

REVIEWS

Meeting

XXII Symposium of Yugoslav Radiation Protection Association

XXII Symposium of Yugoslav Radiation Protection Association was held in Petrovac at Sea from September 29 to October 1, 2003. The Symposium was organized by Yugoslav Radiation Protection Association, VINČA Institute of Nuclear Sciences (Radiation and Environmental Protection Laboratory), Belgrade, and Center for Ecotoxicological Research of Montenegro, Podgorica.

Eighty scientists and experts, as well as all the institutions from Serbia and Montenegro covering the field of radiation protection, participated in the Symposium. At the opening of the Symposium there were present: Mr. Slaviša Simić, who greeted the participants on behalf of Prof. Dr. Andjelka Mihajlov, Minister of Natural Resources and Environmental Protection of the Republic Serbia, Mr. Radojica Pešić, Deputy Minister of Sciences, Technologies and Development of the Republic Serbia and Ms. Nada Mugoša, Deputy Minister of Spatial Planning and Environmental Protection of the Republic of Montenegro.

There were 89 papers accepted for the Symposium presented as oral lectures and in poster sessions. All the papers were published in the Proceedings of the Symposium.

The Symposium had the following sections:

general problems in the field of radiation protection,
legislation,
terrain decontamination and remediation,
reactor decommissioning,
dosimetry and instrumentation,
measuring methods of ionising radiation,
radioecology,
radiobiology,
radon and construction materials,
radiation protection in medicine, and
non-ionising radiations.

In the numerous highly qualitative presentations, there were several ones standing out due to their deep comprehension of the radiation protection basic principles and their overall contents. They are described in the following text.

At the opening of the Symposium, in the invited lecture titled "Evolution of the basic radiation protection concept from the tolerance to the controllable dose model", Marko Ninković (VINČA

Institute of Nuclear Sciences) gave a review of key events in the process of development of radiation protection philosophy during the 20th century: definition of the first tolerance dose, taking into account stochastic effects as a turning point in the establishment of standards for radiation protection approach at the beginning of 50's, acceptance of LNT – hypothesis and ALARA concept in the mid-70's, and finally, strengthening and completely new recommendations in the beginning of the 90's.

In the paper "Characteristics of the low-level underground laboratory of Institute of Physics in Zemun" a group of authors, R. Banjanac, V. Udovičić, A. Dragić, D. Joković, J. Puzović, and I. Aničin, Institute of Physics, Zemun and Faculty of Physics, University of Belgrade, show that only low-level underground laboratory in Serbia and Montenegro has existed for six years. They present its description and purpose as well as the main background characteristics. For example, the measured radon concentration in it is of the same level as the one achieved in the B Hall of the well-known laboratory with low natural radiation level in Gran Sasso, and the cosmic radiation intensity has been reduced to the level expected for the laboratories of this profile. The natural radiation level in the laboratory is constant and nondependent on the radiation changes in the atmosphere or in the ground in the vicinity of the laboratory, which is a basis for the fundamental research as well as for practical measurements of low activities.

In the field of radiobiology, the authors G. Joksić, S. Petrović, and B. Djurović from the VINČA Institute of Nuclear Sciences, Belgrade, and Military Medical Academy, Belgrade, in the paper "Incidence of micronuclei in lymphocytes depends on apoptotic potential of leucocytes" evaluate the portion of white blood cell dying via apoptosis in conditions of occupational exposure to ionizing radiation, for the purpose of which the group of radiologists was chosen. The relationship between those biological endpoints in the exposed as well as in the control group was evaluated. The results of this examination demonstrated significantly depressed apoptotic potential of leucocytes followed with significant increase of micronucleated lymphocytes.

