



# ISOE NEWS

Electronic edition Restricted Distribution

For ISOE Participants

## **ISOE News No.13, January 2009**

*ISOE Asian, European, North American and IAEA Technical Centres*

**[www.isoe-network.net](http://www.isoe-network.net)**

ISOE NEWS IS A PROJECT OF THE JOINT OECD/NEA-IAEA SECRETARIAT

## **ISOE Management Board meeting**



The 2008 ISOE Management Board meeting was held in November in Kyoto, Japan. The meeting was successful in further advancing the ISOE work programme, and was followed by the 2008 ISOE International ALARA Symposium in Tsuruga, Japan.

### ***Highlights of Important Agreements***

#### ***ISOE Terms and Conditions: Status of Renewal***

The status of participation under the current ISOE Terms and Conditions (2008-2011) was noted. Participants were reminded that in order to continue receiving ISOE products, eligible parties must notify the ISOE Joint Secretariat (OECD/NEA, IAEA) of their acceptance of the current Terms and Conditions. Utilities and authorities that have not yet renewed their participation were strongly encouraged to do so.

#### ***ISOE Network Revision ([www.isoe-network.net](http://www.isoe-network.net))***

Implementation of the updated ISOE Network was approved. The new website will be available to participants in early 2009.

#### ***ISOEDAT Web Migration: Phase 2***

Implementation of the new web-based ISOEDAT data entry modules was approved according to the development timetable. The online data entry form will be available for ISOE data entry by mid-2009.

#### ***Working Group on Data Analysis (WGDA)***

The proposals for new WGDA activities and products were approved, including

- the 18<sup>th</sup> ISOE Annual Report for 2008;
- a new ISOE database query function; and
- improving data collection and analysis aspects for decommissioned reactors. Utilities interested in participating in the road test of the proposal for decommissioned reactors are invited to notify the ISOE Joint Secretariat.

Countries are requested to renew their participation on the WGDA to ensure the continuation of quality products that meet the needs of ISOE participants.



#### **Expert Group on Work Management (EGWM)**

The draft report of the EGWM, "*Work Management to Optimise Occupational Radiation Protection in the Nuclear Power Industry*" was approved for publication. The report provides practical guidance on the application of work management principles as a contribution to the optimisation of occupational radiation protection, presenting its key aspects, supported by practical examples from within the ISOE community. The report will be available to the ISOE community in the first half of 2009.



A key pillar of ISOE is information exchange. Recognising the importance of being proactive and supporting end users through examples of good work planning and other related RP information, the Management Board agreed that ISOE should also focus on routinely collecting reports and articles of occupational RP and ALARA operating experience, and incorporating these into a wider library of information on the ISOE Network.



The development of a proposal addressing qualifications/training of personnel was also approved, for consideration by the Management Board.

#### **Election of New ISOE Bureau Members**

The incoming ISOE Chair is Mr. Vasile Simionov (Romania). The Management Board also elected Mr. Gonzague Abela (France) as the new ISOE Chair-elect, and Dr. Vince Holahan (USA NRC) as the new Regulatory vice-chair.



#### **Schedule of Meetings for 2009**

- 12-14 January 2009: 2009 ISOE North America ALARA & EPRI RP Symposium (NATC, Florida);
- 2-3 March 2009: CRPPH Expert Group on Occupational Exposure;
- 15 May 2009: ISOE Bureau/Technical Centre meeting (NEA/Paris);
- 18-20 May 2009: Working Group on Data Analysis (NEA/Paris);
- 8-11 Sep 2009: 2009 ISOE Asian ALARA Symposium (ATC, Aomori, Japan);
- 13-15 Oct 2009: 2009 ISOE International ALARA Symposium (IAEA/Vienna);
- 16-20 Nov 2009: 2009 ISOE Annual Session – Management Board Meeting (NEA/Paris).

