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Note by the Secretariat

Providing for the Application of the Agency's Safety Standards: Activities during 2003

**A Report supporting the
Nuclear Safety Review for the Year 2003**

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Providing for the Application of the Agency's Safety Standards: Activities During 2003

A. Introduction

Article III.A.6. of the IAEA Statute authorizes the Agency to “establish...standards of safety...and to provide for the application of these standards” to its own operations, to assisted operations, to operations under bilateral or multilateral arrangements (at the request of the parties), and to any of a State's activities (at the request of that State).

In 2003, an Integrated Safety Approach (ISA) was developed to ensure the integration of the IAEA Safety Standards and all aspects for the provision for their application. The ISA considers the feedback from the experience with the application of the IAEA Safety Standards and the lessons learned from all related activities. Special attention is given to establishing and maintaining a knowledge database and networking as a means of knowledge sharing and creation of new knowledge.

This note presents the Agency's activities in 2003 related to the application of Safety Standards both with respect to its own operations and in Member States.

B. Providing for the application of the Agency's safety standards to its own operations

The Agency routinely monitors the occupational exposure of all staff and external experts who might be exposed to radiation as a result of their work for the Agency. A total of 548 Agency staff were monitored routinely (monthly) during 2003, along with 1308 other individuals monitored on an ad hoc basis. The latter group includes Technical Co-operation (TC) experts and participants in Agency training courses and missions. The external dosimetry laboratory processed about 13 000 dosimeters covering whole body and extremities. The whole body counter laboratory performed 363 measurements for fission products and 351 measurements for actinides in lungs. About 700 urine samples were analysed by gamma, alpha and beta spectrometry.

A quality management system (QMS), based on ISO 9001 and ISO 17025, has been developed for all operational services carried out within the Agency's radiation monitoring and protection laboratories. During the last quarter of 2002, an internal audit of the QMS was carried out. All laboratories were audited for compliance with several requirements of the ISO 17025 standard. Improvement possibilities were identified and are already being implemented. A management review of the System was also performed to analyse all achievements, difficulties and deficiencies in the implementation process. Several items were revised, including supplier evaluations, handling of complaints, customer feedback, staff training needs and budget. In addition to ensuring the quality of the services provided by the Agency, the QMS is intended to become a model for Member States. Implementation of the

QMS started in June 2002, with a view to achieving accreditation during the 2004–2005 programme cycle.

Overall during 2003, personal doses were kept to the expected low values, laboratories involved in the radiation practices under review maintained satisfactory working conditions, and no radiological incidents that could have hindered operations were reported. All support activities were carried out in full compliance with the Agency's Radiation Protection Rules and Procedures, and the International Basic Safety Standards (BSS) for Protection against Ionizing Radiation and for the Safety of Radiation Sources.

The Radiation Protection Committee has undertaken a fundamental review of the arrangements relating to radiation safety in the Agency. The motivation for the review was the need to ensure that the arrangements were fully consistent with the Agency's current safety standards, as required by its Statute. In its review, the Committee considered both the organizational aspects and the actual requirements for radiation safety that should apply within the Agency

The Committee's proposals, which covered the organizational arrangements for safety and the regulations to be followed by users of radiation sources are being implemented.

C. Thematic action plans

C.1. National infrastructures for radiation safety

The International Conference on *National Infrastructures for Radiation Safety* was organized by the Agency, hosted by the Moroccan Government at the University of Mohammed V (Agdal Rabat), and held in September 2003 in co-operation with the International Labor Organization (ILO), World Health Organization (WHO), European Commission (EC) and Nuclear Energy Agency of the Organization for Economic Cooperation and Development (OECD/NEA). The Conference brought a large representation of senior government officials, decision makers, experts and national counterparts dealing with radiation and waste safety programmes and activities in Agency Member and non-Member States. In total, 346 participants and 37 observers attended from 108 countries (including 11 non-Member States). The International Commission on Radiological Protection (ICRP), International Organization for Standardization (ISO), Pan American Health Organization (PAHO) and International Radiation Protection Association (IRPA) were also represented.

Last September, the IAEA General Conference, through GC(47)/RES/7, welcomed the findings of the Morocco Conference, and requested the Secretariat to convene a group of experts to advise the Secretariat on their implementation. In response to this Resolution, the Secretariat is convening a Technical Meeting on March 2004 to formulate an international action plan.

C.2. Safety of radiation sources and security of radioactive material

Following the International Conference on the Safety of Radiation Sources and the Security of Radioactive Material held in Dijon, France, in September 1998 (the Dijon Conference), the Board approved the Action Plan for the Safety of Radiation Sources and the Security of Radioactive Materials (Attachment 2 to GOV/1999/46-GC(43)/10). This 'Action Plan' and its subsequent amendments provided the platform for the development of – inter alia – the Code of Conduct on the Safety and Security of Radioactive Sources (the Code) and a 'Categorization of Radioactive Sources' (IAEA-TECDOC-1191).

Following the International Conference of National Regulatory Authorities with Competence in the Safety of Radiation Sources and the Security of Radioactive Materials held in Buenos Aires in December 2000, the Action Plan was revised and was subsequently approved by the Board (Attachment to GOV/2001/29-GC(45)/12). The revised Action Plan called for the Secretariat to consult Member States on their experience in implementing the Code and to review how the Categorization was being used. The effectiveness of the Code was, therefore, reviewed at a series of meetings of technical and legal experts and the provisions relating to the security of sources were strengthened in the light of the events of 11 September 2001. A draft revised Code was made available to the Board of Governors and the General Conference in an IAEA document issued in August 2002, while recognizing that further work was needed, especially in relation to the scope of the Code.

As a result of the International Conference on Security of Radioactive Sources, Vienna, March 2003, (the 'Hofburg Conference'), the Action Plan was updated and was subsequently approved by the Board (GOV/2003/47-GC(47)/7) and endorsed by the General Conference. The revised Categorization was published in July 2003 (IAEA-TECDOC-1344), and it formed the basis for the Scope of the Code. Consensus was reached on the Scope and the revised text of the Code in July 2003, and it was presented to the Board in September 2003 (GOV/2003/49-GC(47)/9).

The revised Code was approved by the Board and in resolution GC(47)/RES/7, the IAEA General Conference welcomed the Board's approval and endorsed the objectives and principles set out in the Code, while recognizing that the Code is not a legally binding instrument. It urged each State to write to the Director General that it fully supports and endorses the Agency's efforts to enhance the safety and security of radioactive sources, is working toward following the guidance contained in the Code and encourages other countries to do the same. By the end of 2003, Argentina, Bulgaria, Morocco, Ukraine, United States of America and United Kingdom had formally written to the DG, and as of January 2004 so had Canada, France, Norway and Turkey. The Code was published by IAEA in January 2004 (IAEA/CODEOC/2004).

Work currently in progress includes the developing of practical guidance on how to import/export radioactive sources in accordance with the Code; and the converting of the Categorization of Radioactive Sources into a Safety Standard.

C.3. Radiological protection of patients

In September 2002, in resolution GC(46)/RES/9.A, the IAEA General Conference endorsed the decision of the Board of Governors to approve the International Action Plan for the Radiological Protection of Patients. A Steering Panel comprising a group of senior experts in various fields was established for the purpose of keeping the various activities of the Action Plan under review, maximizing synergy and minimizing duplication. Within the implementation of the Action Plan, the following activities were carried out:

Three practice-specific guidance documents were finalized and are planned for publication in 2004. The documents refer to application of the International Basic Safety Standards to the three main areas of application of radiation in medicine, namely diagnostic radiology and interventional procedures using X rays, nuclear medicine and radiotherapy. The guidance documents contain the contributions of the World Health Organization (WHO), the Pan American Health Organization (PAHO) and the international professional bodies in these areas.

Three standard syllabuses and packages for training in the application of international basic safety standards in the same three main areas were finalized. In the light of feedback from a number of training courses and workshops to train trainers and from WHO, PAHO and the relevant international professional bodies, the standardized training packages have been revised. These modules were used to train trainers in an interregional workshop in Antalya, Turkey and in six regional training courses.

In addition, two regional workshops were held for disseminating information on accidental medical exposures in radiotherapy and for using the lessons learned to prevent similar accidental exposures in future.

A document on the methodology of surveying patient doses and image quality for establishing guidance levels for diagnostic examination was prepared and will be used and tested in an upcoming project in ten Latin American Member States on the same subject. Pilot projects on image quality improvement and patient dose reduction have been launched in a number of other Member States in Europe and West Asia.

Research was carried out in a number of areas, which require investigation of specific radiation protection problems in order to obtain the knowledge that is necessary to provide guidance and specific training material. These issues were: avoidance of unnecessary dose to patients while transitioning from analogue to digital radiology, dose reduction in computed tomography while maintaining diagnostic confidence and avoiding unnecessary dose in interventional radiology. An additional programme on exploring the possibility of establishing guidance levels for interventional procedures, initiated in 2002, provided first results in 2003, from a pilot study on interventional cardiology procedures. These results indicate that it may be feasible to establish guidance levels for the diagnostic part of the procedure but that the therapeutic part of it may require the guidance levels to be multiplied by complexity factors. The next and last meeting of this research project is planned for early 2005.