A group of researchers, T. Andjelić, P. Vukotić, M. Kovačević, R. Žekić, S. Savić, and A. Mišurović, from Center for Ecotoxicological Research of Montenegro, Podgorica, Faculty of Mathematics and Sciences, University of Montenegro, Podgorica, VINČA Institute of Nuclear Sciences, Belgrade, and Navy of Serbia and Montenegro, in the paper "Types of the sites at Cape Arza contaminated with depleted uranium and results of decontamination" describe six types of the sites at Cape Arza, Montenegro, where dosimetric survey has in-

dicated possible ground contamination with depleted uranium as a consequence of the NATO airplanes struck on May 30, 1999. In total, 637 such sites have been examined and 486 of them have been found really contaminated. After 220 effective working days at the terrain, the expert team of 10 to 15 members finished dosimetric survey and decontamination work. About 200 kg of highly contaminated (10^4 - $3.5 \cdot 10^6$ Bq/kg) and about seven tones of low radioactive material were removed. In this way, Cape Arza has been successfully decontaminated to the level less than twice higher than the maximum local natural background.

In the field of radiation protection in medicine, the authors O. Ciraj-Bjelajac, S. Marković, and D. Košutić (VINČA Institute of Nuclear Sciences, Belgrade), in the paper "Patient doses in radiological examinations of upper gastrointestinal tract" have assessed the patient doses for barium studies of upper gastrointestinal tract undertaken in a two-month period in 2003 in two hospitals. A total of 56 adult patients were analyzed. Kerma-area product for each patient was measured using transmission ionization chamber. It was shown that the contribution of fluoroscopy to the total dose was greater than from radiography, and the potential for dose reduction was discussed.

Within the poster session entitled Reactor Decommissioning, several papers concerning the decommissioning of the RA reactor in VINČA Institute were presented for the first time. Among others, there were: "Experimental approach to the RA reactor radiological characterization for decommissioning purposes" by V. Ljubenov and M. Milošević, "The necessity of record management system establishment for the decommissioning of RA reactor" by M. Steljić and V. Ljubenov, and "The options for decommissioning of research nuclear reactor RA at Vinča" by Ž. Vuković.

The conclusions of the Symposium were the following: the research in the field of radiation protection should be intensified taking into consideration the achieved experiences and actual current problems in this field. Special attention should be paid to the future decommissioning of the RA reactor in VINČA Institute and to the problem of radioactive waste disposal. New regulations, effective and easily applicable, which should be in accordance with the European Union, should be adopted.

Milojko Kovačević

Romanian Nuclear Energy Events

Between October 22 and November 20, 2003, the Romanian Nuclear Energy Association (AREN) in co-operation with Romanian Nuclear Forum Association (ROMATOM) organized a series of public presentations within the Romanian Nuclear Energy Days. In 2003, there were several events, as follows:

(a) On October 22-25, 1995, AREN, in collaboration with the University "Politehnica", Bucharest, and ROMATOM organized the 6th International Symposium on Nuclear Energy – SIEN'03. The Symposium is held regularly each two years. Recent meetings took place in Bucharest in 1999 and 2001.

SIEN'03 gathered a lot of experts and enjoyed a large participation: there were 95 papers and about 125 participants from Romania and abroad. The papers were presented within the following sessions:

Session 1: Nuclear power prospect,
Session 2: Nuclear power operation,
Session 3: Nuclear engineering and research,
Session 4: Young generation – nuclear knowledge management, and
Session 5: Public acceptance.

Organized for the first time as part of the Conference on Energy – Environment – CIEN 2003, and dedicated to new trends in the nuclear power area, SIEN 2003, a traditional event of the Energetic Faculty, Bucharest, called together the expert community in the nuclear field. The event was open for everybody interested in scientific, technical, economical, and financial issues arisen by nuclear power evolution in the present background, out of which we mention the following:

- new nuclear technologies,
- finding ways of boosting the national nuclear programs, and
- strengthening public trust in nuclear power.

Mr. Sami Tulonen, on behalf of Dr. Peter Haug, the general secretary of ENS and FORATOM, submitted the paper "Nuclear energy's status and its prospects in an enlarged EU".

World Nuclear Association – WNA was also represented by Mr. Adrian Collings, director of policy development, who talked about "The world nuclear university (WNU) and its role in the future development of nuclear energy".

