

Ten years of IAEA support for occupational radiation protection in nuclear power plants

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INTRODUCTION

The IAEA is, since 1993, co-sponsoring the Information System on Occupational Exposure, ISOE, through provision of assistance, inviting countries with operating nuclear power plants which are Member States of the IAEA but not of the OECD to participate in ISOE cost-free through the IAEA ISOE Technical Centre.

Establishment of Safety Standards and support for their application, for example through the development of general guidance for occupational radiation protection, is a major part of the IAEA occupational radiation protection programme. The co-sponsorship of ISOE helped the IAEA also to initiate activities aimed specifically at nuclear power plants. In 1997 an IAEA Regional Technical Co-operation project on improving occupational radiation protection in nuclear power plants in central and Eastern Europe was launched and in 1999 a similar project for the Asian region was initiated. An intercomparison for individual monitoring of external exposure aimed specifically at dosimetry services in nuclear power plants took place from 1996 to 1998.

Due to these integrated and systematic efforts the IAEA can offer its Member States with nuclear power plants a comprehensive system for sustaining adequate occupational radiation protection. The purpose of this paper is to give an overview of this support.

INFORMATION SYSTEM ON OCCUPATIONAL EXPOSURE

The Agency's activities within ISOE, i.e. providing the services of the IAEA ISOE Technical Centre and the IAEA Joint ISOE Secretariat, form an integral part of the IAEA Occupational Protection Programme. A growing number of IAEA Member States are participating in ISOE. As of 1 January 2004, there are twelve utilities and nine regulatory authorities from eleven countries participating in the ISOE through the IAEA ISOE Technical Centre, i.e. utilities in Armenia, Bulgaria, Brazil, China, Lithuania, Pakistan, Romania, Russian Federation, Slovenia, South Africa and Ukraine (representing 47 operating reactors) and the regulatory authorities in Armenia, Bulgaria, China, Lithuania, Pakistan, Romania, Slovenia, South Africa and Ukraine.

TECHNICAL CO-OPERATION

One of the main mechanisms for providing for the application of occupational radiation safety standards is through the IAEA Technical Co-operation (TC) programme. Two current IAEA TC projects are closely related to the IAEA ISOE programme: a Regional Project on Enhancing Occupational Radiation Protection in Nuclear Power Plants (NPPs) in Central and Eastern Europe and in the Republics of the former Soviet Union (target countries: Armenia, Bulgaria, Czech Republic, Hungary, Lithuania, Romania, Russian Federation, Slovak Republic, Slovenia and Ukraine) and a Regional Model TC project on Improving Occupational Radiation Protection in NPPs in the Asian Region (target countries: China, Korea and Pakistan). These projects have been supported since 1997 and 1999 respectively with the general objective of supporting the implementation of the optimization (ALARA) principle in NPPs in accordance with the *International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources* (BSS) [1].

One major element of these programmes is information exchange. In addition to workshops organized continuously within the projects, these projects have supported participation in the ISOE Workshops and occasionally also interpretation during a workshop. Another important element is training and information is given below on material that is now available to support education, information and training on the application of the ALARA principle in NPPs.

SAFETY STANDARDS

The basic requirements for radiation protection against exposure to ionizing radiation of workers are given in the BSS [1]. A set of three Safety Guides concerning the application of the BSS to the control of occupational exposure was developed in a coordinated fashion. They are co-sponsored by the International Labour Office (ILO) and have been published in English and Russian [2-4]. Publications of translations into the other four IAEA official languages are under way. These Safety Guides are also published on CD-ROM together with the BSS as an interlinked set of searchable documents, called ORPGUIDE [5]. They are also the basis of an Occupational Radiation Protection Appraisal System to assess compliance with relevant international standards and practices. Guidance specifically for NPPs has been published in a Safety Guide on *Radiation Protection and Radioactive Waste Management in the Operation of Nuclear Power Plants* [6]. Another Safety Guide on radiation protection aspects of design for nuclear power plants is expected to be published in the first half of 2005.

SAFETY REPORTS

Complementary advice on specific topics of occupational radiation protection is published as Safety Reports (previously called Safety Practices). These publications provide either topic specific or practice specific guidance and are used to prepare standardized training packages. The Safety Guide on *Occupational Radiation Protection* [2] is being supported by two Safety Reports: *Health Surveillance of Persons Occupationally Exposed to Ionizing Radiation: Guidance for Occupational Physicians* [7] and *Optimization of Radiation Protection in the Control of Occupational Exposure* [8]. The latter publication is available also in Russian and French and is under translation into the other three IAEA official languages. A Safety Report on occupational radiation protection related to the employment of itinerant workers is under development.