In summary, 2/3 of the Action Plan is in an advanced stage of implementation and the remaining actions are being started in 2004, in cooperation with the relevant international organizations and professional bodies.

C.4. Exposure to Enhanced Natural Radiation in the Workplace

The United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) estimates that occupational exposure to natural sources of radiation accounts for more than 80% of the worldwide annual collective dose from occupational exposure. The control of occupational exposure to natural sources of radiation is a complex issue because of the presence of natural radiation in all workplaces. The International Basic Safety Standards (BSS) for Protection against Ionizing Radiation and for the Safety of Radiation Sources contain the basic requirements to be fulfilled in all activities involving radiation exposure, including exposure to naturally occurring radioactive material (NORM). In support of these requirements, a Safety Guide on *Occupational Radiation Protection in the Mining and Processing of Raw Materials* and a Safety Report on *Radiation Protection against Radon in Workplaces other than Mines* were completed in 2003.

Following recommendations made at a Technical Committee Meeting held in May 2001, the Agency is establishing more practically oriented guidance and supporting activities tailored to particular NORM industry sectors, including the development of sector-specific Safety Reports targeted at regulators and operators/users. These various Safety Reports will in turn lead to the development of training material for the industry sectors concerned. During 2003, the drafting of Safety Reports on the zircon/zirconia and phosphate industries continued, and a Safety Report on the oil and gas industry was finalized. In addition, a training package for the oil and gas industry was developed, and an Africa Region training course for this industry was held in Nigeria.

A need has also been identified for practical guidance on the establishment of national systems of control over exposures to natural radiation, taking into account the very wide range of exposure scenarios and the necessity for pragmatism — that is, for radiation protection to be optimized to ensure that the degree of regulatory attention given to any particular situation is commensurate with what can be realistically achieved. A start was made in 2003 on the development of a Safety Report on this topic.

C.5. Occupational Radiation Protection

An *Action Plan for Occupational Radiation Protection*, based on the findings and recommendations of the first International Conference on Occupational Radiation Protection, held in Geneva in August 2002, has been developed in co-operation with the International Labour Office (ILO) and reviewed by the organizations involved in the Geneva Conference¹. It was approved by the Board of Governors on 8 September 2003. The overall objective of the action plan is to focus the efforts of the relevant international organizations, in particular, the Agency and the ILO, to assist their Member States in establishing, maintaining and, where necessary, improving programmes for the radiation protection of workers. Implementation of the proposed actions will strengthen international efforts in nine high-priority areas identified as areas of major concern by the Conference. To ensure the successful implementation of this action plan, the Agency and the ILO have agreed to establish a Steering Committee having a general remit to advise on and monitor the practical implementation of the action plan.

C.6. Radioactive waste management

The action plan on the safety of radioactive waste management developed after the March 2000 International Conference on the Safety of Radioactive Waste Management held in Cordoba and approved by the Board in September 2001 has been modified in the light of the findings of the International Conference on Issues and Trends in Radioactive Waste Management held in Vienna in December 2002. The Board of Governors received a progress report on the implementation of the original action plan in September 2003 and at the same time approved the new plan. The modified plan contains actions on the following topics: a common framework for radioactive waste management and disposal, assessment of the safety implications of extended storage of radioactive waste, safety standards on geological disposal, harmonized approach for removing materials and sites from regulatory control, systematic programme for application of Agency waste safety standards, transfer of knowledge to future generations, the broader social dimensions of radioactive waste management, policies for control of discharges to the environment and management of spent sealed sources. The original seven items of the action plan have been slightly modified in some cases and the last two items have been added following the Vienna Conference.

An action plan on decommissioning has been developed with the help of national experts based on the findings of the International Conference on Safe Decommissioning for Nuclear Activities held in Berlin in October 2002, which were reported to the Board in September 2003. The Action Plan aims to assist Member States in systematic planning and decommissioning of nuclear facilities in compliance with internationally agreed safety standards and recommendations. The Plan covers safety and technological aspects related to the magnitude of decommissioning, safety assessment, decommissioning of research reactors, financial mechanisms, management of decommissioning waste, etc. The draft action plan was reviewed by the Agency's Technical Group on Decommissioning (TEGDE) in late 2003 and the revised plan has been sent to Member States for comments prior to being prepared for submission to the Board of Governors for approval in 2004.

¹ The Conference was hosted by the Government of Switzerland, co-sponsored by the European Commission (EC) and held in co-operation with the World Health Organization (WHO) and the Nuclear Energy Agency of the Organization for Economic Cooperation and Development (OECD/NEA) and also with the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR), the International Commission on Radiological Protection (ICRP), the International Commission on Radiation Units and Measurements (ICRU), the International Electrotechnical Commission (IEC), the International Radiation Protection Association (IRPA) and the International Society for Radiology (ISR).

C.7. Safety of research reactors

In Resolution GC(45)/RES/10.A, adopted in 2001, the IAEA General Conference endorsed a decision of the Board to request the Secretariat to develop and implement, in conjunction with Member States, an international research reactor safety enhancement plan. This plan includes a survey of the safety status of research reactors in Member States, preparation of a Code of Conduct on the Safety of Research Reactors, and exploration of possible means to strengthen the system for monitoring research reactor safety. Most of the responses to the survey were received in 2002. The few additional responses received this year have not provided any information that would change the conclusions. In particular, the level of concern over the safety of shut down research reactors, without plans for resuming operation or for decommissioning, has been reduced. This is because most such reactors are located in States having good regulatory supervision and some are in extended shutdown for valid reasons, such as major modifications. A document summarizing and analysing the survey responses was released in February 2003 and posted on the Agency Web-site.²

The Code of Conduct on the Safety of Research Reactors is a key part of the plan. The Code is a non-binding, stand-alone, international legal instrument. The purpose of the Code is to achieve and maintain a high level of safety in research reactors through enhancement of national measures and international cooperation. The Code provides guidance to States regarding development and harmonization of policies, laws and regulations. In addition, it includes recommendations for 'best practices' in the management of research reactor safety. The technical provisions of the Code are based on international consensus documents, primarily IAEA Safety Fundamentals and Requirements. Since the Code provides guidance to States, regulatory bodies and operating organizations, it is expected to support decision-makers in all of these organizations. The draft Code will be submitted to the Board for its consideration at the March 2004 meeting.

Several mechanisms are available to monitor the safety of research reactors. The most extensive safety assessment is the Integrated Safety Assessment of Research Reactors (INSARR) mission, which addresses all aspects of operational safety. Other Agency review missions, such as the International Regulatory Review Team (IRRT) provide information on the regulatory control of research reactors, as do the special purpose missions that address specific issues. In addition to the primary missions, follow-up missions are used to assess progress and verify implementation of recommendations. A total of 12 missions were conducted in 2003.

In order to make efficient use of the limited resources available to monitor the 26 research reactors under project and supply agreements the following actions have been taken:

- Research reactors declared as decommissioned but still having project and supply agreements (located in Finland, Japan, Spain, Uruguay and Venezuela) are not monitored.
- Priority is given to monitoring research reactors in countries that do not have independent and/or well-established regulatory bodies.
- Whenever possible, a safety review mission is included in a Technical Co-operation (TC) project for reactors under agreement. All safety review missions are conducted with an intent to conduct a follow up mission about two years later.
- The Secretariat is planning to host periodic meetings of all countries with research reactors under agreement to exchange information on utilization and operational experiences. In addition, these meetings will support the Agency's collection of updated information on the safety status of these facilities and the

² <http://www.iaea.org/worldatom/Programmes/Survey/survey2.html>

Agency's evaluation of performance indicators. The first of such meetings is planned for 2005.

- The research reactors under agreement will receive performance indicators at the beginning of 2004 and will be requested to provide updates of the values every 12 months. Together with the data, Member States will be requested to send comments on the performance indicators. The results of this exercise will be presented and discussed during the meeting planned for 2005.
- In the last two years, the Agency conducted either INSARR or specific type missions to 13 out of the 21 project agreement research reactors that are still in operation, and various communications were maintained with the operators of the remaining eight reactors.

The International Conference on Research Reactor Safety, Utilization, Fuel Cycle, Waste Management and Decommissioning, was held from 10-14 November 2003 in Santiago, Chile. The Conference addressed several challenges currently facing the research reactor community and made recommendations to the research reactor operators and regulators and to the Agency. These include to support conversion from high to low enriched fuel and repatriation of spent fuel, to initiate Regional and International Networks for knowledge preservation and sharing of experience and expertise, to carry out regional strategic planning for utilization and the promotion of regional "centres of excellence", to improve physical security at research reactors and research reactor fuel cycle facilities, to adopt the "Code of Conduct" for the operation and utilization of research reactors and to charter a new Technical Working Group, with a long-term time horizon of 2025 or 2030, to look at the projected needs for Research Reactors on a global and regional basis.