Mr. Teodor Chirica, the general secretary of ROMATOM, declared: "In Romania, nuclear power has become a real fact since we joined the nuclear countries club"... "We have a share of 10% of the country electricity generation with a target of 25% within the interval of time between the years

2011-2015. We supply a safe, nonpolluting and competitive energy and all these due to the efforts made by the company operating the Cernavoda NPP, but also due to the support of the educational, design and research infrastructure and, last but not least, due to the industrial infrastructure – heavy water, mining and uranium processing, machine building industry and construction contractors"..."I am optimistic that the presentations, debates and discussions will lead to important conclusions and recommendations to be considered in the plans for improving the future life not only in our country, but also in the European community and at the global level."

Mr. Collings declared at the end of the Symposium: "The impressions I have gained during the three days are very favorable. I have been struck forcibly over the past days by the extent to which the nuclear industry in Romania is outward-looking, by the strong international orientation and by the willing openness to new ideas"..."I leave the Symposium with one lasting impression – of an industry with a real sense of purpose and direction, and an industry that is fully committed to and confident about its future."

Participants also took part in the joint concluding session and contributed to general review of the Symposium, initially prepared by chairpersons of the technical sessions. Proceedings of the Symposium were issued as a CD ROM publication and distributed to participants.

Post Symposium technical tours were organised to visit the "Cernavoda" nuclear power plant and the nuclear fuel plant in Pitesti.

(b) In the year of 2003, the 9th Contest and the Exhibition of Drawings prepared by children from 6 up to 17 years old occurred. The contest was organized in the age group levels. On November 4, within a ceremony, ROMATOM awarded a special prize for the best drawing "In the beginning there was the Atom". The different artistic teams of the Palace of children performed a very attractive program for the participants. The members of Children's hydro biological society offered a big surprise, as well, organizing a contest on the subject "What do we know about nuclear energy?" The exhibition had great success, proving that nuclear energy is a field of interest for the young generation.

Mihaela Stiopol

Radioactive Waste and Spent Fuel Management

The International Conference on Radioactive Waste and Spent Fuel Management was held on November 6-8, 2003, in Plovdiv, Bulgaria. Under the patronage of the Minister of Energy and Energy Resources of Bulgarian Government, the Conference was organized by the Bulgarian Nuclear Society (BgNS), together with the European Nuclear Society, Nuclear Regulatory Agency, Bulgarian Atomic Forum, the Kozloduy Nuclear Power Plant, Plovdiv University, and numerous domestic nuclear research institutes, engineering and construction companies. The Conference events were actively coordinated by George Geoshev, the vice president of BgNS, as the program committee chairman, and by Prof. Krassimira Ilieva, the president of BgNS, as the organizing committee chairman.

More than 100 participants, mostly from Bulgaria, but also from the Balkan Region, Europe, and Russia, attended the Conference. During two days, they presented their papers in the following sessions:

- Regulatory and fuel cycle possibilities for radioactive waste management optimization,
- Treatment of radioactive waste,
- Disposal of radioactive waste – research and practice,
- Investigations of ground and water contaminated with radionuclides,
- Spent nuclear fuel management,
- Nuclear knowledge and skills for human health, and
- Poster session.

Some of the interesting oral presentations will be mentioned here in short.

In the invited lecture, Session 1, titled "Comparison of the strategies for the management of spent nuclear fuel and long-lived radioactive waste in European countries", M. Dutton (UK) gave a review of the COMPAS project. The main purposes of the project were: (a) to compare strategies that had been adopted by the waste management organizations of 15 countries in both west and central Europe for the handling of spent nuclear fuel and long-lived radioactive waste; (b) to determine which issues affected key decision points in the management of the fuel and materials in both the short- and long-term aspect, and (c) to identify the key aspects of the process leading up to a successful selection of a repository site.

In the paper "Long-lived radioactive waste minimization in nuclear power systems with closed nuclear fuel cycle", P. Alekseev (Russia) discussed the final repository problem in the frame of (a) low cumulating rates of long-lived dangerous radionuclides and (b) reduction of these radionuclides by transmutation.