The Safety Guide on *Assessment of Occupational Exposure Due to Intakes of Radionuclides* [3] is supported by three publications. *Direct Methods for Measuring Radionuclides in the Human Body* [9] and *Indirect Methods for Assessing Intakes of Radionuclides causing Occupational Exposure* [10] were already published, while a third publication on methods for assessing occupational radiation doses due to intakes of radionuclides is being finalized for publication. The Safety Guide on *Assessment of Occupational Exposure Due to External Sources of Radiation* [4] is supported by the Safety Report on *Calibration of Radiation Protection Monitoring Instruments* [11]. A further Safety Report, which is under development, will provide general advice for dosimetry services for individual monitoring.

OTHER MATERIAL

Additional valuable information is provided as cost free material. The Practical Radiation Technical Manual (PRTM) Series is designed to provide guidance on radiological protection for persons who have a responsibility to ensure the safety of employees working with ionizing radiation and may be used to provide training, instruction or information for these employees. Three earlier published PRTMs on *Workplace monitoring for radiation and contamination*, *Individual monitoring* and *Health effects and medical surveillance* are being revised to be published in 2004 together with a new PRTM on *Personal protective equipment*. These will be translated into all IAEA official languages.

To introduce radiation protection optimization, especially in the nuclear industry, a software-learning program, *RADIOR*, was developed with the financial support of the European Commission and the

IAEA. RADIOR (produced by PRODIDACT with collaboration of the CEPN) is available on diskette from the IAEA, in six languages (English, French, German, Russian, Spanish and Swedish).

As mentioned above, information material has been developed to support sustainable education and training on the application of the ALARA principle in NPPs. The first material, based on training courses and workshops held under the TC project for the Europe region, was distributed as IAEA Working material in English and Russian in 2001. Taking comments from users into account, this material was recently slightly revised and will, after revision also of the Russian translation, be reissued. In December 2003 another IAEA Working material on ALARA was finalized under the TC project for the Asian region. These materials include workshop material for two different target groups, one including senior management in NPPs and regulatory staff from central authorities and the other one for NPP managers and local regulatory inspectors. Both materials include notes for lecturers, PowerPoint presentations and reference papers on optimization. The differences in the materials reflect the differences in the needs for information in the two regions. To further support education and training of NPP workers, the IAEA has acquired the licence to duplicate and distribute a compendium (produced in Sweden) on *Radiation Protection* in English and Russian.

The present phases of the two mentioned TC projects include the introduction of self-assessment of occupational radiation protection in NPPs. A document on *Self-assessment of Occupational Radiation Protection in Nuclear Power Plants* was developed for the Europe region and distributed as IAEA Working material in 2002. It was compiled by a group of experts, based on the generic part of the IAEA-TECDOC on *Self-assessment of operational safety for nuclear power plants* [12] and adding specific guidance and examples.

The OECD document *Work Management in the Nuclear Power Industry* [13], which was developed by an Expert Group within the ISOE is available in Russian and Chinese from the IAEA.

INTERCOMPARISONS

Radiation monitoring of workers to assess exposure due to external sources of radiation and intakes of radionuclides is an essential component of any occupational radiation protection programme. The IAEA has been assisting its Member States in their provision of appropriate occupational monitoring for protection purposes. Since the early 1980's it has been organizing international and regional intercomparisons in the field of external and internal dosimetry with a view to harmonizing the use of radiological quantities and techniques. A co-ordinated research project (CRP) was started in 1997 on *Intercomparison for Individual Monitoring of External Exposure to Photon Radiation*, involving more than twenty laboratories from Eastern Europe and the Republics of the former Soviet Union, and focusing on personnel dosimetry services for NPPs. The preparatory phase included, in May 1997, a workshop aimed at familiarizing the participants with the new operational quantities. The results of the CRP were published in 1999 [14].

