry laboratories.

2016 ISOE Asian ALARA Symposium: Iwaki, Japan

The 2016 ISOE Asian ALARA Symposium was held from 7 to 9 September 2016 in Iwaki, Fukushima, Japan. The symposium was organized and hosted by the ISOE Asian Technical Centre (ATC) and Nuclear Safety Research Association (NSRA), and co-sponsored by the OECD Nuclear Energy Agency (NEA) and the International Atomic Energy Agency (IAEA).

The symposium itself was held from 7 to 8 September in Iwaki City, Fukushima Prefecture. Then a one-day technical tour to Fukushima Daiichi NPP was conducted for participants on 9 September. The symposium provided a forum in which radiation protection professionals from the nuclear industry and regulatory authorities exchanged practical information and experience on occupational exposure issues in nuclear power plants to further improve radiological protection. The technical tour provided participants with an opportunity to get into the site of the NPP. Five years have already passed since the accident while decontamination and restoration work have been carried out on the

site. The situation of Fukushima Daiichi NPP has dramatically changed, and this tour was a good opportunity for the participants to confirm the latest status of the site.

Two distinguished papers were selected by the Technical Programme Committee:

1. New Radiological Control of Areas in Fukushima Daiichi NPS, by Katsuhiro Yasui, TEPCO Holdings Inc., Japan.
2. Analysis on Occupational Exposure of Radiation Workers in Korea based on KISOE Database (2005-14), by Byeongsoo Kim, Institute of Nuclear Safety, Republic of Korea.

2016 ISOE North American ALARA Symposium: Fort Lauderdale, Florida

The 2016 ISOE North American ALARA Symposium was held on 11 – 13 January 2016 in Fort Lauderdale, Florida, USA. Over 165 individuals attended the symposium, including 30 vendors.

The plenary presentations included the TEPCO invited presentation by Shinichi Kawamura, TEPCO General Manager (former Plant Manager Fukushima Daini Units 1-4) on Fukushima Daiichi recovery successes and future challenges. Safety improvements at Kashiwazaki Kariwa Nuclear Power Plant were also discussed. Professor Tadashi Narabayashi, Hokkaido University, discussed the new Super Engineering training Programme with the University of Illinois/NATC and the AgX hardened filter design and installation at TEPCO units.

Dr. Dennis Chamberland, NASA Nuclear Engineer, presented the latest scientific developments on brain effects of protons and cosmic radiation during space travel to Mars.

The two Distinguished Papers included the paper by Karen McDougall, Section Manager-ALARA, Pickering, OPG, Canada on the Pickering Dynamic Learning video training on RWP knowledge (Karen.mcdougall@opg.com) and the paper by J. Cady from Braidwood NPP on Braidwood 2015 Refuelling Outages ALARA Successes.



Photo #3: Shinichi Kawamura, TEPCO General Manager sharing his experience as Plant Manager, Fukushima Daini during the earthquake and tsunami, at the North American Symposium, Fort Lauderdale, Florida



Photo #4: Five Japanese Super Engineers participating in Hokkaido University/ NATC University of Illinois January 2016 radiological engineering education programme, as introduced at the 2016 ISOE North American ALARA Symposium

RPM Challenges in the Transition from Operations to Decommissioning Plant Status: Radiological Protection Professional of the Year Award from College of Engineering, University of Illinois: Citation Presented by Professor Stubbins, Head NPRE.
Recipient: James Mike Hale, RPM Kewaunee Nuclear Plant, Dominion.



Photo#5: James Mike Hale, RPM Kewaunee, receiving 2015 Radiation Protection Professional of the Year Award. Pictured are left to right David W. Miller, James Mike Hale & Dr. John L. Palms, NATC Honorary Board Chair.

2015 ISOE World Class ALARA Performance Award

Presented to Ginna Nuclear Power Plant, Exelon for Outstanding Refuelling Outage Worker Dose Reduction.

Citation presented by Dr. John M. Palms, Distinguished President Emeritus, University of South Carolina & NATC Honorary Board Chair.

Recipients for the Employees and Contractors at Ginna Nuclear Power Station:
Joseph Pacher, Site Vice President; William Carsky, Plant Manager;
Kenneth Gould, RP Manager; James Bement, Rad Eng Manager;
Christian Singley, Sr. RP ALARA Spec; Lynda Fileppi, Sr. RP ALARA Specialist;
Billie Childers, RP Supervisor; Chan Vasey, RP Supervisor.



Photo #6: Joseph Pacher, Site Vice President, Ginna Nuclear Plant Plant, accepting the 2015 World Class ALARA Performance Award on behalf of the station employees

Future ISOE Meetings:

ISOE WGDECOM

3-6 October 2016, 4th WGDECOM meeting/Benchmarking visit, Sweden

ISOE Working Group on Data Analysis

29 November 2016, OECD, Paris, France

ISOE Bureau

30 November 2016 (am) and 2 December 2016 (pm), OECD, Paris, France

Joint Topical Session on Education and Training

30 November 2016 (pm), OECD, Paris, France

ISOE Management Board

1-2 December 2016 (am), OECD, Paris, France

Upcoming Events

2017 ISOE International Symposium:

25th Anniversary of the ISOE System

Organised by the North-American Technical Centre (NATC)

9-11 January 2017, Fort Lauderdale, USA

Other meetings:

PEP course (Continuing Education Course on CZT Technology) Sunday, 8 January (13:00-17:00)

US Region III/IV and RPM meetings on 12 and 13 January (**free of charge**)

Symposium Registration: <https://my.engr.illinois.edu/alara-2017>

Hotel Reservations: <https://aws.passkey.com/event>

Additional information is available on the ISOE Network website (Symposium > Upcoming).

ISOE Newsletter Staff:

Editor-in-Chief: **Tae-Won Hwang, ISOE Chair, Republic of Korea**

Asian Editor: Tomoyuki Nomura (ATC)

European Editor: Caroline Schieber (ETC)

IAEA Editor: Jizeng Ma (International Atomic Energy Agency, IAEA)

North American Editor: Richard Doty (NATC)

ISOE Joint Secretariat: Aleksandr Rakhuba (OECD/NEA), Jizeng Ma (IAEA)

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