Radiation and waste safety: Strengthening national capabilities

Through a technical co-operation model project, countries are following an integrated approach for upgrading their safety infrastructures

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For many years, the IAEA has been collecting information on national infrastructures for assuring safety in applications of nuclear and radiation technologies. For more than a decade, from 1984-95, information relevant to radiation safety particularly was obtained through more than 60 expert missions undertaken by Radiation Protection Advisory Teams (RAPATs) and follow-up technical visits and expert missions. The RAPAT programme documented major weaknesses and the reports provided useful background for preparation of national requests for IAEA technical assistance.

Building on this experience and subsequent policy reviews, the IAEA took steps to more systematically evaluate the needs for technical assistance in areas of nuclear and radiation safety. The outcome was the development of an integrated system designed to more closely assess national priorities and needs for upgrading their infrastructures for radiation and waste safety.

The work draws upon the Agency's long record of safety assistance through avenues of technical co-operation and assistance. By its Statute, the IAEA is authorized to establish or adopt safety standards for protection of health and minimization of danger to life and property, and to provide for the application of these standards to its own operations as well as to operations making use of materials, services, equipment, facilities, and information made available by the Agency or at its request or under its control or supervision. The safety standards which are being promoted are the *International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources (BSS)*, the latest revision of which was published in 1996. *(See box, page 32.)* Regarding technical assistance in this field, the IAEA's Statute further requires that the Agency's Board of Governors consider the "adequacy of proposed health and safety standards for handling and storing materials and for operating facilities" before giving approval to technical co-operation programmes.

With this perspective, this article reviews the IAEA's integrated management approach and establishment of a model technical co-operation project to upgrade radiation and waste safety infrastructures in its Member States. The project today involves more than 50 countries.

Project objectives. The concept for the model project was initiated in 1994; however its scope was adjusted and strengthened in management and financial resources for the 1996-97 technical co-operation programme cycle. The aim is to assist countries having an inadequate radiation and waste safety infrastructure so that they are able to comply with the IAEA's safety standards, i.e., the BSS. The project drew upon the findings of RAPAT missions to 64 countries, which had served to increase awareness of radiation safety issues, and upon numerous expert missions on radiation protection undertaken over the past five years.

One of the first actions to implement the project was to define more clearly what constituted an adequate radiation and waste safety infrastructure. This had to be done for different types of radiation applications, ranging from simple industrial and medical uses that exist in every country to the full nuclear fuel cycle that exists in relatively few developing coun-

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tries. The work led to the preparation of a document entitled "Guidance for the assessment of radiation protection and safety infrastructures in developing Member States and strategies for enhancement of infrastructure". It sets out the basic elements of radiation protection infrastructures. These elements include the legislative framework and regulatory structure; the compliance requirements on users; and the requirements for equipment and procedures. In the document, countries engaged in nuclear fuel cycle activities are considered to require a fully developed radiation protection and nuclear safety infrastructure, whereas the requirements for other countries vary with respect to the levels at which they use nuclear and radiation technologies.

During the document's development, consideration was also given to the necessary mechanisms for assessing the infrastructures in each participating country of the model project. Decisions were taken about what was needed to bring each country up to an adequate level, and about how to implement the provision of technical assistance and how to verify results.

The main components of this process, which are included in the document, were to assign officers from the Department of Nuclear Safety and project officers from the Department of Technical Co-operation with integrated responsibilities. Major aims are to collect and evaluate information on the existing safety infrastructure; establish and maintain country safety profiles; formulate and implement country safety action plans needed to rectify weak or non-existent infrastructure elements; monitor the development of improvements in safety infrastructure; and sustain an effective infrastructure and develop it for additional uses of radiation.

It was originally envisaged in 1994 that some five to six countries would benefit each year from the model project. However, material subsequently gathered indicated that more than 50 countries needed assistance. *(See table.)* Hence, programme and management adjustments had to be made, since achieving the objectives under an approach only concentrating on five to six countries per year would require more than a decade. An integrated management approach thus was developed with the aim to achieve adequate national radiation and waste safety infrastructures in most participating countries by the year 2000. In support of the new approach, the Department of Technical Co-operation appointed four "regional field managers" who are posted in Addis Ababa, Ethiopia (for the African group); Beirut, Lebanon (for the West and East Asian group); San José, Costa Rica (for the Latin American group); and Bratislava, Slovak Republic (for the European group).

