Findings and Recommendations of the International Conference on National Infrastructures for Radiation Safety

1-5 September 2003, Rabat, Morocco

Background

The International Conference on National Infrastructures for Radiation Safety belongs to a series of conferences and other activities aimed at implementing international standards for radiation safety and the security of radioactive sources.

In 1994, the IAEA Board of Governors and the corresponding bodies of five other co-sponsoring organizations approved the *International* ***Basic Safety Standards*** *for Protection against Ionizing Radiation and for the Safety of Radiation Sources* (the BSS), which established international requirements relating to, among other things, regulatory frameworks and the safety and security of radioactive sources. The BSS require governments to establish national infrastructures for the proper control of radiation sources, including systems of notification, authorization, inspection and enforcement. Also, the IAEA launched an unprecedented international technical co-operation effort, through ***Model Projects*** *on Upgrading Radiation Protection Infrastructur*e, to help Member States establish national radiation and waste safety infrastructures compatible with the BSS requirements.[1] Through the Model Projects, the IAEA has been implementing a proactive and integrated approach to identifying and meeting Member States' infrastructure needs.
A prerequisite for the approval by the IAEA Board of Governors of technical co-operation projects involving sources of ionizing radiation are effective measures for ensuring "(t)he adequacy of

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[1] The Model Projects were originally conceived as a series of steps which would, when all completed, ensure that all infrastructure features for protection against ionizing radiation and for the safety of radiation sources required by the BSS were present in participating Member States. The scope of the Model Projects is best described in terms of five milestones.
Milestone 1: *The establishment of a regulatory framework* - the most time-consuming activity - involves the drafting and promulgation of radiation protection laws and regulations, the designation and empowerment of a national regulatory authority and the establishment of a system for the notification, authorization and control of radiation sources (including the preparation of an inventory of radiation sources and installations). Attainment of this milestone can be regarded as one of the main indicators of progress by a participating country in meeting Model Project obligations.
Milestone 2: *The establishment of occupational exposure controls,* with individual and workplace monitoring, dose assessments, systematic record-keeping and quality assurance programmes. The effectiveness of the control system is strongly dependent on the soundness of the regulatory framework.
Milestone 3: *The establishment of medical exposure controls* aimed at controlling the exposures of patients in diagnostic radiology, radiotherapy and nuclear medicine. It includes the establishment and implementation of quality assurance programmes.
Milestone 4: *The establishment of public exposure controls* involving programmes for the control and safe disposal of radioactive waste, for the control of consumer products containing radioactive substances, and for environmental monitoring.
Milestone 5: *The establishment of emergency preparedness and response capabilities*, which involves the development of plans and the allocation of resources to ensure the effectiveness of national regulatory authorities and other relevant organizations in dealing with different radiological emergency scenarios.

proposed health and safety standards for handling and storing materials and for operating facilities" in recipient Member States (Article XI.E.3 of the IAEA Statute). Consequently, the Model Projects, in which 88 Member States are now participating, are essential for the peaceful utilization of ionizing radiation in recipient countries.

The *International Conference on National Infrastructures for Radiation Safety* was organized by the IAEA in co-operation with the World Health Organization (WHO), the International Labour Organization (ILO), the European Commission, the Nuclear Energy Agency of the Organisation for Economic Co-operation and Development (OECD/NEA), and the Pan American Health Organization (PAHO).[2]