#### **ISOE International ALARA Symposium**

The 2008 ISOE International ALARA Symposium held on 12-14 November 2008 in Tsuruga, Japan. Of the many excellent presentations, two were selected as distinguished papers: Mr. Shigeru Ito (Tohoku Electric Power Company, Japan) presented the measures for *Reduction of Radiation Exposure at Higashidori Nuclear Power Station* (described below), and Mr. Patrick Daly (Braidwood PWR, USA) presented the *Braidwood Station Alternate Post Peroxide Cleanup Methodology*.

Five distinguished papers from previous symposia in USA, Asia and Europe were also presented. The keynote speech on *ALARA and Occupational Exposure* was given by Mr. Jacques Lochard (CEPN, France, and OECD/NEA CRPPH Chair).



Some other presentations to be pointed out include:

- *Reduction of Radiation Exposure at Aged BWR Plants by Water Chemistry;*
- *Radiological Protection in EPR Design;*
- *ALARA Studies for EDF NPPs.*

Prior to the symposium, the participants visited the Monju fast breeder reactor site (described later).

All presentations are available on the IAEA Network.

### ***Highlights from: Reduction of Radiation Exposure at Higashidori Nuclear Power Station***



The Higashidori Nuclear Power Station is located in Higashidori-mura, looking out onto the Pacific Ocean on the eastern side of the Shimokita Peninsula in Aomori Prefecture. Unit 1 is a boiling water reactor with an output of 1100 MW. This nuclear power station consists mainly of a reactor building, a turbine building, a service building and a seawater heat exchanger building. Construction of Higashidori NPS began in December 1998; commercial operations started in December 2005.

At Higashidori NPS, Unit 1, a total collective dose of as low as 0.14 man-Sv was achieved at the first periodic inspection. This low dose was supported through various dose rate reduction measures, such as "Clean Plant Activities" including the crud reduction measures, "Ultra Low Fe High Ni Operation" for water chemistry control, and oxidation treatment on the feed water heater tubes, which was the first surface treatment to be applied to such a part in an actual plant.

Radiation sources that influence worker exposure include both exchangeable and deposited radiation sources. Clean Plant Activities aim mainly at reducing crud, which forms deposited radiation sources, while water chemistry control aims at suppressing exchangeable radiation sources. These activities have reduced crud by performing clean-up operations during start-up tests and taking other appropriate measures at various stages, from system and start-up testing to power operation.

Meanwhile, the Ultra Low Fe High Ni Operation is employed in water chemistry control. This measure allows the amount of Fe crud carried by the feed water into the reactor to be kept low, and a high Ni state is formed in the reactor. The Ni forms a dense oxide film on the ex-core pipe surface which controls radioactive material absorption. The Fe crud concentration in feed water is kept below 0.1 ppb. The Ni concentration in the reactor water was low at first; however, beginning with the second cycle, it has been successfully kept at several ppb and the core is in a high Ni state.

A problem sometimes seen in recently commissioned plants is the phenomenon of Cr ions markedly increasing in reactor water. A study was conducted on preventing Cr ions from being taken out of the feed water. The Cr ions turn the in-core environment into an oxidative atmosphere, which accelerates the elution of radioactive corrosion products (Co-60) which in a stable way are taken into the oxide film on the fuel surface. The result is the risk of increasing radioactivity concentration in reactor water. The main source of Cr ions is the feed water heater tube, and Higashidori NPS, Unit 1, was the first plant to apply oxidation treatment to the second feed water heater tube at the final stage of the feed water heater to keep Cr from being taken from the feed water.

Intake of radioactive nuclides into ex-core equipment and tubes was suppressed by the synergy of Ultra Low Fe High Ni Operation and oxidation treatment of feed water heater tubes. Consequently, the dose rate of the reactor recirculation system tubes that governs the atmospheric dose while in containment was successfully suppressed. At Higashidori NPS, Unit 1, the measured result at the first periodic inspection was 0.06 mSv/h, which was below the initial target value; at the second inspection, the measured value was kept at a low level of 0.16 mSv/h.

## Monju Reactor

### Fast Breeder Reactor Development

Prior to the 2008 ISOE International ALARA Symposium, the participants visited the Monju fast breeder reactor site.

