

## ISOE News No.19, July 2012

ISOE Asian, European, North American and IAEA Technical Centres

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### New Expert Group on Occupational Radiation Protection in Severe Accident Management and Post-Accident Recovery is in progress

The 1<sup>st</sup> meeting of the ISOE Expert Group on Occupational Radiation Protection in Severe Accident Management and Post-Accident Recovery (EG-SAM) was held on 18-20 April 2012 at the OECD Conference Centre, Paris / France with the participation of 20 experts from 10 countries. Expert group consists of 44 members from 18 countries (34 members from utilities, 8 members from authorities, 2 non-ISOE members (representative of REAC/TS & RS Company from the US). The meeting was chaired by Mr. W. Mizumachi (JNES, Japan). In the opening ceremony, Mr. U. Yoshimura (NEA Deputy Director, Safety and Regulation) welcomed the Group on behalf of the NEA and thanked for the kind contribution of the ISOE participating utilities and regulatory bodies to the work of the new expert group.



EG-SAM April 2012 meeting, Photo by ATC

### Feedback from ISOE Regional Technical Centres

European Technical Center (ETC) introduced the proposal of the European subgroup of the EG-SAM for the report which was prepared in February 2012 during the Prague meeting. The subgroup proposes to structure the document according to the Radiation Protection Programme elaborated by the IAEA safety guide (*Occupational Radiation Protection RS-G-1.1*) with an objective to develop a report on best radiation protection management procedures for proper radiation protection job coverage during severe accident, initial response and recovery efforts. The proposal was supported by the Expert Group and it was indicated that there is a need to address the current practices from utilities, safety authorities as well as feedback experiences from TMI, Chernobyl and Fukushima accidents.

North-American Technical Center (NATC) provided an update on Fukushima RP technical response of the North American countries, including NATC Board actions and NATC working groups. Working groups are indicated below:

- *Group 1:* Canadian and US RPMs or RP utility experts who volunteered to assist the Asian Technical Center & TEPCO in any way- Chaired by Terry Brown, senior manager at Cook,
- *Group 2:* US RP personnel involved in the cleanup of TMI-2 from 1998 to 1985. Their experience felt to be directly applicable to the Fukushima radiological challenges,
- *Group 3:* Developed North American network to monitor and analyze I-131 across North America and compare results with US EPA and prior 1986 Chernobyl I-131 monitoring program maintained by NATC at University of Illinois.



*Dr. Harold Denton, Special Communicator for TMI 2 Accident with Mr. Mizumach and Roger Shaw, TMI 2 Recovery RP at high water mark for Tsunami at hospital near Sinai. Dr. Denton and Roger Shaw spoke at November 2011 Japan Society of Mechanical Engineers meeting.(Photo by NATC)*

During the presentation, it was indicated that NATC experts are ready to share their experiences in the field of SAM management, exposure control (external and internal), contamination & effluent controls, emergency planning and regulatory considerations. Within this framework, a visit was organized by ATC in collaboration with the NATC in November 2011.

Asian Technical Center (ATC) provided information on the current status of Fukushima NPPs, chronology of the tsunami attack and the ATC views on the conclusions of the IAEA expert group report. The EG-SAM was also informed about the radiological consequences of Fukushima accident including details on dose rate distribution and trends around the site (air dose rate by monitoring posts, radioactive concentration in the dust around plant gates, etc), distribution of external and internal exposure doses of workers and characteristics of high dose detected areas, working environment and activities performed by the operator to improve the conditions and finally, technical information on technology used for dose reduction.

The EG-SAM reviewed the proposals of the TCs and agreed on the content of the report which includes below listed topical issues.

- RP Management and Organisation,
- RP Training and Practices related to Severe Accident Management,
- Facility Configuration and Readiness,
- Worker Protection,
- Radioactive Materials and Contamination Control, and
- Lessons Learned and Example Protection Measures.



*Mr. Mizumachi (EG-SAM Chair) addresses to the group. April 2012 (Photo by NATC)*

By the end of the meeting, all members of the group were invited to contribute the report with their own perspective. The EG-SAM will meet in November 2012, just after the ISOE Management Board meeting.