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[2] Other relevant conferences:
The *International Conference on Occupational Radiation Protection* organized by the IAEA and ILO was held in Geneva in 2002, and led to the formulation of an *Action Plan for Occupational Radiation Protection* which was on 9 September 2003 approved by the IAEA Board of Governors for implementation by the IAEA in co-operation with ILO.
In co-operation with many other international organizations, the IAEA organized the *International Conference on the Radiological Protection of Patients in Diagnostic and Interventional Radiology, Nuclear Medicine and Radiotherapy* held in Málaga, Spain, in 2001. That conference led to the formulation of an *International Action Plan for the Radiological Protection of Patients* which is in the process of being implemented.
In 1998, the IAEA held an *International Conference on the Safety of Radiation Sources and the Security of Radioactive Materials* in Dijon, France. This conference led to the formulation of an initial *Action Plan for the Safety of Radiation Sources and the Security of Radioactive Materials* (in Attachment 2 to IAEA document GOV/1999/46-GC(43)/10). At the same time, the IAEA Board of Governors requested the Director General to initiate exploratory discussions relating to an international undertaking in the area of the safety and security of radiation sources. With such international action in mind, the IAEA developed a *Code of Conduct on the Safety and Security of Radioactive Sources* and a supporting *Categorization of Radiation Sources* (IAEA-TECDOC-1191).
In 2000, the IAEA held an *International Conference of National Regulatory Authorities with Competence in the Safety of Radiation Sources and the Security of Radioactive Materials* in Buenos Aires. The Buenos Aires Conference recommended that States establish strategies for the education and training of regulatory staff, including the on-the-job training of regulators and radiation source users, and that regulatory authorities ensure the continuity of control over radiation sources from manufacture through use to disposal. This conference led to the formulation of a *Revised Action Plan for the Safety and Security of Radioactive Sources* (in the Attachment to IAEA document GOV/2001/29-GC(45)/12).
In May 2001, the IAEA, in co-operation with the World Customs Organization, Interpol and Europol, organized an *International Conference on Security of Materials –Measures to Prevent, Intercept and Respond to Illicit Uses of Nuclear Material and Radioactive Sources*, which was held in Stockholm and which produced a number of results relevant to the strengthening of national infrastructures for radiation safety.
Following the terrorist attacks of 11 September 2001, the IAEA Board of Governors approved a *Nuclear Security Plan of Activities* that included actions relating to the security of radioactive material other than nuclear material and designed to ensure that significant uncontrolled radioactive sources are brought under control and properly secured.
In March 2003, the IAEA held an *International Conference on Security of Radioactive Sources* which produced two major findings:
1) An international initiative should be launched under the IAEA's aegis to locate, recover and secure "orphan" sources.
2) An international initiative should be launched under the IAEA's aegis to help governments establish effective national infrastructures for radiation safety and the security of radioactive sources, including implementation of the *Code of Conduct on the Safety and Security of Radioactive Sources*.

This conference also produced findings relating to the recovery of high-risk sources, strengthening the long-term control of sources, the interdiction of illicit trafficking, roles and responsibilities, emergency response, and public information.
In July 2003, the IAEA published a revised *Categorization of Radiation Sources* (IAEA-TECDOC-1344), which provides underpinning for a revised *Code of Conduct on the Safety and Security of Radioactive Sources* which was on 9 September 2003 approved by the IAEA Board of Governors for implementation within the framework of the IAEA's approved programme.

Findings of the President of the Conference

Major findings and recommendations

1. There was agreement among the participants that the Model Projects had assisted many countries in establishing appropriate laws and regulations and regulatory authorities empowered to authorize and control practices involving radioactive sources, but much more work needs to be done. The Model Projects have promoted a common understanding with regard to the need for sound radiation safety frameworks and strong regulatory authorities. They have also helped to minimize the possibility of illicit trafficking in radioactive materials in participating countries. The key challenges identified in the Conference were: the lack of human and financial resources in participating countries; delays in promulgating necessary laws; and institutional instability. Speakers indicated that, as the Model Projects move forward, there should be greater emphasis on the maintenance of radiation source inventories and on continued capacity-building, and that there was a need for greater political will to implement radiation protection requirements. The Model Project approach, which has proved to be so successful, should continue, with due consideration to the experience gained in the implementation of the Model Projects.

2. Assistance should be provided not only to countries that are IAEA Member States but also to countries that have not yet joined the IAEA, so that all can ultimately have sound infrastructures for the safety and security of radiation sources. A new international initiative under the aegis of the IAEA may be needed in order to accomplish this, with the international community making the necessary extrabudgetary resources available to the IAEA. At the same time, the IAEA Secretariat should continue to encourage countries that are not Member States to join the IAEA, providing them with all necessary information.