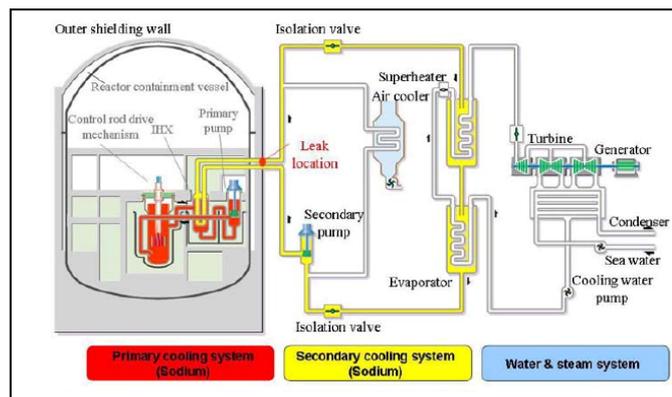
The Japan Atomic Energy Agency (JAEA) promotes research and development of fast breeder reactor (FBR) cycle technology with the knowledge that excellent performance, good economics and reliability are necessary for this technology to be accepted by society. JAEA has taken a step-by-step approach for this development. The first step was the Joyo experimental reactor and the second was the Monju prototype reactor. The final report of the Feasibility Study on Commercialized FBR Cycle System Phase-II was compiled in March 2006. Following the report, JAEA will establish commercialized FBR cycle technologies comparable to future LWR cycle and other energy resources by 2015, aiming at the full-scale introduction of FBR before 2050.

### Progress in Monju



The prototype FBR Monju has an output of 280 MW electrical. It achieved initial criticality in April 1994. In August 1995, Monju became the first Japanese FBR to generate power. It remains the only Japanese facility that can generate electricity using a fast breeder reactor. In December 1995, sodium coolant leaked from a temperature sensor in the secondary system piping. Since then, plant operation has been suspended.

After this incident, a thorough investigation of the cause, and a study of preventive measures were carried out. Following a governmental safety review and after gaining agreements with the local governments, plant modifications were carried out and the modified system function test was conducted. The entire system function test began on August 31, 2007.



### Practical Features

Differences between light water and sodium reactors are that, for the latter, normal emergency core cooling is provided by natural recirculation and thermal energy is removed by air. No additional safety injection or residual heat removal pump systems are necessary. The primary system is not under pressure and therefore the loop piping is much thinner. The sodium coolant has to be heated also in a stand-by condition. It is practical that a refuelling machine is integrated with the reactor vessel. Between the nuclear and turbine island, there is an additional secondary sodium heat transfer system with steam generators. Some specific procedures of fire protection are required in case of sodium fires.



In case of a sodium leakage incident, fire fighting procedures are well prepared and exercised. The final product after a fire is sodium carbonate.

Sodium itself has no impact on corrosion of the primary system components and therefore activated corrosion products are not a problem as is the case in light water reactors. Sodium can be pumped by a magnetic pump not in direct contact.

Natural sodium Na-23 is activated in a neutron field and Na-24 is produced. It decays with a half-life of 15 hours. This characteristic has to be taken into account before any entry to the primary loop area inside reactor containment. Operating floors inside containment are protected against radiation by concrete shielding.

### ***Role of Monju test operation***

Through Monju operations, JAEA will confirm the validity of its design approach for a large-scale fast breeder reactor and demonstrate its competitiveness with existing light water reactors in operation, maintenance and repair performance. At the same time, JAEA will try to confirm the design performance of equipment used to handle the sodium coolant while accumulating and standardizing sodium handling technologies through continued experience with Monju, including improved thermal performance of the coolant, extension of fuel life, improvement of the power density and efficient use of neutrons to confirm technologies developed in the fuel fabrication and fuel reprocessing fields.

### **Announcements**

#### ***2009 ISOE International ALARA Symposium***

The 2009 ISOE International ALARA Symposium will, for the first time, be hosted by the IAEA Technical Centre at IAEA Headquarters in Vienna, Austria, from 13-15 October 2009. More information, including the first announcement and call for papers, can be found on the ISOE Network.