D. Providing for Safety Assistance

More than 160 safety-related TC projects were in operation during 2003, amounting to a total budget of about US\$ 18 million. 66% of this amount involved topics in the fields of radiation, transport and waste safety. The remaining 34% was related to the safety of nuclear installations.

The following brief summary mainly addresses regional and interregional TC projects. In addition, there are national projects on a wide range of safety-related issues.

D.1. Safety of nuclear installations

National Technical Co-operation projects have addressed topics related to the safety of Nuclear Power Plants (NPPs) and research reactors. The scope of these projects includes safety review missions, expert advice and training activities. Topics addressed include seismic, siting, and design safety, fire safety, operational safety, deterministic and probabilistic accident analysis, and accident management. In addition, assistance was provided to Member States that operate WWER NPPs in the fields of design basis reconstitution, use of analytical tools in support of operational safety, analysis of severe accidents and accident management, safety assessment of component replacement and implementation of periodic safety reviews, necessary for a safe management of long term operation situations. Regional Technical Co-operation Projects supplemented the national projects in the areas of safety assessment and strengthening of Regulatory infrastructure and effectiveness. The individual activities are reported under chapter 6 of this report.

D.2. Radiation, transport and waste safety

For several years, a substantial part of the Agency assistance in the radiation and waste safety fields has been delivered through the Model Project(s) on upgrading radiation safety infrastructure. This was originally a single interregional project, then five regional projects, and now comprises 11 regional projects, 2 each for 4 regions and 3 for Africa.

There has been an ever-increasing demand from Member States for support and assistance in providing for the application of the Agency's standards through mainly the Model Projects on upgrading radiation protection infrastructure. The total number of Member States participating in one or both of these projects in their region has increased from 54 by December 2000 to 89 by December 2003, and are based on comprehensive information provided by peer review missions, project monitoring, expert missions and the co-ordination and planning meetings with participating Member States.

The progress on the implementation of the Model Projects is monitored through a new methodology quantified through performance indicators covering the five milestones³ of the projects. This methodology is based on comprehensive information provided by peer review missions, project monitoring, expert missions and the co-ordination and planning meetings with participating Member States. The status of the implementation of the Model Projects, as of September 2003, for milestones 1 and 2 was presented in the GOV/INF/2003/19 (30 October 2003). The performance indicators presented in this document reflect the new assessment methodology. According to this assessment tool, it is concluded that 41 participating countries (47%) have achieved principal requirements for attaining milestones 1 and 2. Specifically, these requirements have been met by 12 countries in the Africa region (40%), 6 in East Asia and the Pacific (50%), 10 in Europe (50%), 7 in Latin America (50%), and 6 in West Asia (50%). Substantial parts of activities relating to milestones 3, 4, and 5 are still to be implemented by most of the participating countries. Furthermore, tools are still being developed for the appraisal of the progress made in the areas of medical and public exposure control, as well as in the development of national plans for response to radiological and nuclear emergencies.

During the International Conference on National Infrastructures for Radiation Safety held in September 2003, participants agreed that the Model Projects had succeeded in helping many countries to establish appropriate laws and regulations, and to empower regulatory authorities to authorize and control practices involving radioactive sources. However, they further agreed that significant additional work is needed. The Model Projects have promoted a common understanding with regard to the need for sound radiation safety frameworks and strong regulatory authorities. It was also agreed that assistance should be provided to Member States and, with the use of extrabudgetary resources, to countries, which have not yet joined the Agency. At the same time, the conference participants recognized that the structure of the Model Projects, established nearly 10 years ago, needs to be adjusted in the light of security concerns and of recent developments such as the creation of a new categorization of radiation sources and the formulation of a revised code of conduct on the safety and security of radioactive sources.

³ Milestone 1: "The establishment of a regulatory framework"

Milestone 2: "The establishment of occupational exposure control"

Milestone 3: "The establishment of medical exposure control"

Milestone 4: "The establishment of public exposure control"

Milestone 5: "The establishment of emergency preparedness and response capabilities"

The achievements of the Model Projects were also recognized by the Member States during the 47th Regular Session of the General Conference (15–19 September 2003). This was reflected, inter alia, in a resolution on Measures to Strengthen International Co-operation in Nuclear, Radiation and Transport Safety and Waste Management (GC(47)/RES/7, paragraphs A.16, A.20, B.7 and B.8).

Peer reviews of the effectiveness of regulatory infrastructure were conducted during 2003 in the following States participating in the Model Project: Algeria, Nigeria and Zambia in Africa; Cyprus, in Europe; Guatemala, Paraguay and Uruguay, in Latin America; Vietnam, in East Asia; Qatar, Saudi Arabia and Yemen, in West Asia. Of the 89 Member States currently in the Model Projects, 44 had been peer reviewed by the end of 2003.

Decommissioning and waste storage

Two training courses have been provided regarding the decommissioning of the shutdown research reactor at the Vinca Institute in Serbia and Montenegro, one on the basics of decommissioning and the other on project management. Assistance has also been provided in developing the decommissioning plan and associated safety related documents. Initial steps in the characterization of the facility have been taken to plan the survey and ensure necessary equipment is available to perform the survey.

Safety of Borehole Disposal

A report has been published on the related safety aspects of borehole disposal, which is being used to develop safety standards guidance. A project is underway under the TC supported African Regional Cooperative Agreement for Research, Development and Training related to Nuclear Science and Technology (AFRA) programme to develop a standardized borehole design for use in the African region, which will accommodate radionuclide inventories typically found in countries within the region, a generic approach to safety and licensing and mechanisms to apply the generic approach in practice.

Rehabilitation of Mining and Mill Tailings and Radioactive Waste Management

The Agency reviewed the status and provided recommendations on measures for improvement of safety and future Agency technical cooperation for the Republic of Tajikistan in the following areas - regulatory infrastructure for nuclear and radiological activities; radioactive waste storage and disposal within the country; uranium mill tailings and the mill tailings facilities at Taboshar and Chkalovck; and decommissioning activities associated with the uranium ore processing facility at the Vostokredmet enterprise.

Legal Framework on Radioactive Waste Management and Decommissioning

The Agency has also provided technical assistance to the competent authorities in China on development of the national legislation, specifically, regulations on radioactive waste management and decommissioning to complement the new Atomic Act. The support also addressed safety assessment for existing and new near surface disposal facilities and planning for decommissioning of the research reactor close to Beijing.

Environmental assessment

Following a preliminary assessment in 1991 of the radiological impact of former nuclear test sites in Algeria on the surrounding population, expanded activities have been agreed for a more rigorous assessment including groundwater monitoring and more detailed evaluation of the surface and subsurface contamination. The expanded activities are scheduled during 2004.

Semipalatinsk Test Site

Assistance is being provided to develop an assessment plan for the entire site to ensure collected data would be compatible with future needs.

Dnieper Basin

In frame of the UNDP-GEF Dnieper River Basin Environment Programme under the TC project RER/9/074, the Agency has completed in 2003 its assessment of radioactive contamination of the area located in Belarus, Ukraine and Russia. The first major project output is completion of the Transboundary Diagnostic Analysis (TDA). The Agency team has contributed to this task by carrying out a scientific assessment of data on radioactive contamination in the Dnieper River Basin and its radiological consequences. To gather information, members of the assessment team undertook fact-finding missions and participated in workshops. The project will be completed in 2004 by the development of the Strategic Action Plan for the Dnieper River Basin.

Highly-enriched Uranium Fuel

As part of a tripartite effort (IAEA, Russia and USA) to reduce the amount of highly-enriched uranium in reactor fuel available world wide, fresh fuel in Eastern European countries is being returned to Russia. During 2003, the Agency's missions to Bulgaria and Romania have facilitated the return of the fuel. In both cases, the Agency's Transport Regulations were the main standards used. As required by the Regulations, the Agency ensured that the appropriate authorizations and certifications were obtained, the correct packages were used, the conditions of transport were optimized and worker exposures were minimized.

E. Extrabudgetary Programmes

E.1. Extrabudgetary Programme on the Safety of Nuclear Installations in the South East Asia, Pacific and Far East Countries

The first phase of the Extrabudgetary Programme (EBP) was completed in 2003. The EBP's objective is to assist China, Indonesia, Malaysia, Philippines, Thailand and Vietnam to enhance safety of nuclear power plants and research reactors, and to strengthen their legal and governmental safety infrastructures.

France, Germany, Japan, Korea, Republic of, Spain and the USA provided cash and/or in-kind contributions for the implementation of the EBP.

The project scope included safety review missions, expert missions and regional and national training events.