## **Expert Group on Primary Water Chemistry and Source-Term Management**

Water chemistry, operational procedures and material choice approaches in different design of NPPs vary in results and consequences in terms of radiation protection performance. During the ISOE Management Board meeting in 2010, it was suggested that radiation protection aspects of primary system water chemistry and source-term management could be discussed in detail by the participation of ISOE utilities with an establishment of an expert group. The Expert Group on Water Chemistry and Source-Term Management (EGWC) has been mandated to address the experience of various ISOE utilities with various water chemistry regimes to explore if experience exchange could help to improve radiation protection performances. It was proposed to discuss a few of the most commonly used water chemistry approaches (e.g. zinc injection, pH

control, iron injection, hydrogen water chemistry, operational procedures (shut down and start up operations) and material choices (steam generator tubes, cobalt inventory, surface preconditioning), etc.) to focus the exchange of experience discussions.

The outcome of the work will be a new ISOE publication, which is planned to include information and practical experience available in the nuclear industry on addressing operational aspects of primary water chemistry and source-term management of nuclear reactors with special emphasis on effects on the management of occupational exposures, identification of factors and aspects which play key roles in achieving good practices in water chemistry management and analysis on impact on worker doses and operational costs. Another objective of the work is also to improve radiation protection staff knowledge regarding source-term management. In addition, specific case studies will be included in the document to demonstrate the various approaches used at various utilities to achieve source term and dose rate reduction. While it is recognized that each plant has unique characteristics, it is through these case studies that practical application of these methods will be illustrated.

The EGWC report focuses on three topics dealing with water chemistry, source term management and remediation techniques. In order to address various designs, PWRs, BWRs, PHWRs and VVERs are addressed within the document. Additionally, available information address current operating units and lessons learnt are outlined with choices that have been made for the design of new plants.

The first part of the document addresses current practices regarding primary chemistry management for different design - how to limit activity in the primary circuit and to prevent contamination -. General information is provided regarding activation, corrosion and transport of activated materials in the primary circuit (background on radiation field generation). Primary chemistry aspects that are related to radiation field generation are addressed, such as material issues (steam generator, cobalt inventory, surface preconditioning and fuel support material) and chemical methods (pH control, zinc injection, shut down and start up operations and purification) are also addressed. Specific contaminations with <sup>110</sup>Ag or <sup>124</sup>Sb are also discussed.

The second chapter - monitoring of radiation fields - provides information regarding measurement techniques and mapping strategies (such as EPRI methodology or EDF RCA index) that are used in order to precisely follow radiation field evolution within the RCA and to detect abnormal elevation of dose rate.

Routine measurements within common techniques such as routine dose rate meters are discussed as well as more complex techniques such as CZT detectors or germanium detector. Advantages and disadvantages of both techniques are presented. In the follow up of the document, techniques for full system and component remediation are discussed with quantitative datasets “remediation of contamination”. Finally, experiences of various sites for source terms management are provided, addressing the topics previously discussed in the report in section titled as plant specific results. These will include different applications of the topics presented in this work, including examples of elevated zinc injection programs, use of speciality resins, and removal of cobalt contributing components. For example, a refuel outage was recently completed which included full scale steam generator inspections for less than 300 mSv (30 person-rem) as a result of implementation of practices discussed in this work. The EGWC will meet in October 2012 to finalize the report, which will be submitted for ISOE Management Board approval in November 2012.