The systems of nuclear energy with nuclear fuel cycle closed by heavy metals were considered and equilibrium amounts of long-lived radioactive wastes were calculated.

B. Kalchev (Bulgaria), in his paper "Some aspects during decommissioning of RAW treatment facility located at Kozloduy NPP site", Session 2, analyzed the main features during the decommissioning RAW treatment facility which provided and guaranteed safe and effective activities with radioactive materials and minimized their influence on the environment. Those aspects included decommissioning concept, radiological inventory, radiation protection, RAW management, materials realize below licensing clearance level, main activities and systems needed during the decommissioning.

In Session 3, I. Mele from ARAO – Agency for Radwaste Management, Slovenia, in the paper "Disposal plans and activities in Slovenia", presented the disposal plans and activities including the site selection procedure with the methods and tools used in different phases of the process. She pointed that the Slovenian Parliament had adopted recently the amendment of the new Act on the ionizing radiation protection and nuclear safety requiring that the disposal facility for low and intermediate level waste should be available by 2013. The possible new boundary conditions set for the national disposal project by the joint disposal program between Slovenia and Croatia were also discussed.

J. Vaclav from Nuclear Regulatory Authority, Slovakia, in his paper "Spent fuel management in the Slovak Republic", stressed that the interim spent fuel storage facility in Jaslovske Bohunice was commissioned in 1988, and during 1997-2000 was subjected to a reconstruction and seismic upgrade. Moreover, the basic engineering of the interim spent fuel storage facility construction began at Mohovice nuclear power plant in 2001.

In Session 6, Nuclear knowledge and skills for human health, very attractive lectures were given by the domestic lecturers: G. Vassilev ("Radiation safety in XXI century"), T. Hadjieva ("Principle ALARA in diagnostics and treatment by ionizing radiation"), and V. Hadjidekova ("Micronucleus frequencies in radioactive waste repository workers").

Poster session covered a broad range of themes: gamma-spectrometric analyses of low radioactive waste, simulation of nuclear power plant (NPP) loss of water transient, clearance norms for waste metals from NPP, investigation of natural gamma-radiation on NPP site, backscattering of low energy photons, alpha-spectrometry problems, and others.

During a short break of this extremely intense Conference, the participants had a very nice opportunity to relax for a while by visiting the old Plovdiv, placed on the fascinating, beautiful hills and justly called "the jewel of Thracia".

Rodoljub Simović

International Conference on Research Reactor Utilization, Safety, Decommissioning, Fuel, and Waste Management

International Conference on Research Reactor Utilization, Safety, Decommissioning, Fuel, and Waste Management, was organised by the International Atomic Energy Agency (IAEA) and hosted by the Government of Chile through the Nuclear Energy Commission of Chile in Santiago, from November 10th to 14th, 2003.

These types of conferences are regularly organised by the IAEA every three to four years. Recent meetings along these lines were the following: the International Symposium on the Utilization of Multipurpose Research Reactors held in Grenoble, France, in October 1987, the International Symposium on Research Reactor Safety, Operations, and Modifications held in Chalk-River, Ontario, Canada, in March 1989, the International Topical Seminar on Management of Ageing in Research Reactors held in Geesthacht near Hamburg, Germany, in May 1995, the International Seminar on Enhanced Utilization of Research and Test Reactors held in Mumbai (Bombay), India, in March 1996, and the International Symposium on Research Reactor Utilization, Safety, and Management held in Lisbon, Portugal, in September 1999.

The objective of this conference in Chile was to foster the exchange of information on current research reactor concerns related to safety, operation, utilization, decommissioning and to provide a forum for reactor operators, designers, managers, users and regulators to share experience, exchange opinions and to discuss options and priorities.