Over one hundred fifty (150) specific activities have been undertaken since the programme was initiated in 1997.

Substantial progress was demonstrated by the participating countries on enhancing safety awareness and on the implementation of safety improvements in their nuclear installations and on strengthening national regulatory infrastructures.

Training events have been instrumental to prepare a new generation of experts in the region and to establish national sustainable education and training programmes. In that regard, a focused train the trainers course has been delivered.

The second phase of the programme, to start in 2004, aims at consolidating nuclear safety infrastructures and maintaining a continuous process of safety enhancement of nuclear installations. Central to the programme is strengthening safety communication and networking among participating countries.

E.2. Extrabudgetary Programme on Accident Analysis and its Associated Training Programme for RBMK-1000 NPPs

The Accident Analysis and Associated Training Programme for the RBMK 1000 Kursk 1 NPP was specifically designed to contribute towards enhancing the RBMK accident analysis capability at the plant. The second phase of the programme focused on the development of a computer-based Integrated Training and Accident Analysis System (ITAAS) was completed in 2003. ITAAS provides a software and hardware tool for comprehensive, integrated accident analysis, safety analysis and technical training for use at NPPs, technical support organizations, utilities, regulators, and other industry organizations. The system is based on the advanced RELAP5-3D© code; and a Russian version of the training module on the use of RELAP has been incorporated. In November 2003, the system was delivered to the Kursk NPP and associated training of the staff conducted.

E.3. Extrabudgetary Programme on Long Term Operation of Pressurized Water Reactors

In May 2003, the Agency initiated the Extrabudgetary Programme on safety aspects of long-term operation (LTO) of pressurized water reactors (PWRs). The Programme's objectives are to assist those Member States considering LTO of PWRs and WWERs in how to effectively reconcile the multitude of related processes and practices and how to establish a general LTO framework, and to provide those Member States with a forum for open exchange of relevant information. In particular, the following outcomes are anticipated:

- Reviewing existing national approaches, practices and experience that need to be considered during LTO decision-making;
- Developing guidance for regulators on the identification of applicable safety criteria and on the establishment of guidelines for plant operators' LTO licensing submittals;
- Providing guidance for plant operators on the processes and practices needed to support safe LTO.

The Programme activities will be implemented through 4 Working Groups (dedicated to general LTO framework; mechanical and material components; electrical and I&C components; and structures and structural components) guided by the Programme Steering Committee. Bulgaria, Czech Republic, Finland, France, Hungary, Russia, Slovak Republic, Spain, Sweden, Ukraine, U.K., the USA, as well as, the European Commission and WANO are supporting and participating in this 3 - 4 year Programme.

F. Promoting Safety Related Education And Training

F.1. Safety of nuclear installations

In 2003, 10 training courses, 5 seminars and 37 workshops were conducted in the areas of basic nuclear safety, safety assessment, regulatory control, operational safety, siting and design and research reactors. The regions covered by these training activities included Europe; South East Asia, Pacific and Far East Countries; Latin America and Africa. Complementary to these training activities the Agency directed substantial efforts towards assisting Member States in the establishment of sustainable national education and training programmes, consistent with international safety standards.

Essential elements of these efforts are: the identification of Member States needs, the development of standardized training material, the use of distance learning tools and the training of the trainers.

Identification of Member States Needs

The Agency now offers review and advisory missions on education and training for nuclear safety. Upon Member State request, the review will provide an evaluation of the Country's education and training programmes relevant to nuclear safety and advice on improvements. The first such missions were conducted during 2002 to Indonesia, Malaysia, Thailand and Viet Nam, and a similar activity was conducted in China organized as a workshop. New guidelines were created in 2003 based on the experience gained.

Development of Standardized Training Material

Standardized training material, consisting of guidelines on course organization and commented lecture viewgraphs were prepared for several technical areas of nuclear installation safety. 6 new courses, consistent with the guidance provided in the IAEA Nuclear Safety Standards, were finalized in 2003. They address areas where the IAEA has been requested repeatedly to provide training such as: Probabilistic Safety Assessment, Safety Documentation for Research Reactors, Management of Operational Safety and Safety Assessment of NPPs to Assist Decision-Making. Upon request, materials for 11 courses are available, including textbooks and workbooks for the Basic Professional Training course and for the course on Regulatory Control of Nuclear Power Plants..

Use of Distance Learning Tools

The increased access to computers in the workplace has stimulated the development of computer-based training packages. Current training packages were created as hypertext modules and as multi-media material with synchronized video and PowerPoint presentations. In 2003 a new series of multi-media materials dedicated to the IAEA Safety Standards was initiated and ten titles were created on recently issued safety guides. Of the 51 titles available about 3900 CD copies were distributed to Member States in 2003.

Training the Trainers

A train-the-trainers course was conducted at the Argonne National Laboratory, USA, in 2002. The four-week course covered most of the topics important to the safety of nuclear power plants and research reactors and was based on the Standard Training and Distance Learning Materials. Some Member States used the materials provided in this course to conduct national level training courses and workshops in 2003. Examples include the National Basic Professional Training courses and the Ageing Management for Research Reactors and Core Calculation courses organized in Indonesia.

Radiation and waste safety

Strategic Plan for Education and Training in Radiation, Transport and Waste Safety

A strategic plan on Education and Training in Radiation and Waste safety was endorsed by General Conference resolution GC(45)RES/10C in 2001. Resolution GC(46)RES/9C of September 2002 urged the Secretariat to continue implementing the strategic plan for a sustainable education and training programme. As part of the strategic plan 'Steering Committee for Education and Training representing, Regional, Collaborating and National training centres and International Organisations' was formed in 2002 with a remit to advise on policy development, the maintenance of the Agency's training programme and the monitoring of the long term action plan in education and training.

A considerable amount of work has been undertaken in 2003 in pursuance of the strategic aims for education and training. This work, which has been undertaken by Agency staff, has focused on a range of key issues, including the development of an inter centre network mechanism, the creation of training modules, and the ongoing development of the various mechanisms of training provision (e.g. on-the job training, e-learning, appraisal system). The key milestones for 2003, the development and

provision of train the trainers courses, and the development of training packages, were successfully achieved.

Training events

The increase of training events on waste safety during the last few years has been continued in 2003. Upon request of Member States, the Agency has organized and delivered eleven training events – seven workshops and four training courses. These events were organized on a regional or national basis in the areas of general aspects of waste management, safety assessment for near surface disposal facilities, decommissioning of nuclear facilities, and radioactive discharges. Over 450 specialists from over 52 Member States in Europe, Africa, and East Asia took part in these events and presented and discussed safety, technological and legal aspects of importance to safe management of radioactive waste in their countries, and provided useful feedback on the application of Agency safety standards by both regulators and operators.

Development of training material on radioactive waste management

Following the resolution GC(44)/RES/13 (2000), of the General Conference in 2000 the Agency has been developing reference training material on radioactive waste management. The material aims to assist the Agency and Member States in delivering consistent and comprehensive training on safety and technological aspects of waste management in compliance with the up-to-date Agency safety requirements and guidance and supporting documents. The training material, comprised of thirty modules, covers general aspects of waste management (such as waste classification, legal and regulatory framework, monitoring, quality management); management of waste prior to disposal; disposal, management of materials with naturally occurring radionuclides, disused sealed sources, restoration of contaminated sites; Joint Convention and Agency safety standards and supporting documents. The first draft of the material is being finalized to be tested in the regional, national and post-graduate training events scheduled in 2004. The module on safety assessment for near surface disposal was approved by the Training Committee in November 2003 and the remaining modules are planned to be finalized by the end of 2004.

Inter Centre Network

Networking is considered essential to facilitate implementation of action plans at the working level and to improve the effectiveness of the training centres. There are three categories of Agency training centres: regional, national and collaborating training centres. It is vital for the success of the Agency's training programmes that these centres do not operate in isolation. The establishment of a network to facilitate communication and information exchange would ensure that this does not occur, and it could play an important role in harmonizing the training courses and improving their quality.

Networking broadly means that partners come together to achieve an overall goal, for example the harmonization and sustainability of radiation protection training by defining a strategy and formulating an action plan. In this sense, the Steering Committee, which consists of representatives of the Agency, of training centres (national, regional), of collaborating institutions and international organizations, can be seen as a network. This, however, does not automatically imply that communication, co-operation and information exchange between the centres takes place at the working level. To achieve this, the creation of an intercentre network (ICN) would serve as an operational instrument of the Steering Committee for achieving its objectives. The ICN would enhance the effectiveness of the centres by improving communication and ensuring awareness of radiation protection training activities worldwide. The objectives proposed a structure for the ICN website and a timeline for its development and implementation have been prepared in 2003.

G. Rendering safety reviews and expert advice

The following provides an overview of safety reviews and missions to provide expert advice conducted in 2003. All safety services are based on the Agency's safety standards and on the results of other activities carried out in the Agency's regular Nuclear Safety Programme. These activities have been conducted in the frame of Technical Co-operation and Extrabudgetary Programmes.