RADIATION PROTECTION ASPECTS OF PRIMARY WATER CHEMISTRY AND SOURCE TERM MANAGEMENT				
PART A - STRATEGIES AND TECHNIQUES				
1. BACKGROUND ON RADIATION FIELD GENERATION				
2. MATERIAL ISSUES	PWR	VVER	BWR	PHWR
3. CHEMICAL METHODS				
4. REMEDIATION OF CONTAMINATION DURING OUTAGES				
PART B - RADIATION FIELD MEASUREMENT TECHNIQUES				
1. DOSE RATE MEASUREMENT TECHNIQUES				
2. GERMANIUM DETECTOR				
3. CZT DETECTOR				
PART C - MEASUREMENT LOCATIONS AND INDICES				
1. DOSE RATE MEASUREMENTS	PWR	VVER	BWR	PHWR
2. GAMMA SPECTROMETRY				
PART D - RADIATION PROTECTION OUTCOMES				
PLANT SPECIFIC RESULTS	PWR	VVER	BWR	PHWR

Summary description of the draft report

## Performance Indicators for ISOE Technical Centres

In 2011, the ISOE Bureau decided to initiate a process in establishing Performance Indicators (PIs) for all Technical Centers and the first draft report was evaluated and approved by the Bureau in its April 2012 meeting. The primary objective of this work is to provide a formal mechanism for the Bureau and Management Board to assess TC performance and monitor improvements or degradation in performance in time. The initial PIs were agreed as follows;

- Submittal of data (collection and entry) to the ISOE Database,
- Technical quality and validity of data submitted (ISOE Database Management),
- Contribution to the annual reports,
- ISOE Network Websites Management (e.g. timely input of Technical Centre information for the ISOE Network Website, timely update of information on the ISOE Regional Website, etc.), and
- Other topics (participation to ISOE Bureau, MB and WGDA meetings, working group experts nomination, follow up of expert working group actions, organization of ISOE ALARA Symposia, ISOE organized benchmarking visits, new documents posted, technical and reports produced, information exchange, etc.).

At the beginning of June 2012, all TCS were invited to write their procedures and indicate the completion date for each PI. The consolidated report will be circulated to the ISOE Management Board membership for review by the end of July 2012.

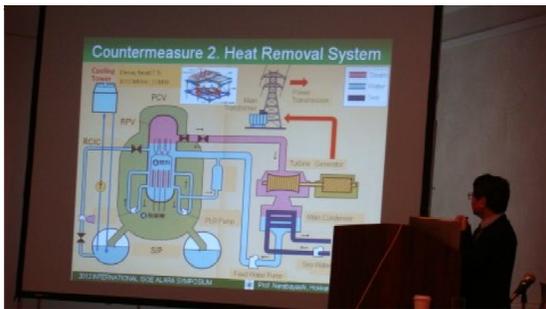
## 2012 International ISOE ALARA Symposium

The 2012 International ISOE ALARA Symposium, organised by the North American Technical Center, was held on January 8-11, 2012 in Fort Lauderdale, Florida. Over 12 countries were represented including Canada, Brazil, Switzerland, France, Sweden, South Africa, Japan, S. Korea, UAE and the US. Attendance achieved 145 utility, regulators and vendors for the international ALARA forum sponsored by the North American Technical Center. Mr. Wataru Mizumachi (JNES, Japan) provided the plenary address on Fukushima Severe Accident Recovery Plans.

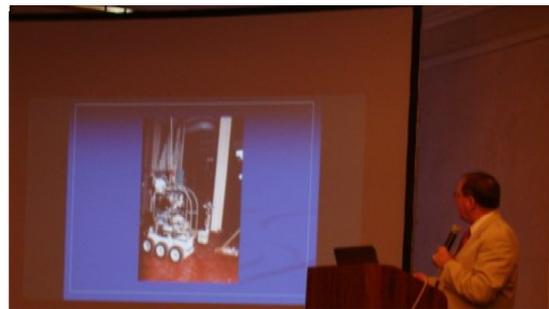
Mr. Terry J. Brown, Cook Engineering Projects Manager provided an insightful presentation on Fukushima Severe Accident - Potential Impacts on North American & European NPPs.

Dr. Tadashi Narabayashi, Prof., Nuclear & Environmental Systems, Hokkaido University, Japan, provided the second plenary address on Lessons of Fukushima-Daiichi NPP Accidents.

Considering TMI-2 Radiological Dose Management Lessons Learned Applicable to Fukushima, the topic was presented by Mr. Roger Shaw, former TMI-2 RP manager.



