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ISOE

INFORMATION SYSTEM ON OCCUPATIONAL EXPOSURE

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Meeting of the ISOE Steering Group in Japan

The 15th Meeting of the ISOE Steering Group was held 7-8 November 2005 in Tokyo, Japan. The meeting was chaired by Mr. Jean-Yves Gagnon, ISOE Chair (Gentilly-2, Canada), and hosted by Mr. Waturu Mizumachi, Director General of the Japan Nuclear Energy Safety Organization/Asian Technical Centre and ISOE Chair-elect. The meeting was continued in Hamaoka with the Asian ALARA Workshop and site tour of the NPP.

Following a review of the 2005 ISOE achievements, which included continued world-wide collection of occupational exposure data for the ISOEDAT system, the organisation of ALARA symposia and various technical analysis and support products, the chair of the Working Group on Strategic Planning (WGSP), Mr Carl-Goran Lindavall (Barseback, Sweden) presented the group's work. With a global objective for ISOE to be the system of reference for occupational radiation protection, the WGSP is working towards improvements in the ISOE activities, products, and organisation. Of importance here is the use of a bottom-up approach to identify user needs, in which the ISOE National Coordinators and Technical Centres play a critical role.

The ISOE Network (www.isoe-network.net) is intended to provide a single portal to the all of the ISOE products. With the objective of making the ISOE occupational exposure database more accessible to its users, the web group has successfully migrated the ISOEDAT-MADRAS data analysis module to the web.

The Steering Group approved the formal launch of the web-enabled ISOEDAT, following the setup of user accounts, and directed the working group to proceed towards Phase II of the project, which is the development of data input modules for web-based ISEODAT data entry.

The work of the Working Group on Data Analysis (WGDA) was presented by its Chair, Mr. Sergio Zorrilla (Laguna Verde, Mexico). The work of the WGDA in 2006 will focus on meeting the ISOE user needs that have been identified through the National Coordinators and Technical Centres.

The proposed ISOE Programme for 2006, which includes continued data collection and web development, data analysis products and software development under the WGDA, organisation of international and regional ALARA Symposia and completion of the work of the WGSP was approved by the Steering Group.

Finally, the Steering Group meeting marked the end of term of the current Regulatory Vice-Chair, Dr. Seong-Ho Na (KINS, Korea). The Steering Group thanked Dr. Na for his very valuable work in support of ISOE, and unanimously elected Mr. Veli Riihiluoma (Finland) for the next 3 year term. Mr. Riihiluoma works for the Radiation and Nuclear Safety Authority of Finland (STUK) as a senior inspector.

ISOE Asian ALARA Workshop

The first ISOE Asian ALARA Symposium took place in Hamaoka, Japan on 9 November 2005, in conjunction with the 15th Meeting of the ISOE Steering Group. This workshop, organised by the Asian Technical Centre, saw the involvement of about 55 participants from 14 countries.

With the aim of encouraging methods for regional connection and communication, the workshop consisted of six presentations from Japanese utility representatives on the topic of current challenges and good practices in Japan, as well as 3 international presentations.

Following the example of other regional symposia, the paper presented by Mr. Yasuyuki Kashimoto (Shikoku Electric Power Co.) on “Measures to Reduce Radiation Exposure during the Reactor Vessel Core Internals (CI) Replacement at Ikata Nuclear Power Station Unit 1” was selected as the symposium’s Distinguished Paper. This work represents the first replacement of core internals in the world, and therefore generated much interest throughout the audience. The lessons learned from Unit 1 are now being used in the CI replacement of Ikata NPP Unit 2.

Mr. Kashimoto was invited to present this paper at the 2006 International ALARA Workshop in Essen, Germany (Mar 2006).

In closing the workshop, Mr. Mizumachi (Director General, JNES) thanked all participants and encouraged continued international information exchange.

Planning Reactors for Africa

Tom Ferreira, PBMR Communication Manager

Up to 30 nuclear reactors built on the southern tip of Africa in the next decade? It may sound unlikely, but that is exactly what the South African Government envisages with the country's Pebble Bed Modular Reactor (PBMR) technology.

Over the past year or so, South Africa's Minister of Public Enterprises, Mr Alec Erwin, stated more than once the Government's intention to produce between 4 000 MW – 5 000 MW of power from the inherently safe pebble bed reactors in South Africa. This equates to between 20 and 30 PBMR reactors of 165 MW each.

"The project is now factored into our future energy planning from about 2010 onwards. We firmly believe that the PBMR will place the country at the forefront of energy technology. Its positive attributes from an environmental point of view and its potential link with hydrogen production, add immensely to the attractiveness of this technology," he said.

Mr Erwin is not the only Government Minister who supports the PBMR project in particular and nuclear in general. According to Deputy President, Ms Phumzile Mlambo-Ngcuka, South Africa's is treating the "very ambitious, but very important Pebble Bed Modular reactor project with a great deal of seriousness." She said even President Thabo Mbeki took a very active interest in the project.

But what exactly is the PBMR project and how does the technology work?