G.1. Infrastructure for safety

The demand for the International Regulatory Review Team (IRRT) service remained high in 2003. During this period, two full scope IRRT missions were performed (a full scope IRRT in Pakistan and a full scope follow up IRRT in Bulgaria). In addition, three follow up IRRT missions were performed in Hungary, Switzerland and Finland. A follow up IRRT mission is scheduled for Armenia in 2004. These missions have identified four main issues:

- lack of resources of the regulatory body,
- competency and training of regulatory body staff,
- staff succession planning and
- the need for both internal and external regulatory guidance.

The first issue regards not only the number of personnel in the regulatory body, but also the availability of appropriate facilities and adequate funding arrangements. Regulatory bodies must have the ability to recruit and retain suitable numbers of appropriate personnel. The level of remuneration provided to those personnel by the regulatory bodies should be relatively consistent with the remuneration provided to the personnel in the industry being regulated. It appears that remuneration of a regulatory body staff is often significantly lower than that of its licensees' staff.

The second issue includes both initial and ongoing training for regulatory body staff in order to ensure that the appropriate competencies are available and maintained including the need for additional specialised support in the form of a Technical Support Organization.

The third issue is based on observations of a very high age profile of the regulatory body's staff. Such profiles necessitate appropriate succession planning to ensure continuity of adequate regulatory control.

The fourth issue emerges from numerous examples of demands for regulatory bodies to produce a range of regulatory guidance. This guidance should provide assistance to the industry being regulated and make the regulatory process more transparent. In addition, some regulatory bodies need to address guidance to deal with the regulatory processes of inspection, enforcement and assessment. In particular, there have been recurring examples of a need for guidance associated with the nuclear plant's ageing. This includes the need for guidance for licensees and regulators relating to producing and reviewing periodic safety reports.

Furthermore, in some instances there has been a need for introduction of a quality management system to assist the regulatory body in improving overall regulatory performance and to enhance the conduct of regulatory activities such as planned/unplanned inspections and announced/unannounced inspections.

A positive theme has also emerged from the follow up IRRT missions: In general, regulatory bodies have made significant progress in resolving issues raised during the full scope missions.

The Agency also conducts, upon request, review missions specifically related to the infrastructure for radiation and waste safety. Missions can be conducted in combination with an IRRT or separately. The

latter may be of particular interest to States that do not have nuclear power programmes. Similar reviews are used to assess States' progress in achieving the milestones set out in the Model Project on upgrading radiation safety infrastructure.

G.2. Safety of nuclear installations

G.2.1. Site evaluation and design safety

Seismic safety and siting reviews in general continued to receive high attention. Two main activities have been implemented in relation to siting of NPPs: a review mission to the Mochovce (Slovakia) site and a workshop on siting for nuclear desalination plants on Madura Island (Indonesia). Similar tasks, though less comprehensive, have been included in more general safety missions in Egypt (nuclear desalination plant), Indonesia (nuclear power plant) and Thailand (research reactor). These tasks demonstrated a generic trend toward the application of probabilistic techniques in siting facilities. However, the need for additional training in this field to avoid too large uncertainties associated with simplified engineering assumptions was identified. Assistance was also provided to China to review seismic and fire safety of the Qinshan NPP and to Armenia to review seismic upgrading of the Metzamor NPP.

The Agency has received an increasing number of requests from Member States for review and advice on "Long Term Safety Operation of NPPs". One of the specific reviews in this area is the Ageing Management Assessment Team (AMAT) review. Based on a request from the Netherlands, an AMAT was organized and scheduled for February 2004 to review the management of ageing at the Borssele Nuclear Power Plant. The purpose of the AMAT mission is to provide an independent review of (1) the assessment on ageing status of the plant and (2) the utility's ageing management system. In addition, five workshops on long term operation or ageing management were held in Europe (Paris, Bratislava and Rovono) and in Asia (Daya Bay and Mumbai), and four expert missions were sent under Technical Co-operation projects in this category (two to Ukraine, one to Romania and one to Armenia).

Appropriate Design Basis Documentation is a prerequisite in particular also for LTO. Therefore Guidelines for Design Basis Documentation for WWERs was developed as a part of a regional European project. Furthermore, pilot studies for the preparation of a Design Basis Document for a selected system were completed at the end of 2003.

An Agency review mission, focused on technology and safety, was conducted in Jakarta, Indonesia to review the preliminary feasibility study for a nuclear desalination plant on Madura Island. Comments on the draft feasibility study and recommendations for its completion were provided to the National Atomic Energy Authority (BATAN), who prepared a schedule of key activities necessary for completion of the plant by 2005. Recommendations were provided to the safety authority (BAPETEN) regarding identification of the important steps in the licensing process and the timely preparation of necessary safety guidelines.

Two workshops were conducted in Cairo for the El-Dabaa nuclear desalination project. The IAEA Safety Standards were presented and discussed and recommendations were provided to the future operating organization of the plant regarding the preparation of the bid invitation specifications related to safety.

Assistance was also provided to Pakistan and Indonesia on the application of IAEA safety standards for design and construction of desalination plants that use nuclear power plants.

On request by the safety authority, a workshop on Safety Standards and Severe Accident management was held in Islamabad, Pakistan. The Agency's safety standards for design and technical documents related to severe accident and accident management were presented and discussed.

In preparation for the future review of the Iran's Bushehr NPP Final Safety Analysis Report (FSAR), a workshop on the methodology for reviewing the FSAR was organized in Tehran under the Technical Co-operation Programme. The workshop was attended by numerous delegations from the Iranian Operating Organization (NPPD) and Safety Authority (NNSD). Assistance was also provided in the fields of emergency planning, accident analysis and accident management and human factors.

A safety review mission was conducted in Lianyungang (China) to review the safety of the Tianwan NPP start-up without the use of an external neutron source. Advice was provided to perform the safety assessment of the procedures for the first criticality tests.

G.2.2. Operational safety

The Agency's operational safety reviews continue to seek to inform and advise nuclear power plants and regulators on the application of IAEA safety standards at specific facilities and, more generally, within the Member States. Results of the operational safety reviews are fed back into the process to improve future revisions to the safety standards.

Assistance in developing a national 'operational assessment' programme is being provided to China. The project provides opportunities to study operational assessment programming and implementation (as utilized by OSART and PROSPER) and to review various applicable operational assessment programmes in Member States. Training is also being provided for evaluators and team leaders along with expert assistance and guidance in developing and implementing the programme.

Assistance was provided to the Hungarian Atomic Energy Authority (HAEA) regarding its planned improvements in the management of safety, with particular emphasis on the conclusions and recommendations of the IAEA expert mission which assessed the results of HAEA's investigation of the April 2003 fuel-cleaning incident at the Paks NPP. Both the plant and HAEA have confirmed that they needed further Agency assistance as they continue to review and manage this incident and to improve the safety at the facility. A follow up expert mission was carried out at the facility in October 2003 to assist in safety management improvements.

Operational Safety Review Team (OSART)

In 2003, five OSART missions, four OSART follow-up visits and six preparatory meetings were performed. Increased emphasis has been placed on the promotion of effective self-assessment by operating organizations. To this end, a pilot for an enhanced review of operating experience feedback was carried out during the OSART at Civaux NPP in France, and a pilot for an enhanced review of safety culture was done in conjunction with the OSART at Krsko NPP in Slovenia. As part of the OSART, seminars on the OSART methodology were held to assist plant staff, utility staff and regulatory personnel in implementing and enhancing operational safety self-assessment.

The follow-up visits to the Santa Maria de Garona NPP in Spain and the Dukovany and Temelin NPPs in the Czech Republic completed the scheduled OSART programme for all nuclear power plant sites in those Member States.

The OSART activities in France, Spain, Ukraine and China are part of a sustained effort in those countries to use the OSART programme to enhance operational safety at their NPP's. The Agency has also made arrangements with the Government of United States of America to periodically conduct OSART missions, one every three years.

Future requests for OSART missions and follow-up visits in 2004 and 2005 have been received from Brazil, Canada, China, France, Iran, Japan, Netherlands, Pakistan, Slovenia, Ukraine, Romania, the United States and Germany.

Member States. These included workshops and seminars on the OSART methodology, a technical meeting on outage indicators and the above mentioned workshop on safety standards. These activities were developed and presented based on the IAEA Safety Standards for Operations

The overall conclusion gathered from OSART missions is that managers are committed to improving the operational safety and reliability of their plants. The missions identified several examples of good practices in training programmes and management tools, and also made recommendations and suggestions to improve operational safety in staffing programmes. The results of each mission are made available to the nuclear industry and their regulatory authorities through the OSART mission reporting system (OSMIR).