An IAEA safety related service was launched in 1999 for the harmonization of radiological quantities and units through *Intercomparison of Radiological Measurements for Monitoring Purposes*. The objective of this service is to provide national authorities with a mechanism for the intercomparison of radiological measurements that will ensure that their responsibilities for radiation protection are properly met as far as the assessment of radiation doses to workers and the public is concerned. Reports on the IAEA intercomparisons programme have been published [15, 16]

CONCLUSIONS

This paper has given a short summary of activities within the IAEA occupational radiation protection programme in support of nuclear power plants. While the publications available appear in the list of references, the other material mentioned is available from the authors. Further information on the IAEA radiation protection programme can be found in the webpage: <http://www-rasamet.iaea.org/>

REFERENCES

- [1] FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, INTERNATIONAL ATOMIC ENERGY AGENCY, INTERNATIONAL LABOUR ORGANISATION, OECD NUCLEAR ENERGY AGENCY, PAN AMERICAN HEALTH ORGANIZATION, WORLD HEALTH ORGANIZATION, International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources, Safety Series No. 115, IAEA, Vienna (1996).
- [2] INTERNATIONAL ATOMIC ENERGY AGENCY, INTERNATIONAL LABOUR OFFICE, Occupational Radiation Protection, Safety Standards Series No. RS-G-1.1, IAEA, Vienna (1999).
- [3] INTERNATIONAL ATOMIC ENERGY AGENCY, INTERNATIONAL LABOUR OFFICE, Assessment of Occupational Exposure Due to Intakes of Radionuclides, Safety Standards Series No. RS-G-1.2, IAEA, Vienna (1999).
- [4] INTERNATIONAL ATOMIC ENERGY AGENCY, INTERNATIONAL LABOUR OFFICE, Assessment of Occupational Exposure Due to External Sources of Radiation, Safety Standards Series No. RS-G-1.3, IAEA, Vienna (1999).
- [5] ORPGUIDE , Safety Standards series, IAEA, Vienna (2000) (CD-ROM).
- [6] INTERNATIONAL ATOMIC ENERGY AGENCY, Radiation Protection and Radioactive Waste Management in the Operation of Nuclear Power Plants, Safety Standards Series No. NS-G-2.7, IAEA, Vienna (2002).
- [7] INTERNATIONAL ATOMIC ENERGY AGENCY, INTERNATIONAL LABOUR ORGANISATION, WORLD HEALTH ORGANIZATION, Health Surveillance of Persons Occupationally Exposed to Ionizing Radiation: Guidance for Occupational Physicians, Safety Report Series No. 5, IAEA, Vienna (1998).
- [8] INTERNATIONAL ATOMIC ENERGY AGENCY, Optimization of Radiation Protection in the Control of Occupational Exposure, Safety Reports Series No. 21, IAEA, Vienna (2002).
- [9] INTERNATIONAL ATOMIC ENERGY AGENCY, Direct Methods for Measuring Radionuclides in the Human Body, Safety Series No. 114, IAEA, Vienna (1996).
- [10] INTERNATIONAL ATOMIC ENERGY AGENCY, Indirect Methods for Assessing Intakes of Radionuclides causing Occupational Exposure, Safety Reports Series No. 18, IAEA, Vienna (2000).
- [11] INTERNATIONAL ATOMIC ENERGY AGENCY, Calibration of Radiation Protection Monitoring Instruments, Safety Reports Series No. 16, IAEA, Vienna (1999).
- [12] INTERNATIONAL ATOMIC ENERGY AGENCY, Self-assessment of operational safety for nuclear power plants, IAEA-TECDOC-1125, Vienna (1999).
- [13] NUCLEAR ENERGY AGENCY OF THE ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT, Work Management in the Nuclear Power Industry: A Manual prepared for the NEA Committee on Radiation Protection and Public Health by the ISOE Expert Group on the Impact of Work Management on Occupational Exposure, OECD/NEA, Paris (1997).
- [14] INTERNATIONAL ATOMIC ENERGY AGENCY, Intercomparison for Individual Monitoring of External Exposure from Photon Radiation, IAEA-TECDOC-1126, Vienna (1999).
- [15] CRUZ SUÁREZ, R., GUSTAFSSON, M., MRABIT, K., *Present and Future Activities of the IAEA on Internal Dosimetry: Lessons Learned from International Intercomparisons*. Radiat. Prot. Dosim. **105**(1-4), 433-435 (2003).
- [16] BÖHM, J., CRUZ SUÁREZ, R., *IAEA Intercomparisons for Individual Monitoring of Photon Radiation 1987-1998*. Radiat. Prot. Dosim. **96**(1-3), 143-150 (2001).