For more than 50 years research reactors have played an important role in the development of nuclear science and technology. They have made significant contributions to a large number of disciplines as well as to the educational and research programmes of about 70 countries worldwide. About 675 research reactors have been built to date, out of which some 278 are now operating in 59 countries (86 of them in 38 developing IAEA Member States). Altogether over 13,000 reactor-years of cumulative operational experience has been acquired during this remarkable period. As required by its Statute, the IAEA has been promoting the exchange of scientific and technical information related to the utilization and safety of research reactors for many years. Periodical seminars, symposia, and conferences that the IAEA has convened on this topic have been the major avenue for this exchange.

Nowadays, the research reactor community is facing a number of significant issues, in particular those related to utilization, safety (operational and regulatory), decommissioning, fuel cycle and waste management. The continuing interest in these topics and in a wide range of additional issues has indicated the need to convene the international conference in Chile on a broad range of research reactor topics in order to exchange experiences and views, discuss priorities in future efforts and promote co-operation.

The Conference programme was structured as follows:

- an opening session,
- technical sessions in which invited and contributed papers were presented,
- parallel poster sessions, and
- a concluding panel discussion session.

The opening session was chaired by representatives of the Government of Chile, the Nuclear Energy Commission of Chile and by IAEA officials. Mr. T. Taniguchi, Deputy Director General for Nuclear Safety and Security of the IAEA, gave a keynote address to the participants. Mr. Taniguchi pointed out to the following challenges that stood before the Chile conference in the field of nuclear safety and security:

- anticipated comments on the last revision of the Code of Conduct which is expected to be accepted by the IAEA Board of Governors in March 2004. The Code of Conduct will become the fundamental document of the IAEA for Member States in nuclear safety of research reactors;
- need to effectively deal with unique issues associated with fuel management in research reactors, organised through the RERTR (Reduced Enrichment for Research and Test Reactors) Programme, US Acceptance Spent Fuel Programme and Tripartite Initiative (IAEA, Russian Federation and USA) for establishing a similar programme in the Russian Federation;
- the provision of adequate physical protection for all nuclear materials, radioactive materials and facilities as the key priority to increase public safety and security against rising forms of global terrorism, and
- better utilisation of research reactors based on regional joint programmes that will allow efficient approach to decommissioning of old and underutilised research reactors with IAEA support.

Technical sessions and poster sessions included about 140 papers – half of which were presented orally on the following topics: (1) Research reactor safety, (2) Utilisation of research reactors, (3) Research reactor decommissioning and waste

management, and (4) Fuel management. About 150 participants from nearly 50 countries attended the Conference.

A technical tour of La Reina Nuclear Research Centre near Santiago was organised and the research reactor and a proton cyclotron were visited during the Conference.

During the concluding panel session participants took part and through discussion and comments contributed to the enhanced version of draft recommendations of the Conference, initially prepared by chairpersons of the technical sessions. Some of the accepted and supported recommendations to the IAEA and research reactor community countries are to:

- Continue and strengthen support of RERTR and its non-proliferation goals;
- Support development and qualification of new, high-density fuels;
- Support repatriation of research reactor fuel to the country of origin;
- Promote regional and international solutions for the back-end of the research reactor fuel cycle;
- Initiate and support regional and interregional programmes for enhanced utilisation of research reactors;
- Initiate regional and international networks for knowledge preservation and experience sharing;
- All countries with at least one research reactor should adopt the Code of Conduct;
- Have a strong, independent regulatory body and relevant legal basis;
- Strengthen physical security of research reactors and fuel cycle facilities including transportation;
- Establish strategic planning for promotion of the regional Centres of excellences;
- Establish timely planning and funding for decommissioning of research reactors;
- IAEA has experts and will provide full set of safety documents for decommissioning and waste management including dissemination and transfer of information, knowledge and technology; and
- The only safe and *final solution* for spent nuclear fuel disposal for small countries without nuclear programme (*e. g.* Serbia and Montenegro) is to ship spent nuclear fuel back to the country of origin.

The full text of recommendations and conclusions of the Chile conference will be published together with the papers presented by the IAEA as a TECDOC in the form of CD ROM in near future.