The benefits from the OSART safety reviews are proven by the increasing degree to which follow-up missions find that previously identified issues have been resolved. On average, the rate of resolution of and compliance with the Agency's recommendation at follow-up missions in 2003 remained at 97%.

Overall improvement was observed in the areas of safety management, industrial safety and plant material conditions. Specific improvements were also noted in reporting criteria and analysis of low level events, standards for quality management systems and expanded use of safety performance indicators.

OSART reviews identified opportunities for some nuclear power plants to enhance their operational experience programmes. This would better ensure safe operations and better avoid recurrence of undesirable operating events. In addition, the reviews noted specific areas for improvement including: reporting human factor related events, near misses and industrial safety problems; human related factors in management programmes; safety goal that incorporate human aspects of safety; communication of safety goals; timeliness of root cause analysis for significant events; implementation of appropriate corrective actions regarding safety significant events; and systematic implementation of self-assessment and management indicator programmes regarding the effectiveness of the operating experience feedback processes.

Peer Review of Operational Safety Performance Experience (PROSPER)

The Agency, in consultation with the Member States, has developed the Peer Review of the Effectiveness of Operational Safety Performance and Experience Review process (PROSPER), a revised programme to replace the previous ASSET.

Guidelines for the PROSPER were developed, and during 2003, PROSPER missions were conducted at Metzamor NPP in Armenia, and at the Electricité de France (EDF) corporate headquarters in France.

The PROSPER technique served as the basis for the Operating Experience pilot mission done at Civaux in 2003. During 2004, this enhanced review is scheduled as part of the OSART missions to be conducted at Pickering NPP in Canada and Qinshan-3 NPP in China. The pilot mission was conducted under a new guideline developed for the expanded review of operating experience during OSART missions, and a technical meeting was held in Vienna to review this guideline in light of the results of the OSART review.

Workshops on event analysis, low level events, operational safety management practices, enhancing safety in a competitive environment, changes and modifications and operational assessment were conducted in China, France, Republic of Korea and Slovenia. In addition, an operational assessment visit to Spain and France was conducted in 2003.

G.2.3. Safety assessment

The development of Probabilistic Safety Assessment (PSA) has become a regular requirement for each individual plant in most countries. Since nuclear plant operators and regulators are making greater use of PSA results in combination with deterministic approaches for safety related decisions, there is an international consensus that peer review of a PSA by independent and experienced PSA practitioners, would enhance the quality of the PSA. Consequently, this peer review, similar to that done in International Probabilistic Safety Assessment Review Team (IPSART) missions, would strengthen PSA credibility in supporting safety related decision making during plant design and operation. In addition, the Agency continues to support Member States in the development and use of PSA through the conduct of workshops, training activities and technical meetings. Even though PSA techniques are mature, they continue to evolve to address emergent and more difficult aspects of PSA.

Three IPSART missions, were conducted in 2003 to verify the adequacy of modelling data and important methodology issues stemming from the development of the PSAs for three different types of plants.

Furthermore, the scope differed for the 3 PSAs reviewed. A level 1 PSA, including internal hazards, for Cernavoda NPP unit 1 in Romania, a CANDU reactor; a full scope level 1 and 2 PSA, including internal hazards for all the operational modes, for Temelin NPP, a VVER 1000 reactor in the Czech Republic; and a level 1 PSA for the Chinese PWR NPP Qinshan-1.

The Qinshan NPP IPSART mission was the plant's first IPSART mission. A pre-IPSART mission had been conducted at the Cernavoda NPP in 2001, and a previous mission had been conducted at the Temelin NPP in 1995 – 1996. Since the Temelin NPP's PSA had undergone several updates and the original scope had been substantially increased, the mission in 2003 was not considered a follow-up mission.

In general, the overall quality of the PSAs reviewed during these IPSART missions had increased; this might partially be attributed to the Agency's continuous support. Therefore, the reviews performed are focussing attention on main modelling assumptions, less standardized techniques and input data. Main findings of IPSART missions relate primarily to the adequacy of assumptions and calculations supporting the development of accident sequences, adequacy of data for plant specific PSAs (e.g. initiating event frequencies) and human error methods. Less frequent are now issues related to model quantification and uncertainty calculations. In 2003, requests for IPSART missions to be conducted in 2004 were received from Argentina, Bulgaria, China, Pakistan and Iran. A mission to Sizewell B in the United Kingdom was postponed from 2003 to January 2004.

In response to increasing activities in Member States towards consideration of severe accidents in design and operation of nuclear power plants, which are in line with the IAEA Safety Requirements on Design and Operation, the Agency is now offering new Safety Review called Review of Accident Management Programme (RAMP). Based on the experience from the pilot review mission to Krsko NPP in 2001, the final guidelines for the Safety Review have been published in 2003. The review is intended to perform an objective assessment of the status in various phases of RAMP implementation, compared with international experiences and practices. The elements reviewed include the establishment of the team, selection of strategies, safety analyses required, evaluation of the plant systems performance, development of procedures and guidelines, staffing and qualification of associated personnel, and training needs. RAMP is considered as a complementary safety review to OSART missions.

G.2.4. Safety of research reactors

In 2003, three Integrated Safety Assessment of Research Reactors (INSARR) missions were conducted at the Dalat Research Reactor in Vietnam, the TRR-1/M1 in Thailand and the LVR-15

research reactor in the Czech Republic. In addition, one Pre-INSARR was conducted in the Czech Republic at the LVR-15 reactor, which included a visit to the LV-0 critical facility and the VR-1 training reactor at the Czech Technical University in Prague. One follow-up INSARR was done at the Maria Research Reactor in Poland.

The Agency also conducted missions on research reactor safety including those related to Project and Supply Agreements. During 2003, expert missions visited research reactors in Uzbekistan, the Philippines, Malaysia, Iran, Vietnam, Libya and Portugal. Follow up missions to the Bandung and Kartini Research Reactors in Indonesia have also been conducted.

National projects on research reactor safety were initiated in Europe (Portugal and Romania), Africa (D.R. of Congo, Libya and Nigeria) and West Asia (Uzbekistan and Iran) to address specific safety issues. These issues included the establishment of competent regulators and operators, refurbishment of reactor systems, and introduction of quality assurance programs. Additional, new national projects covering research reactors safety issues are being considered for the 2005-2006 cycle.

G.3. Radiation, transport and waste safety

In addition to the service providing peer reviews of radiation safety infrastructure (see section above), the Agency offers safety review and advisory services on request in relation to occupational radiation protection (ORPAS), emergency preparedness, the safety and security of radioactive sources, safety assessment of radioactive waste management and decommissioning. These services are normally tailored to the particular needs of the requesting State.

The appraisal of a State's transport operations has become one of the necessary tools for assisting States in discharging effectively their regulatory responsibilities. During 2003, two TranSAS missions were completed - to Panama and Turkey - and a mission in preparation for a full TranSAS mission to France to be carried out in 2004 took place. TranSAS missions have previously been provided to Brazil, Slovenia and the United Kingdom. Thus two of the States (France and the United Kingdom) requesting appraisals have large international nuclear and radioactive material programmes and activities, and two others (Panama and Turkey) contain international waterways through which such shipments may pass. It is the Secretariat's intention to publish, subject to the agreement of the State concerned, full mission reports of each appraisal for the purpose of ensuring greater transparency and fostering constructive and soundly based technical discussion. The General Conference⁴ commended those States that had already made use of TranSAS and encouraged other States to avail themselves of TranSAS missions.

TranSAS missions to Turkey and Panama took place, respectively, from 3-14 March and 9-20 June 2003. The Secretariat intends to publish the reports of these missions, subject to agreement in 2004. During 2003, it published the report on the TranSAS mission to Brazil, which took place in April 2002. These missions have been welcomed by the General Conference and, in resolution GC(47)/RES/7C, the GC looks forward to the TranSAS mission to France which is currently planned to take place in 2004. Initial preparations for this mission are underway. The resolution, as with previous resolutions, commends those Member States that have already made use of TranSAS and encourages them to put into effect the recommendations and suggestions and encourages other Member States to avail themselves of the service.

New near surface disposal facility in Australia

International peer review is being organized upon request of the Australian government and aims to provide advice to the national regulator body (ARPANSA) on the safety case for a new national near

⁴ In resolution GC(47)/RES/7

surface disposal facility submitted to the regulatory body as part of the license application for construction of this facility in South Australia.

Decommissioning plan for the BN-350 NPP in Kazakhstan

The Government of Kazakhstan submitted a draft decommissioning plan for the decommissioning of the BN-350 Nuclear Power Plant located in Aktau, Kazakhstan, to the Agency for an international peer review. A review panel of 4 experts with expertise in various facets of decommissioning was assembled. After a careful review of the submitted documentation, a visit to the reactor site and discussions with the responsible personnel, a report was submitted to the Kazakhstan Atomic Energy Committee for their consideration. The plan will need modification to ensure it meets international standards and the Kazakhstan Government has requested the Agency to provide technical assistance.