*Explanation of Fukushima Accident (Photo by NATC)*



*Roger Shaw describes the use of Robots at TMI 2(Photo by NATC)*

## Distinguished Papers of the International Symposium

One of distinguished paper was titled Underwater Diving Remote Monitoring Implementation, presented by Mr, Rick Leasure, Braidwood Radiation Protection Manager of Exelon Nuclear. He presented an overview of industry lessons learn and following corrective actions, training and remote monitoring solutions. Vendor led instructions and mock-up training are also important in the preparation phase.

As a brief summary, excellence in control of underwater activities should be covered by a procedure containing the following aspects;

- Clear roles and responsibilities,
- Constant communication capability between diver, dive supervisor and radiation protection personnel,
- Requirement for physical diver restriction (tether/underwater screen),
- Detailed survey of underwater radiological conditions prior to dive evolution,
- Multiple dosimetry with remote monitoring by radiation protection personnel,
- Underwater survey instrumentation with remote readout to supporting RP personnel for surveying periodically, and
- Clear stop work criteria with all personnel possessing stop work authority.



Marcos Antonio Do Amaral, RPM, Eletrobras – Eletronuclear, presented ALARA program successes and future initiatives at Angra 1 and Angra 2. He received 2012 ISOE distinguished paper award with this presentation. During his presentation, he informed the symposium participants on next steps planned to be realised at Angra as follows;

- Personal Mobile Extension for Use Inside Containment and later in general areas,
- Increase the use of CCTV (40 cameras for Angra2),
- In progress the design modification in Angra1 for setting up a very modern CCTV/full duplex audio system,
- Increase the tons for tungsten and covered lead shielding,
- Use of robot for surveys inside high radiation areas –already assembled, and
- Setup of a new formal source term reduction program – PDCA based – first cycle in May, 2012.

### Regional RPM meeting

The NATC Regional US Regional RPM meeting was held on 12-13 January after the 2012 International ISOE ALARA Symposium. Over 65 regulators, RPMs and vendors from 5 countries including Brazil, Canada, South Africa, UAE and the US, participated in the open forum and discussed lessons learned from fall refuelling outages. There was much discussion about training the next generation of health physicists. US NRC Regional Inspectors provided important insights on strengths and weakness observed at US nuclear plants during NRC routine inspections. RPM felt this was the most important aspect of the meetings which have been held consistently for 24 years in US NRC Region III.

### 2012 ISOE European Symposium

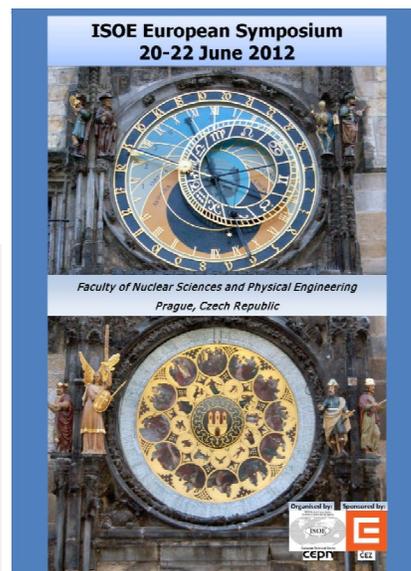
The 2012 European ISOE Symposium, organised by the European Technical Centre in collaboration with the Czech nuclear operator (ČEZ), was held at Faculty of Nuclear Sciences and Physical Engineering in Prague (Czech Republic) from the 20<sup>th</sup> to 22<sup>nd</sup> of June, 2012. The symposium was attended by 171 participants from nuclear electricity utilities, contractors and national regulatory authorities from 18 countries.

The symposium covered all aspects of radiation protection related issues and was preceded by three separate meetings;

- Radiation Protection Managers meeting,
- Regulatory Body representatives meeting, and
- a meeting on the use of the CZT for source-term management.

The main topics of the symposium were:

- Regulatory Aspects
- Accident Management
- RP Management
- Source-Term Management
- Large Job Experiences
- Instrumentation and Measurements
- Decommissioning
- Internal Contamination Management



The participants had the possibility to participate to a technical visit of Dukovany NPP and Temelin NPP on the 22<sup>nd</sup> of June, 2012.

