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ISOE INFORMATION SHEET

CONCLUSIONS AND RECOMMENDATIONS FROM THE 3rd EUROPEAN ISOE WORKSHOP ON OCCUPATIONAL EXPOSURE MANAGEMENT AT NUCLEAR POWER PLANTS

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Summary

This information sheet summarizes the main conclusions and recommendations from the 3rd European ISOE Workshop on Occupational Exposure Management at Nuclear Power Plants, held in Portoroz, Slovenia, 17-19 April 2002. It also gives some excerpts from a few presentations.

Five main recommendations were agreed on by the participants:

1. When handling deregulation, management should address the effects of downsizing radiological protection staff.
2. When handling deregulation, regulatory bodies should negotiate with nuclear power plants (NPPs) the minimum number of radiological protection and safety staff to allow the maintenance of a good level of radiological protection.
3. When handling deregulation, utilities need to maintain regular investments in radiological protection and safety culture.
4. There is a need for harmonization of dose constraints to facilitate the optimization of radiological protection of contractors and itinerant workers.
5. There is a strong wish from the utility side to assess the possibility of keeping a single dosimetry system relying on external operational dosimeters.

1. The 3rd European ISOE Workshop

The European Technical Centre, with the International Atomic Energy Agency and the European Commission, co-organized the Third European ISOE Workshop on Occupational Exposure at Nuclear Power Plants in April 2002, at Portoroz, Slovenia. One hundred and thirty participants from 26 countries, mainly in Europe but also from the United States and Asia, attended the meeting, with a good balance between utilities, regulatory bodies and contractors. The IAEA supported participants from Central and Eastern European countries and from Asia. The workshop comprised 35 oral presentations and eight poster presentations, and vendors presented their products. As in previous workshops, all participants appreciated the work in small groups. The workshop's success is largely due to the significant organizational support from the Krsko NPP, and the Slovenian regulatory body.

One major feature was the participation of representatives from Russian speaking countries, the IAEA having provided Russian-English interpretation. This reflects the improvement in occupational exposure management in these countries during the past few years, partly as a result of both the IAEA technical co-operation programme and ISOE. In that context, a special award has been provided to A. Petrov for his presentation in Russian on « Steam generator replacement at Balakovo NPP ».

Both the small group discussions and the oral presentations were more focused on the management aspects of occupational exposure reduction and on the influence of political and legal backgrounds than on technical matters. Three topics in particular were selected by the participants:

- the impact of deregulation on occupational exposure
- setting up radiological protection goals and indicators
- setting up and using dose constraints

2. Deregulation and radiological protection

The problem of the impact of deregulation on radiological protection was raised for the first time at Malmö in 1998 (1st EC/ISOE Workshop). At that time it did not appear to be a real concern. Two years later at Tarragona (2nd EC/ISOE Workshop), deregulation appeared clearly as a real challenge for the future of radiological protection. This led to a recommendation from the participants: "To consider new radiation protection management techniques to avoid potential negative impact of deregulation on exposure, while keeping radiation protection independent from operation and maintenance of the plant".

At Portoroz, for the first time participants from some countries mentioned “significant reduction in radiological protection staff, and loss of skills” and “higher turnover of staff with little experience”.

There was a consensus from the present radiological protection specialists to give warnings and recommendations:

- *Management should address the effects of downsizing radiological protection staff.*
- *Regulatory bodies should negotiate with NPPs the minimum number of radiological protection and safety staff required to maintain a good radiological protection level.*
- *Utilities need to maintain regular investments in radiological protection and safety culture.*

3. Setting up radiological protection goals and indicators

The participants found that, in the context of competition, radiological protection goals and indicators were very important management tools. Goals must be measurable, realistic and challenging. They must be communicated to all stakeholders. They may be proposed by radiological protection specialists according, or not, to long term goals set up by management. Deviations from the goals should require post job reviews.

Depending on national culture and facility context, they may concern:

- dose: distribution of individual doses, collective dose, unplanned doses;
- event occurrence: contamination, survey compliance, levels of training, etc.;
- waste and effluent generation.

In the USA the new INPO 2005 collective dose goals are 650 person-mSv/year for PWRs and 1200 person-mSv/yr for BWRs (D. Wood presentation); in France, the collective dose target per reactor is 800 person-mSv for 2005.

4. Setting up and using dose constraints

On this topic, the first consensual conclusion is that there is a need for clarification in order to have a common language: Are dose constraints action levels? Are they goals? Are they warning levels? The only certitude is that they should not be limits and, as they should be principally focused on the individual, they should be below the dose limits. In most countries, the opinion is that regulatory bodies should not state them. Their use is mainly for optimizing protection in planning tasks, and in designing and decommissioning facilities and equipment.

Some plants have been using dose constraints for several years. British Energy Generation in the UK, for example, started in 1991 with a 15 mSv annual "company dose restriction level" (CDRL) and has now a 10 mSv CDRL (S. Morris presentation). *"The benefit of having a CDRL of 10 mSv provided motivation for enhanced dose reduction practices that resulted in minimizing both individual and collective dose."*

Thus, dose constraints appeared to the participants as complementary to goals and radiological protection indicators.

However there was a strong opinion that dose constraints should be harmonized to facilitate the optimization of radiological protection of contractors and itinerant workers.

4. Best paper awards and other nominated papers

Three technical presentations were awarded and invited to make their presentation in 2003 at the ISOE International ALARA symposium in the United States of America. These papers dealt with circuit contamination, fuel decontamination and occupational exposure related to spent fuel shipments.