H. Fostering safety related information exchange

H.1. Conferences and other meetings

International conferences and other major meetings have been organized by the Agency in co-operation with other international organizations. These events are reported throughout this Note under the relevant thematic area and in Note 6, Safety Related Events and Issues Worldwide during 2003, and include *inter alia*:

- International Conference on Security of Radioactive Sources, March 2003, Vienna (Section 3.2)
- International Conference on National Infrastructures for Radiation Safety, September 2003, Morocco (Section 3.1)
- International Conference on Research Reactor Safety, Utilization, Fuel Cycle, Waste Management and Decommissioning, November 2003, Chile (Section 3.7)
- International Conference on the Safety of Transport of Radioactive Material, July 2003, Vienna (Section on Transport of Radioactive Materials in Note 6, Safety Related Events and Issues Worldwide during 2003)

Furthermore, a symposium on ‘Seismic Evaluation of Existing Nuclear Facilities’ was organized in Vienna on 25-29 August 2003. The symposium provided an important forum for the exchange of experiences and confirmed the need for an international safety standard.

Findings and recommendations from these events were used to develop and/or review action plans and to fine tune on going programmes of work.

H.2. Publications

Publications under the safety standards series are reported on Note 7. Therefore, this section only addresses other safety-related publications in 2003.

A methodology for the safety assessment on innovative reactors was developed and the TECDOC-1366 “Consideration on the development of safety requirements for innovative reactors: Application to modular high temperature gas cooled reactors” was published.

A Technical Meeting with the participation of delegates from 16 Countries explicitly addressed the development of probabilistic hazard for external events, clarifying methods and procedures and providing proper guidance for the implementation of the safety recommendations issued in the recent

review of the IAEA Safety Guides. The conclusions have been collected in a technical document for future reference.

A technical meeting on Outlines of design guidelines dedicated to innovative reactors was held in Vienna. A draft guidance to developing technology neutral safety requirements was prepared.

Routine reviews of nuclear power plant operation (including modifications to hardware and procedures, significant events, operating experience, plant management and personal competence) and special review following major events of safety significance are the primary means of safety verification. Along this line, the Agency published Safety Guide on Periodic Safety Review of Nuclear Power Plant (No. NS-G-2-2.10).

Configuration management is the process of identifying and documenting the characteristics of a facility's structures, systems and components of a facility, and of ensuring that changes to these characteristics are properly developed, assessed, approved, issued, implemented, verified, recorded and incorporated into the facility documentation. A configuration management system is necessary for the long-term operation of any nuclear power plant. For this purpose, IAEA-TECDOC on "Configuration management in nuclear power plants" was also published (TECDOC-1335).

Two Safety Reports were published in the area of deterministic safety analysis for nuclear power plants. These Safety Reports address design features of two individual reactor types, pressurized water reactors (PWRs) and pressurized heavy water reactors (PHWRs). Specific guidance is given on selection of initiating events and their categorization, selection of acceptance criteria and initial conditions for analysis, as well as on various conservative assumptions for the analysis. These Safety Reports provide complementary information to *Accident analysis for nuclear power plants*, Safety Report No.23 issued in 2002, which was generally applicable to all reactor types.

H.3. Information systems

H.3.1. Information System on Occupational Exposure

The Information System on Occupational Exposure (ISOE) is co-sponsored by the Agency and the OECD/NEA, forming a joint secretariat. A 1993 agreement allows IAEA Member States with operating nuclear power plants and which are not members of the OECD to participate through the IAEA Technical Centre. The ISOE programme offers the world's largest database on occupational exposure from nuclear power plants, which forms the basis for detailed studies and analyses of dose trends. Equally important is its function as a forum for exchanging information on occupational exposure management issues. Following ten years of experience in 2002, an in-depth analysis of the system was performed in 2003.

H.3.2. Incident Reporting System

The Incident Reporting System (IRS), operated jointly with the OECD/NEA, was set up in 1983 to exchange information on unusual events at nuclear power plants and increase awareness of actual and potential safety problems. Over the twenty years the IRS has proved its usefulness as a comprehensive source of information for worldwide operating experience and lessons learned from that experience.

The IRS is an essential element of the mechanism for providing feedback of international operating experience for nuclear power plants. It ensures proper reporting and feedback of safety significant events in the nuclear power plants for the international community, so that the causes and lessons learned can be disseminated widely. In this way, the IRS plays an important role in contributing to the prevention of occurrence or recurrence of incidents. The information provided through IRS is also

useful for making improvements in design, operational procedures, organizational aspects and human factors in NPPs.

Activities within the IRS extend beyond the exchange of IRS reports. The Agency and the NEA have assigned working groups of experts who meet annually and discuss the safety relevance of such events, thus contributing to the dissemination of lessons learned to the international community and to the safe operation of nuclear power plants.

The IRS meeting held in 2003 at the NEA in Paris focused on the reporting rates and possible ways to raise awareness of Member States.

Currently, the system contains more than 3100 reports. In 2003, 71 new reports were received, slightly more than in 2002. Since the reporting rate has been comparatively low in the last few years, the joint Secretariat has taken steps to increase the awareness in Member States for the need for more proactive participation and collaboration including improving the number and timing of events reported. Another measure is the implementation of the reporting system using web technology. It is expected that this shift, which is planned for 2004, will improve the reporting of events.

The number of countries participating in the Incident Reporting System for Research Reactors (IRSRR) has increased from 32 to 38, covering more than 85% of the current research reactor population. The IRSRR Web site was modified this year, allowing access to the public to the introductory page and continuing to provide access to registered users to retrieve reports and provide comments.

The 3rd Coordinators Meeting on the Incident Reporting System for Research Reactors was held from 17-21 November 2003 in Bariloche, Argentina. It was organized by the Agency and hosted by the Government of Argentina through Investigacion Aplicada, Sociedad del Estado (INVAP, S.E.). The meeting of twenty-six participants provided an opportunity to: (a) review the lessons learned from the experience gained in the participating countries; (b) evaluate and communicate events that have occurred at research reactors; (c) discuss improvements of the software for the IRSRR database and the links with the Research Reactors Data Base; (d) provide training in key safety issues; and (e) discuss recent achievements and future actions to further increase the number of participants and reports, and introduce the recent addition of countries to the IRSRR. During the meeting discussions, participants noted that the data from the IRSRR could be used by Member States for: review of Safety Analysis Reports; collection of reliability data for Probabilistic Safety Assessment; Quality Assurance; training of operators, regulators and designers; identification of Postulated Initiated Events; design improvements; and safety culture enhancement.

H.3.3. International Nuclear Event Scale (INES) and Nuclear Events Web-based System

The International Nuclear Events Scale (INES) is used for facilitating rapid communication to the media and the public regarding the safety significance of events at all nuclear installations associated with the civil nuclear industry, including events involving the use of radiation sources and the transport of radioactive materials.

To date, 60 countries are participating in the INES Information Service. The scale was initially applied to nuclear power plants and then extended to any event associated with radioactive material and/or radiation and to any event occurring during the transport of radioactive material. During the recent meeting of the INES Advisory Committee, in October 2003, additional guidance for the rating of transport events, of radiation events and the rating of fuel damage events has been prepared and will be used by the INES National Officers during a trial period. During the 2003 period, 21 events ratings using the INES scale were received, 1 at level 0, 9 at level 1, 10 at level 2 and one event was rated at level 3.

Since 2000 the Agency has developed, with the agreement of OECD/NEA and the World Association of Nuclear Operators (WANO), a Nuclear Events Web-based System (NEWS) aiming to provide fast, flexible and authoritative information on the occurrence of nuclear events that are of interest to the international community. The Nuclear Events Web-based System (NEWS) provides event descriptions, ratings according to the International Nuclear Event Scale, press releases, technical information for experts and the opportunity for experts to contribute to a discussion forum on these events. So far approximately 1000 users are registered in NEWS.

Starting in 2003 the general public has free access through the Agency Website at <http://www-news.iaea.org/news/default.asp> to the INES information (event descriptions, INES ratings and press releases) without registration. Currently, the NEWS site has registered about 1500 hits per month and it is one of the most accessed sites at the Agency.

H.3.4. Emergency Preparedness and Response

In September 2003, the Agency General Conference in its resolution GC(47)/RES/7.A.8 welcomed the decision by the representatives of *Competent Authorities to the Convention on Early Notification of a Nuclear Accident (Notification Convention)* and *the Convention on Assistance in the case of a Nuclear Accident or Radiological Emergency (Assistance Convention)* to establish a regionally balanced National Competent Authorities' Co-ordinating Group (NCACG) and supported the Secretariat's intention, expressed in Agency document GOV/INF/2003/49-GC(47)/9, to facilitate the NCACG's work and to develop, with the NCACG, an action plan. The representatives of these Competent Authorities, together with the Agency Secretariat, started the follow-up to the relevant Agency General Conference resolutions by preparing the basis for the action plan. A meeting between the Secretariat and regional representatives of NCACG was held in December 2003 at the Agency headquarters and a draft of the action plan was produced. This draft will be circulated through the competent authorities for comments and reviewed by a Technical Meeting, in April 2004.