Developing out of a desire for energy sustainability, the PBMR technology defines 21st century energy thinking. Its ability to economically generate electricity and create high value co-products such as hydrogen for the fuel of the future, desalinated water and industrial or residential process heat, not only sets it apart from all previous nuclear reactors, but also from the next generation of energy sources.

The PBMR is a High Temperature Gas-cooled Reactor with a closed-cycle, gas turbine power conversion system. Although it is not the only gas-cooled high-temperature reactor currently being developed in the world, the South African project is internationally regarded as the leader in the power generation field. Very high efficiency and attractive economics are possible without compromising the high levels of passive safety expected of advanced nuclear designs.

Under development since 1993, the PBMR project entails the building of a demonstration reactor project near Cape Town and a pilot fuel plant near Pretoria. The current schedule is to start construction in 2007 and for the demonstration plant to be completed by 2011. The fist commercial PBMR modules are planned for 2013.

PBMR (Pty) Ltd's current investors, Eskom, the Industrial Development Corporation and British Nuclear Fuels (BNFL), share the vision of small, standardised, inherently safe, modular reactors as one of the best carbon-free alternatives for new power generation capacity around the world.

The PBMR is therefore poised to be the world's first commercial scale advanced reactor built in the new millennium.

How it works

The PBMR uses particles of enriched uranium dioxide coated with silicon carbide and pyrolitic carbon. The particles are encased in graphite to form a fuel sphere or pebble about the size of a billiard ball. Helium is used as the coolant and energy transfer medium, to drive a closed cycle gas turbine-compressor and generator system. When fully loaded, the core would contain approximately 450 000 fuel spheres.

To produce electricity, helium gas at a temperature of about 500 °C is inserted at the top of the reactor, and passes among the hot fuel spheres, leaving the bottom of the vessel having been heated to a temperature of about 900 ºC.

The hot gas then enters the turbine, which is mechanically connected to the generator through a speed-reduction gearbox on one side and the gas compressors on the other side. The coolant leaves the turbine at about 500 ºC and 2,6 MPa, after which it is cooled, recompressed, reheated and returned to the reactor vessel.

While a typical light water reactor has a thermal efficiency (electrical power output/thermal heat input) of approximately 33 percent, an efficiency of about 41 percent is anticipated in the basic PBMR design.

Online refuelling is another key feature of the PBMR. Fresh fuel elements are added to the top of the reactor while used fuel is removed at the bottom while the reactor is at power.

The aim is to operate uninterrupted for six years before the reactor is shut down for scheduled maintenance. However, for the demonstration module, a number of interim shutdowns will be required for planned evaluation of component and system performance.

Shutdown will be done by inserting the control rods. Start-up is effected by making the reactor critical, then using nuclear heat-up of the core and circulating the coolant by motoring the turbo-generator set. Heat is then removed by the pre- and inter-cooler. At a specified temperature, the cycle becomes self-sustaining.

Safety systems

The passive safety systems of the PBMR are designed to make it “meltdown proof”. The physical characteristics of the reactor are such that it shuts itself down, without any engineered safety systems, in any imaginable accident scenario. The PBMR system has a self-stabilizing temperature effect: If the temperature of the reactor core should heat up, this slows down the neutron production, because of the large amount of U-238 in the fuel particles, which captures the neutrons without fissioning. The spent fuel from the PBMR also has built-in safety features. Because it is encapsulated in several coatings, including silicon carbide, the radioactive fission products remaining in the spent fuel are fully contained within the fuel kernels.

The reactor core concept is based on the well-tried and proven German AVR power plant, which ran for 21 years until 1986. This safe design was proven during a public and filmed plant safety test, when the flow of coolant through the reactor core was stopped and the control rods were left withdrawn just as if the plant was in normal power generation mode.

It was demonstrated that the reactor core shut itself down inherently within a few minutes. It was subsequently proven that there was no deterioration over and above the normal design failure fraction of the nuclear fuel. This proved that a reactor core meltdown was not credible, and that an inherently safe nuclear reactor design had been achieved.

Nuclear Plant Safety: No Room for Complacency

(from www.iaea.org)

Today´s nuclear power plants are performing at higher safety levels than twenty years ago, but there is no room for complacency when it comes to their continuing safe operation, delegates at the *International Conference on Operational Safety Performance in Nuclear Installations* in Vienna heard in December 2005.

The safety bar is significantly higher than in the days of the 1986 Chernobyl accident. "We can point to a substantially improved nuclear safety situation throughout the world," IAEA Head of Nuclear Safety and Security Mr. Tomihiro Taniguchi told the conference.

Mr. Tomihiro Taniguchi cited the way the nuclear industry had coped with severe natural disasters as a testament. "Tsunamis, floods, hurricanes and earthquakes have affected many parts of the world and nuclear installations everywhere responded admirably," he said. "The design and operational features ensured that the extreme natural conditions would not jeopardize safety."

However, Mr. Taniguchi issued a strong warning to the industry against complacency in an age where more than half the world's nuclear power plants are more than 20 years old, with many operators wanting to extend the lifetime of plants beyond their original design. "There is a very real possibility that we will become complacent with our high level of performance," he cautioned. The nuclear industry knows too well that a major accident at any one nuclear power plant in the world would weigh heavily on the entire industry.