4.1. « Impact of Main Radiological Pollutants on Contamination Risks (ALARA). Optimization of Physico-Chemical Environment and Retention Techniques during Operation and Shutdown »; A. Rocher *et al*., France (awarded paper).

EDF plants face radioactive pollution (i.e. Co-60, Ag-110m and antimony) leading to significant increases of shutdown doses in affected units (10–30%) or increasing the contamination risk for personnel. Early detection in operation and during shutdown requires good knowledge of their behaviour in order to find appropriate solutions. Replacing critical material as soon as possible should limit the source term. Limiting pollution in circuits requires implementation of chemistry and shutdown procedures to minimize contamination. Also, optimizing purification features (filters, resins and flow rate) is necessary to limit these effects. Studies are still in progress to propose a chemical policy and adapted procedures to operators for each type of radioactive pollution to enable them to reduce the impact on dose rates. On the other hand, a new specific gamma spectrometer — able to characterize the nature of radioactive deposits in the field in order to improve diagnostics — is being developed.

4.2. « Fuel decontamination at Ringhals 1 with the new decontamination process ICEDEC™ »; E. Fredriksson *et al*., Sweden (awarded paper).

The new fuel decontamination technique ICEDEC™, developed by Westinghouse, is based on abrasion of fuel crud with ice particles. A mixture of ice and water is fed continuously through the fuel assembly, which is placed in a specially designed fuel decontamination container connected to a closed loop recirculation system. The ice particles scrape off the loose crud from the fuel surfaces and a mixture of crud and water from the melted ice is then fed to a filter unit where the crud is separated from the water. Activity measurements at Ringhals (Sweden) in 2001confirmed that about 50 % of the loose crud was removed from the fuel surfaces of the two-year-old assembly. Fuel inspection after the decontamination process showed no influence on the fuel integrity. Furthermore, no enhanced personnel radiation dose was received from the fuel decontamination compared to that from normal fuel services.

4.3. « Analysis of the doses associated with the spent fuel shipments from the French NPPs: are they ALARA? »; J.-P. Degrange *et al*., France (awarded paper).

The spent fuel shipments from French nuclear power plants to the La Hague reprocessing plant have always been subject to significant efforts devoted to the prevention and elimination of the non-fixed contamination of the flask surface during their preparation (loading and cleaning) and the workers involved in those tasks receive annual individual dose levels that may be significantly higher than the average. Moreover, these shipments have been subject, since 1998, to a reinforced procedure of contamination monitoring. For these reasons, the French electricity utility Electricité de France (EDF) has initiated several studies, which have enabled it:

- to gain better knowledge of the distribution of the gamma and neutron doses received during cask preparation and contamination monitoring operations, and of the influence on these doses of the reactor model (900 MWe/1300 MWe), the fuel type (UO2/MOX), and the thermal residual power of the assemblies.

- to determine the relative contributions of the main operations, irradiation sources and workplaces to the collective dose, with a specific focus on the operations associated with the prevention, elimination and monitoring of the contamination.

- to identify a set of radiological protection options and experience analysis that could be envisaged in order to reduce the collective dose by up to 36% associated with the preparation and on monitoring of the spent fuel tasks before their shipment from the NPPs.

Some other papers were nominated such as the following two.

4.4. «Dose assessments from whole body measurements: the approach at NPP Kozloduy», G. Valtchev *et al*., Bulgaria.

Dose assessments from the intake of inhaled radionuclides present rather complex problems. They require some information and comprehensive investigation and calculation. In addition, ICRP has reviewed and changed some of the biokinetic models and adopted a new model for the human respiratory tract (ICRP Publications 56, 66, 67, 69). At NPP Kozloduy, new software named DOSEART has been designed. The program DOSEART is verified against LUDEP 2.07 for some radionuclides typical for NPPs. It has been developed using Visual Basic 5.0 and is user friendly and reliable.

4.5. « CDRL – Company Dose Restriction Level », S. Morris, U.K.

For a number of years, dose constraints and controls have been used as effective measures in restricting exposure to ionizing radiation. Predecessor companies to British Energy Generation (BEG) originally established the company dose restriction level (CDRL) as a consequence of the revision of risk estimates, then with the revised Ionizing Radiation Regulations 1999 (IRR99) [1] the CDRL for BEG was also revised. The CDRL is the annual maximum dose that can be planned for any employee, or contractors' employee, to receive from work on BEG locations. In exceptional circumstances (and with the agreement of the contractor), the BEG Company Executive Director of Health & Safety (HSED) may authorize (or approve) the exposure of personnel to doses which are greater than the CDRL, provided the doses are maintained as low as reasonably practicable (ALARP) and remain within statutory dose limits.

Table 1: Company Dose Restriction Level

Category	Restriction Level
Employees and contractors aged 18 years or over (not being a trainee or other person).	10 mSv effective dose per calendar year
Any female employee who has informed her employer that she is pregnant.	1 mSv equivalent dose to the surface of the abdomen for the remainder of the pregnancy.

Lessons learned from the CDRL sanctioning process:

The introduction of a CDRL in a self-regulated organization has been effective in reducing both collective and individual dose, coupled with sanction by the organizations' Executive Director of Health & Safety, who is supported by a unit that undertakes independent review and evaluation. The benefit of having a CDRL of 10 mSv was the incentive for enhanced dose reduction practices that resulted in minimizing both individual and collective dose. The prominence of the CDRL produced a greater awareness for effectual dose management for both BEG and contractor staff. Post task and outage ALARP reviews have been invaluable in identifying areas and actions necessary for the improvement of dose reduction practices.

Many other papers proposed important and interesting conclusions and feedback experience analysis. They are all, including PowerPoint slides, available on the ETC web site:

http://isoe.cepn.asso.fr/