### Distinguished Papers of the European Symposium

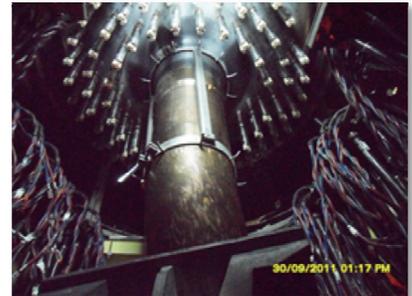
Two oral presentations and one poster were distinguished.

#### 1. Operational Experience of the Replacement of Pressuriser Heaters during a Forced and a Planned Refuelling Outage by G. Renn, M.Lunn (Sizewell B NPP, UK)



*Cutting old heaters in the glove box*

Sizewell B NPP is a 4-Loop Westinghouse design PWR reactor. Mr. Guy Renn presented the replacement of 17 damaged or failed heaters during the forced outage started on 17<sup>th</sup> March 2010 (197 days of shutdown) and the remaining 63 heaters in the next refuelling outage (30 days for the pressurizer project). The main lessons learned were: use of a realistic mock-up, involvement of the whole RP crew, the need to have development and rehearsal of contamination control dressing and undressing sequences, and the use of automated heater well welding equipment.



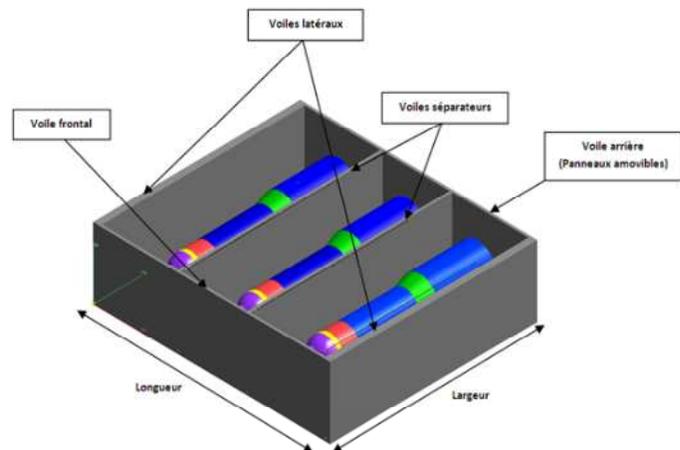
*Pressurizer with new heaters installed*

#### 2. Radiation Area Classification and Sizing of the Storage buildings of used-up steam generators - Practical application by J. Routtier, T. Canal, X. Michoux (EDF CIPN, France)

After the Steam Generator Replacements, the used SGs with radioactive deposits are transferred to a storage building. J. Routtier presented the need to design tools (software) in order to justify respect of radiation protection requirements.

For 900 MWe Storage Buildings, an Excel Tool was used to resolve the dose rate overtaking problematic on the site boundaries. For 1300 MWe Storage Buildings, EDF designed a tool allowing visualisation of temporary isodose curves on the site during used SG transfer.

He showed that the use of practical and user-friendly excel tool hiding complex modelisation calculations under several calculation codes is a way to reinforce links between radiological protection calculation domains and other technical professions of the nuclear domain as they are available for both nuclear plant workers and nuclear engineering departments, and for all for non-health physicist users.



*Steam generators building storage*

#### 3. Poster: Harmonization of Use and Calibration of Radiation Measurement Equipment in the Spanish Nuclear Power Plants by M. A. de la Rubia (CSN), M. Rosales (CSN), A. Félez (UNESA)

The project involves the study of detectors to measure radiation in order to control people and materials at the exit of controlled area and double fence used in the Spanish NPPs to harmonize the use and calibration of aforementioned detectors.

Main project milestones were:

- Analyses of barriers to radiological control of people and reusable materials in the Spanish NPPs.
- Preparation of a table showing technical data of the detectors used in each Plant.
- Parameter homogenization (calibration isotope, activity of the source used for calibration, calibration distance, alarm threshold, calibration/verification periodicity)
- Implementation of the project results in each plant.