3. The Conference recognized that the structure of the Model Projects was created nearly ten years ago and considered whether any major changes were needed in order to accommodate recent developments, the most important of these being increases in concern about the security of radioactive sources, the publication of the revised *Categorization of Radiation Sources* and the approval of the revised *Code of Conduct*. It was recognized that some clarification was needed as to the meaning of the concepts “safety” and “security”; some speakers regarded them as almost synonymous, while others considered them to be different but complementary. Overall, it was concluded that compliance with many of the BSS requirements relating to the safety of sources had increased source security, but that compliance with new requirements in the revised *Code of Conduct* was now necessary. There was strong support for the integration of additional security requirements, especially those emanating from the revised *Code of Conduct*, into the relevant IAEA programmes. At the same time, the opportunity should be taken to emphasize – in activities relating to Milestone 4 - the importance of the safety of radioactive waste management, and particularly the importance of the safe management of Category 1 and 2 sources throughout their lifetime, from manufacture to disposal. In this connection, with many countries storing conditioned radium sources there was a call for the concept of regional disposal facilities for such waste to be re-examined in the light of the new security implications of temporary storage at many different locations. The Conference noted the need to balance transparency requirements for safety and emergency preparedness against confidentiality requirements for the protection of sensitive security-related information. Advice to Member States on how to handle this issue is needed.

4. The key request from all participants was that the IAEA manage the transition of radiation safety infrastructures to sustainability in a positive manner, so that there would be no loss of IAEA

assistance. Preference was expressed for a regional or sub-regional approach, so that the benefits of synergism, harmonization and networking might continue and be increased. Throughout the Conference, emphasis was placed on the importance of networking as an effective means of improving co-operation and fostering an integrated safety approach. Networks can facilitate exchanges of knowledge and experience among regulators, radiation protection personnel and professional societies, helping to create "critical masses" of professionals in individual countries. Also, they can be used for communicating with workers. They can have databases such as the ISOE, they can be primarily scientific, like EURADOS, or they can focus on interactions among groups of specialists fostered through professional societies and the ALARA Networks. Overwhelmingly, networking was recognized by participants as a very effective instrument for enhancing the sharing of knowledge and experience - a key to the prevention of accidents and to implementation of the ALARA concept. Networking can facilitate the transition from dependence to self-sufficiency and sustainability, so it should be promoted and become an integral part of international co-operation. Conference participants noted the importance of the relevant scientific and professional societies in supporting the IAEA's efforts to promote the control of sources. To ensure the sustainability of networks, it is important to create an environment within which they can flourish; they should therefore be adequately supported by international organizations. Existing successful networks should be examined with a view to identifying ways of improving their coverage as regards regions, languages, topics and stakeholder involvement.

5. It was noted that there are various strategies for building and strengthening radiation safety infrastructure, including strategies for education and training in the safety and security of sources. The Conference urged the international organizations concerned to ensure co-ordination in the implementation of those strategies, taking into account activities included in relevant action plans.

Additional findings and recommendations

The additional findings and recommendations of the Conference related to a number of specific areas, as follows:

Improving implementation of the Model Projects

An important issue was the continuity of assistance. Some countries may well in due course meet all the Model Project requirements and "graduate", while some countries have started participating only recently and others will start participating if the plans to extend the benefits of the Model Projects to non-Member States of the IAEA come to fruition thanks to the availability of extra-budgetary resources. Most participating countries, however, are at an intermediate stage, having met some of the Model Project requirements, mainly those associated with Milestones 1 and 2. Given this situation, the importance of continuity was stressed. There will be a need to accommodate "new entrants", it being recognized on the basis of lessons learned from implementation of the Model Projects, regarding - inter alia - the time taken to promulgate enabling legislation or establish regulatory authorities, that the time frame will probably have to extend for 5-10 years after the "new entrants" start participating. As regards "graduating" countries, there will be a need for a mechanism to ensure that the achievements in building adequate safety infrastructures are not allowed to decay. This mechanism could involve, inter alia, regular peer reviews and involvement in regional seminars.

With regard to Milestone 3 (the establishment of medical exposure controls), there already exists in every participating country a strong and highly professional medical fraternity accustomed to

controlling its own standards of behaviour. Thus, in improving safety it is important to inform and involve the medical profession and those working as health physicists. It was suggested that efforts be made to involve international professional organizations such as those which were involved in the Málaga Conference and that the regulatory authority in each participating country foster links with the national bodies of medical professionals.

The Conference noted that progress was slower in workplace monitoring than in individual monitoring. The workplace monitoring programme might benefit from some more specific assistance material such as classification of areas, model local rules, schemes of work, and establishment of investigation levels. Provided that there is a system of inspection in place (which is the case in most participating countries), significant progress could perhaps be made relatively easily by emphasizing these matters in the inspection programme.

While acknowledging that exposures to natural radiation sources may at the moment not be a first-priority issue, the Conference noted that some activities involving naturally occurring radioactive material (NORM) can result in such significant exposures of workers and members of the public that they should not be totally disregarded. In some countries, NORM industries - and radon in workplaces - are the most significant source of occupational exposure.