Under the Assistance Convention one function of the Agency is to collect and disseminate to the Member States information concerning methodologies, techniques and available results of research relating to response to such emergencies. In this context the Agency's Board of Governors approved in 2002 a Safety Requirements publication, *Preparedness and Response for a Nuclear or Radiological Emergency*, which establishes the requirements for an adequate level of preparedness and response for a radiological or nuclear emergency in any State. The IAEA General Conference in resolution GC(46)/RES/9 encouraged Member States "to implement, if necessary, instruments for improving their own preparedness and response capabilities for nuclear and radiological incidents and accidents, including their arrangements for responding to acts involving the malicious use of nuclear or radioactive material and to threats of such acts" and has further encouraged them to implement the Safety Requirements for emergency preparedness in response to a nuclear radiological emergency.

To meet these obligations, the Agency published in 2003 a practical document, "*Method for Developing Arrangements for Response to a Nuclear or Radiological Emergency*", (EPR-Method 2003). This document provides information on response to the full range of foreseeable emergencies to include those involving malevolent acts involving radiological dispersal devices (RDD). In addition, this document defined, in terms of activity (Bq), quantities of radioactive material that should be considered dangerous if not controlled. These quantities are being used not only for emergency response but also for the categorization of radioactive sources in the code of conduct on the safety and security of radioactive sources. The Agency has two safety guides under development that will provide further guidance on the implementation of emergency preparedness arrangements that meet the Agency requirements.

The Agency continues to update and develop practical documents that can be implemented immediately by Member States. This includes the development of practical tools for preparing and managing for: a) the response actions of first responders; b) the medical response; and c) media relations during radiological emergencies, including those involving malevolent acts. Practical tools are also being developed on the conduct and evaluation of exercises. Standardized training material is also being developed to support the application of this guidance.

The Agency continued its efforts to effectively make information available to Member States. Through the use of regional training courses representatives from 56 countries received training on the application of Agency guidance for response in 2003. In addition, the Internet has been shown to be a valuable tool in providing information on response with the (EPR-Method 2003) document being viewed more than 30,000 times in one month.

To assist Member States to strengthen and enhance preparedness for response to nuclear or radiological emergencies (particularly given the heightened concern regarding possible malicious acts involving nuclear facilities or radioactive materials) and to allow their authorities to fully integrate into the global arrangements for preparedness and response to emergencies, a two-day *Training Workshop to Raise Awareness of International Practical Arrangements for Response to Nuclear or Radiological Emergencies* was held on 29-30 May 2003 at the Agency's Headquarters in Vienna. This Workshop covered operational issues related with preparedness for response to nuclear or radiological emergencies, focusing in the submission of notifications and emergency information through the Early Notification and Assistance Convention (ENAC) web site and new reporting (EMERCON) forms.

The Agency continues its efforts to exchange information concerning the response to past emergencies with the preparation of reports on accidents in Poland, Bolivia and Georgia.

H.3.5. Networks

Asian Nuclear Safety Network (ANSN)

An Asian Nuclear Safety Network has been established in the same safety Extrabudgetary Programme (EBP) to compile, analyse and share nuclear safety knowledge, information and practical experience among the countries participating at the EBP on the Safety of Nuclear Installations in the South East Asia, Pacific and Far East Countries. In 2003, the ANSN was populated with technical material for nuclear safety education and training. ANSN hubs have been established in China, Germany, Japan, Korea and USA. Guidance was developed on guidance on data input to harmonize entries from the different hubs, and 4 standardized training courses were made available. Moreover, a textbook on operational safety from EDF was adapted and included in the database in cooperation with this organization. Germany, Japan, Korea and USA have also provided training materials that have been incorporated in the ANSN.

H.4. Dissemination of radioactive waste management practices

The Agency has been developing and disseminating an overview of Member States approaches and practices for waste management. Following the work undertaken in 2000 for the countries of Central and Eastern Europe the Agency has undertaken similar overview for sixteen Member States from the region of East Asia and the Pacific – Australia, Bangladesh, China, India, Indonesia, Japan, Korea, Malaysia, Mongolia, Myanmar, Pakistan, Philippines, Singapore, Sri Lanka, Thailand and Vietnam. It focused on low and intermediate level waste with particular emphasis on disposal activities and facilities.

In addition the Agency is fostering the exchange of information and practices on safety of waste management through the recently established Decommissioning Forum, regularly updated Rasanet Website, development and distribution of Newsletters (e.g. NSRW, ASAM news) and CD-ROM

proceedings of Agency training courses and workshops. The Agency has also been working on promoting the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management and has been strongly encouraged to do so by the Contracting Parties participating in the first review meeting in November 2003.

H.5. Intercomparison Exercises

Pursuant to IAEA General Conference resolution GC(43)/RES/13, the Secretariat organizes international intercomparison exercises for monitoring purposes with a view to helping Member States to comply with dose limits and to harmonizing the use of internationally agreed quantities and assessment methods recommended in Agency standards. An international intercomparison focused on the determination of the activity of alpha emitters in urine samples was finished in 2002. A total of 31 Member States nominated 36 laboratories to participate: the results are very satisfactory and were published during 2003. Two other international intercomparisons are ongoing, dealing with the direct method of activity measurement in the whole body and the determination of radiological quantities in neutron-gamma mixed fields. Two regional intercomparisons are ongoing in Latin America and Asia on the determination of radiological quantities in photon radiation fields.

I. Co-Ordinating Safety Related Research and Development

In 2003, the Agency started a new Coordinated Research Project (CRP) on “Assessment of the Interfaces between Neutronic, Thermal - Hydraulic, Structural and Radiological Aspects in Accident Analyses”. The 3 – year project is devoted to investigation of various aspects of large leakages from the primary to secondary system and includes also analysis of uncertainties. WWER-440 reactor was selected as a reference case for the analyses. Possible hazards resulting from this kind of accidents include radioactive releases to the atmosphere, pressurized thermal shock, boron dilution, loss of integrity of secondary systems and potential of progressing into severe accidents. For these hazards, comparison of results from best estimate calculations and conservative calculations will be performed. Comprehensive information for these accidents will be obtained, allowing independent evaluation of their consequences and counter-measures. Methodology for accident analysis described in the existing Agency guidance documents will be also verified.

The final report of the CRP on Development and Application of Indicators to Monitor NPP Operational Safety Performance is being finalized. The general objective of this was to provide guidance, taking the Agency framework as a reference, for development and implementation of plant-specific operational safety performance indicator programmes. This guidance was to include general instructions on the individual steps needed to develop a particular system of safety performance indicators. During this CRP, the participants were expected to discuss the safety indicator framework proposed in IAEA-TECDOC-1141, analyse its applicability to their plants and define their own plant-specific indicators, including calculation formulas, data collection requirements and procedures for indicator monitoring and use. Based on their experience, the participants were to provide proposals for framework improvements and additions. The related objective of CRP was a proposal of methods for specific indicator selection, evaluation and aggregation to the higher levels of the framework. Within the CRP, supporting software necessary for the indicator system administration and display of the actual indicator conditions was also developed. A final outcome of the CRP was a representative set of operational safety performance indicators based on the framework, including goals and action thresholds, which could be used by NPP organisations worldwide as an example for developing their own operational safety performance indicator systems.

A CRP on seismic issues has been completed in 2003. It covered hazard, design and operational experience, providing exchange of information among regulators, owners and researchers. A final document with the main contributions and conclusions is going to be issued in 2004.

During 2003, the Application of Safety Assessment Methodology for Near Surface Waste Disposal Facilities (ASAM) project launched in 2002 has successfully advanced in the main areas of evaluation of the application of safety assessment methodologies for reevaluation of safety and selection of safety upgrading options; for evaluation of safety in case of disposal of disused sealed sources, and for long-term safety assessment of mining and mill tailings. Common understanding is also being developed on the approach for review of safety assessment for these facilities and also on the main elements of the safety case.

The Environmental Modelling for Radiation Safety (EMRAS) project commenced in 2003 with the main objectives to enhance the capabilities of Member States to model radionuclide transfer in the environment and, thereby, to assess exposure levels of the public and biota in order to ensure an appropriate level of protection from the effects of ionizing radiation, associated with radionuclide releases and from existing radionuclides in the environment. The first meeting was attended by over 80 participants from 24 countries. During the First Combined Meeting the six Working Groups started their operation. The subjects of Working Groups belong to the area of radioactive release assessment; some Working Groups will consider the issues of restoration of sites with radioactive residues. During future meetings, the issue of establishing of a Working Group in the area of protection of the environment will be considered.