A systematic of the contamination control, harmonization when possible of detectors used and identification of the reinforcement of the number of detectors and the harmonization of alarm thresholds has been established

### Social events

A Conference dinner sponsored by ČEZ was organised at the Žofín Palace on the 20<sup>th</sup> of June, 2012. The Symposium was also the occasion to celebrate the 20<sup>th</sup> Anniversary of ISOE through the organisation of a special cruise dinner on the Vltava River on the evening of 21 June 2012.



*Žofín Palace (Photo by ETC)*



*Conference dinner at Žofín Palace (Photo by ETC)*



*Celebrating the 20<sup>th</sup> Anniversary of the ISOE*

### ISOE at the IRPA 13 Congress

The 13<sup>th</sup> International Congress of the International Radiation Protection Association (IRPA) organised by the UK Society for Radiological Protection (SRP) was held in Glasgow on 14-18 May 2012. Almost 1500 scientific delegates attended from 74 different countries and 200 exhibitors, making the Congress the world's largest ever gathering of radiation protection experience and expertise. The ISOE program was represented by two posters; "Information System on Occupational Exposure and ISOE Database" and "Data Collection on Occupation Exposure at Nuclear Power Plants under Decommissioning - Challenges for the Information System on Occupational Exposure" and an oral presentation by the EGWC Chair Mr. Alain Rocher on "Radiation Protection Aspects of Water Chemistry and Source-Term Management with a view of an ISOE Expert Group". ISOE Chair-elect Mr. Willie Harris contributed to a technical session on worker education and training with a presentation dealing with NPP's dose trends, usual practice and effective tools. All ISOE presentations were highly appreciated by the participants of the Congress.

In addition, the ISOE program was invited to the 1<sup>st</sup> international and regional ALARA Networks coordination meeting, which was organized by the IAEA during the Congress on 16<sup>th</sup> May 2012 and represented by the ISOE Chair-elect and ISOE NEA Secretary. Seven international ALARA networks (ISOE, EAN- European ALARA Network, RECAN, ARAN- Asian ALARA Network, REPROLAM, Red de Optimización de Protección Radiológica Ocupacional en Latino América, EMAN- European Medical ALARA Network and ISEMIR - International System on occupational Exposure in Medicine, Industry and Research) were represented at the meeting. Meeting participants were informed on recent activities and dynamics of the ISOE Programme. The meeting was found very useful for information exchange between the relevant networks and it was decided to take the opportunity of the IRPA congresses (international and regional) every 4 years to hold such a meeting.

## Schedule of ISOE Meetings for 2012 & 2013

### 2012

- 1-2 October 2012: 4<sup>th</sup> meeting of the ISOE EGWC (OECD, Paris)
- 12-13 November 2012: ISOE WGDA meeting (OECD, Paris)
- 13 November 2012: ISOE Bureau meeting (OECD, Paris)
- 14-15 November 2012: 22<sup>nd</sup> ISOE Management Board meeting (OECD, Paris)
- 15-16 November 2012: 2<sup>nd</sup> meeting of the ISOE EG-SAM (OECD, Paris)

### 2013

- 21-24 May 2013: ISOE Bureau and WGDA meetings
- 18-22 November 2013: WGDA and ISOE Management Board meetings

For further information, please visit  
ISOE websites

ISOE Network: [www.isoe-network.net](http://www.isoe-network.net)  
OECD/NEA: [www.oecd-nea.org/jointproj/isoe.html](http://www.oecd-nea.org/jointproj/isoe.html)  
IAEA TC: [www-ns.iaea.org/tech-areas/rw-ppss/isoe-iaea-tech-centre.asp](http://www-ns.iaea.org/tech-areas/rw-ppss/isoe-iaea-tech-centre.asp)  
NATC: [hps.ne.uiuc.edu/natcisoe/](http://hps.ne.uiuc.edu/natcisoe/)  
ATC: [www.jnes.go.jp/isoe/english/index.html](http://www.jnes.go.jp/isoe/english/index.html)