With regard to the operation of regulatory authorities, interdepartmental co-operation is one of the areas to which not enough attention has been paid. It is now clear that, even if there is a single regulatory authority, strong links must be established with other governmental departments for such matters as control of imports, prevention of illicit trafficking, and emergency response planning.

To accommodate changes related to security and the categorization of sources, the IAEA should make available a standardized format for national registries, using an upgraded version of the Regulatory Authority Information System (RAIS).

Costs of technical services could be reduced through the provision of some technical services on a regional basis. Internal dosimetry and analytical services were mentioned in this connection, and in addition there were calls for efforts to find regional solutions to the problem of managing disused sources.

The IAEA should encourage Member States to incorporate quality assurance into their regulatory infrastructures. The Agency is already issuing quality management guides for regulatory bodies, for radiation users and for service providers.

Member States should develop strategies and action plans for identifying potential orphan sources and locating and establishing control over high-risk orphan sources. Most existing systems for the security of radioactive sources are based on preventing inadvertent access. Given the increased likelihood of malevolent actions carried out by terrorists, Member States should conduct threat reviews and adjust their security measures, drawing on, inter alia, the guidance provided in Annex 1 to the revised *Code of Conduct on the Safety and Security of Radioactive Sources* or the *Categorization of Radioactive Sources* as appropriate.

The safety and security of radioactive sources is a major objective of Model Project Milestone 1, which deals with authorization, inspection, enforcement and the establishment of radioactive source inventories. Every Member State importing or exporting radioactive sources should do so in

a manner consistent with the *Code of Conduct on the Safety and Security of Radioactive Sources*, and transfers of radioactive sources in Categories 1 and 2 should take place only with prior notification by the exporting State and, as appropriate, with the consent of the importing State, given in accordance with its laws and regulations.

The Conference welcomed the development by the IAEA of a two-level scheme for assessing national infrastructures quantitatively, with the generic grading of performance indicators and a set of infrastructure components and assigned parameters that are assessed. Member States were encouraged to perform self-assessments of their safety and security infrastructures, particularly for high-risk radioactive source control. Attention was drawn to the IAEA's recently created *Radiation Safety Infrastructure Appraisal (RaSIA*) service.

Networking

Networking is an effective way for less experienced persons to rapidly improve their knowledge and benefit, through feedback, from the greater or wider experience of others. Networking can also be a very effective instrument for involving stakeholders and increasing their willingness to accept responsibility for the management of radiation safety.

Networking should complement other mechanisms which have proved to be effective for sharing experience, such as co-operation between institutes, conferences and workshops, scientific and expert visits and professional societies. Outputs from networks should be accessible to a large audience and serve as a basis for informing the public, workers and patients. Whenever possible, the outputs should be put into perspective through reference to similar activities involving harmful substances.

The relevant international organizations should, by providing sufficient human and financial resources, facilitate the creation and support the maintenance and improvement of networks. It was recognized that the ingredients for successful networks include the commitment of the participants, the recognition of mutual benefit, a common language, a shared objective, a critical mass, access to appropriate technology and the ability to adapt to the evolution of techniques.

Furtherance of stakeholder involvement

Public confidence in the regulatory process can be promoted by appropriately involving the public and other stakeholders in regulatory decision-making. Member States should integrate public involvement into their regulatory approaches, tailoring it to the significance of the regulatory decisions. The IAEA, in collaboration with other relevant international organizations, should produce and disseminate a document on good practice as regards public involvement in regulatory decision-making.

The relevant international organizations were called upon to analyse stakeholder involvement case studies and disseminate to all countries the lessons learned from them, pointing out what is generic and what is country-related, and to provide guidance on how to implement the existing techniques in specific local and regional situations. Also, they were requested to stimulate "bottom up" approaches as a complement to "top down" procedures and to further support the methodological development and practical applications of stakeholder involvement theory in the radiation safety domain.

Education and training

There is a broad spectrum of radiation applications (energy, medicine, industry, agriculture, petroleum, mining, biological research…), of radiation sources (reactors, accelerators, radioactive sources) and of future activities to be embarked upon by trainees (equipment maintenance, radiology, radiobiology, radiation protection…). Therefore, education and training should continue to be made available in order to meet the diverse needs of Member States through the use of appropriate tools. They should convey understanding of how to use IAEA safety documents such as the BSS and related safety guides.