The focus of the three-day conference in Vienna was to foster the exchange of information on operational safety performance and operating experience in nuclear installations, with the aim of consolidating an international consensus on:

- The present status of these issues;
- Emerging issues with international implications;
- Priorities for future work; and
- Needs for strengthening international co-operation, including recommendations for future activities for the IAEA, NEA, nuclear operators and regulatory authorities.

Mr. Taniguchi called for strong safety leadership, effective safety management and sustained safety culture, especially for those nuclear plants facing extended operations.

IAEA Safety Reports Series No. 42

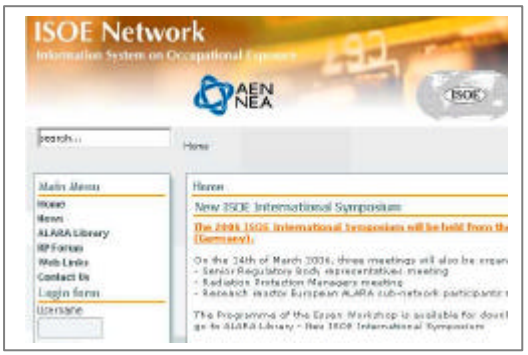
Safety Culture in the Maintenance of Nuclear Power Plants

Building upon earlier IAEA publications on this topic, this Safety Report reviews how challenges to the maintenance of nuclear power plants can affect safety culture. It also highlights indications of a weakening safety culture. The challenges described are in areas such as maintenance management, human resources management, plant condition assessment and the business environment. The steps that some Member States have taken to address safety culture aspects are detailed and singled out as good practices, with a view to disseminating and exchanging experiences and lessons learned.

ISOE Network

During its 15th meeting, the ISOE Steering Group approved the launch of the updated ISOE Network web portal. Although currently a work in progress, the aim of the ISOE Network is to make all ISOE products available through a single portal, providing a "one-stop shop" from which users can:

- obtain the latest ISOE dose data, trends and analyses though on-line access to the ISOEDAT database;
- search the most complete ALARA-approach database in the nuclear industry;
- directly exchange experience through a question-and-answer archive system; and
- connect to the other related information, including links to every significant, available RP web-site.



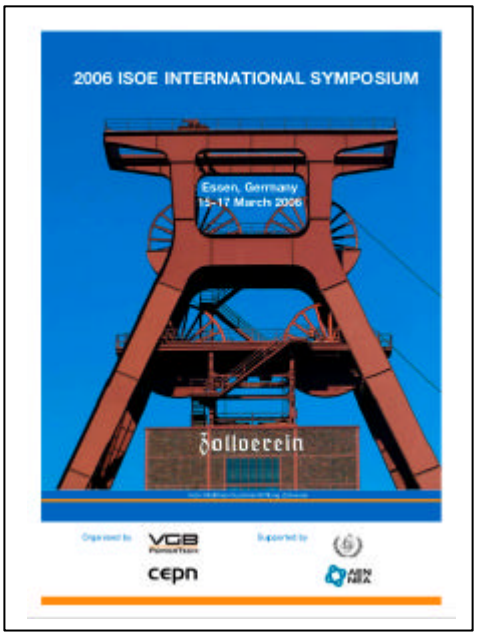
As many of these resources will be available only to registered users, all ISOE participants are encouraged to submit a request to the NEA through their ISOE National Coordinator.

The web portal is intended to address the needs of the ISOE community, so users are invited to supply comments through the website: www.isoe-network.net.

2006 ISOE International Symposium

The European Technical Centre of the International System on Occupational Exposure (ISOE) is organizing the **2006 ISOE International Symposium on Occupational Exposure Management at Nuclear Facilities**. The Workshop will be held in Essen, Germany, from 15th to 17th March 2006.
The main aims of the Workshop are:

- to provide a large forum of information exchange on occupational exposure concerns; and
- to allow vendors to present their recent experiences and developments in radiation protection in a commercial exhibition. Vendors will have also the possibility to make oral presentations in plenary session room during coffee-breaks.



Abstracts for poster presentation are still possible and should be sent to the Workshop Programme Committee by Email or by Fax before the end of February 2006. Contact-person: Lucie D'ASCENZO, CEPN, Email: dascenzo@cepn.asso.fr - Fax: +33 1 4084 9034.

The ISOE Workshop will be preceded on the 14th of March 2006 by three meetings devoted to specific audience:

- Senior Regulatory Body Representatives Meeting
  (Contact-person: Olvido GUZMAN, CSN, Email: ogl@csn.es)
- Radiation Protection Managers Meeting
  (Contact-person: Heinz-Peter KAPTEINAT, VGB PowerTech e.V,
  Email: heinzpeter.kapteinat@vgb.org)
- Research Reactor European ALARA Sub-Network Participants Meeting
  (Contact-person: Charles JOLY, CEA, Email: charles.joly@cea.fr)

Further information on http://isoe.cepn.asso.fr/ - New Workshop. The International Atomic Energy Agency (IAEA) and the OECD Nuclear Energy Agency (NEA) co-sponsor this Workshop.