The IAEA should continue implementing its "Strategic Approach to Education and Training in Radiation and Waste Safety" with the aim of establishing, by 2010, sustainable education and training programmes in Member States. In resolution GC(45)/RES/10.C, the General Conference urged the Secretariat to implement this approach, to strengthen its efforts in this area (subject to the availability of resources), and to assist national and regional training centres and collaborating centres in conducting education and training activities in relevant official languages of the IAEA.

The "train the trainers" concept should continue to be supported, in order to increase the number of skilled people in Member States and thereby promote infrastructure sustainability.

The IAEA should, in accordance with its Strategic Approach, continue helping Member States to organize postgraduate educational courses leading to a diploma in radiation protection, developing and disseminating standardized curricula and modules for specialized training and public education in radiation safety and security, and organizing training courses where needed (when possible in local languages).

A long-term agreement with the IAEA is essential for hosting postgraduate education at regional training centres. Postgraduate educational courses help to create a core of qualified experts in different countries, but in order to create a radiation safety culture it is essential that the qualified experts soon become involved in the training of radiation protection officers. This is not the role of the IAEA, but of the different countries. Nevertheless, in order that sustainability be achieved as soon as possible, the IAEA should, when implementing the Strategic Approach, prepare training packages specifically for radiation protection officers, particularly those working in medicine and industry. The IAEA and Member States should conduct appraisals of radiation safety education and training consistently to help ensure high quality and compliance with IAEA standards.

Member States should educate occupationally exposed workers (such as medical staff, irradiator facility operators and regulators), potentially exposed workers (such as source distributors, police officers, firemen, scrap dealers, customs officers, and border guards), news media staff, and the general public about radiological hazards, radiation protection, radioactive waste safety, the security of radioactive materials, and radiological emergency response.

The IAEA should enlarge its glossary of nuclear, radiation, waste and transport safety terminology, have it translated into all official United Nations languages, and include it in its training packages. The definition of "Qualified Expert" should be clarified with other international organizations in order to meet the need for mutual recognition.

Member States should take advantage of the information in IAEA publications such as *Training in Radiation Protection and the Safe Use of Radiation Sources* (IAEA Safety Reports Series No. 20,

2001) and the Safety Guide *Building Competence in Radiation Protection and the Safe Use of Radiation Sources* (RS-G-1.4).

Emergency preparedness

Member States should ensure that their regulatory bodies and emergency response organizations have the resources necessary for dealing with nuclear or radiological emergencies. Member States should establish adequate arrangements for responding to nuclear or radiological emergencies at the local and national levels, and integrate them with arrangements for response to conventional emergencies.

Member States should adopt legislation that clearly allocates the responsibilities for preparing for and responding to nuclear and radiological emergencies and for meeting the requirements established in the IAEA Safety Requirements document *Preparedness and Response for a Nuclear or Radiological Emergency* (GS-R-2, 2002).

Regulatory bodies and emergency response organizations should organize training exercises for first responders and local officials and co-ordinate public information activities.

Local and national emergency response arrangements should be supplemented by preparations at the international level, which necessarily require a global/regional approach consistent with international standards and the relevant conventions providing for information exchange and the rendering of assistance.

Member States should ratify the Convention on Early Notification of a Nuclear Accident and the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency if they have not already done so. Member States should strengthen their mechanisms for exchanging information and for the rendering of assistance, as stated in IAEA General Conference resolution GC(46)/RES/9.D and as envisaged in those two conventions.

International co-operation

Networking could enhance international co-operation in all aspects of infrastructure development directed towards increasing, through education and training, the number of radiation safety professionals, so that even in small countries there could be a self-sustaining critical mass of such professionals.

The IAEA should continue to facilitate international co-operation in all areas important for radiation safety and security, including information exchange, networking, knowledge management, the provision of assistance by one country to another, the maintenance of international databases, border monitoring, and the disposal or long-term storage of disused sources.

Continuing the series of conferences held in Dijon, Buenos Aires, Málaga, Stockholm, Geneva, Vienna, and Rabat, the IAEA should organize further conferences dealing with radiation safety and security, as information exchange through such conferences is recognized as a highly effective means of improving radiation safety and security in countries facing similar problems and of facilitating the development of action plans and the assignment of priorities.