For all participating countries, assessments have been made to identify their infrastructure weaknesses. These include, for example, inadequate information -— or even a complete lack of information — on the radiation sources in the country, and deficiencies in radiation and waste safety regulations, personnel dosimetry services, and the calibration and state of repair of equipment. Shortcomings were discussed by the regional field managers with national authorities as part of steps to prepare detailed safety action plans. In essentially all of the participating countries, these plans have already been finalized and approved, with their implementation started.

Countries participating in the Model Project to Upgrade Radiation and Waste Safety Infrastructure

Africa	East Asia & the Pacific	Latin America	Europe	West Asia
Cameroon	Bangladesh	Bolivia	Albania	Afghanistan
Côte d'Ivoire	Mongolia	Costa Rica	Armenia	Kazakstan
Ethiopia	Myanamar	Dominican Republic	Belarus	Lebanon
Gabon	Sri Lanka	El Salvador	Bosnia & Herzegovina	Qatar
Ghana	Viet Nam	Guatemala	Cyprus	UnitedArab Emirates
Madagascar		Haiti	Estonia	Uzbekistan
Mali		Jamaica	Georgia	Yemen
Mauritius		Nicaragua	Latvia	Kyrgyzstan*
Namibia		Panama	Lithuania	
Niger		Paraguay	Moldova	
Nigeria			The Former Republic of Macedonia	
Senegal				
Sierra Leone				
Sudan				
Uganda				
Zaire				
Zimbabwe				

*Not a Member State of the Agency

Note: Colombia and Syria have recently requested the Agency to leave and join the Model Project, respectively.

National obligations

It should be noted that the model project presumes that governments and national author-

ities are prepared to comply with their obligations as described in the Preamble of the BSS. This includes the obligation for the government to establish a national infrastructure which shall include *inter alia*:

- an appropriate national legislation and/or regulations (the type of regulatory system will depend on the size, complexity and safety implications of the regulated practices and sources as well as on the regulatory traditions in the country);
- a regulatory body empowered and authorized to inspect radiation users and to enforce the legislation and/or regulations;
- sufficient resources, and
- adequate numbers of trained persons.

The first milestone to be achieved under the model project in 1997 is the establishment of a system of notification and authorization as required by the BSS. The regional field managers are expected to monitor and report on each country's compliance, and in December this year, the IAEA is scheduled to submit a comprehensive report on the progress achieved to its Board of Governors.

Safety profiles of countries

The intention of the country safety profile information system is to maintain and keep updated all the data known to the Agency on the radiation and waste safety infrastructure of the country. Although the system includes a database which will be made available to all concerned, it is not limited to the database alone. It also includes the assembly of hard-copy information including laws and regulations, mission reports, papers describing the situation, and other material and relevant safety action plans. The essential structure of the system is provided by a questionnaire, the answers to which are the basic inputs for the computerized database. This questionnaire was completed initially as much as possible within the Agency before it was sent to the counterpart in the country for final completion.

The questionnaire and derived database cover the following main sections:

- organizational infrastructure;
- legal and regulatory status, including training;
- extent of practices involving ionizing radiation;
- provisions for individual dosimetry;
- public exposure control;
- radiation protection and safety of patients in medical diagnosis and therapy;
- transport of radioactive material;
- planning and preparedness for radiation emergencies; and
- quality assurance.

There is provision within the database for insertion of the answer to the questionnaire given by the country and an appraisal of those answers to determine the infrastructure status of the country. The country safety profile will only be fully effective if it is kept continually updated. The provision of the information to do this is one of the responsibilities of the regional field managers and designated country safety officers. Responsibility for maintaining the database is assigned to the Nuclear Safety-Technical Co-operation Co-ordinator.

Safety action plans for countries

Implementation plans are developed from an analysis of the completed questionnaires, within the framework of requirements for an adequate infrastructure. Missing or deficient items are determined and documented for preparation of a safety action plan specific to each country. The plan includes actions that are needed for the country to achieve a full and adequate infrastructure, commensurate with its existing and planned applications of ionizing radiation.

Safety systems must be able to prevent accidents such as this, where an operator tried to free a jammed package in an irradiation facility with the source exposed.

Once the Department of Technical Co-operation receives the agreement by the government on the action plan, it will start implementation of the scheduled activities. As of the beginning of 1997, more than 90% of participating countries have officially endorsed the action plans, which were prepared by the Agency in consultation with them.

The plans include both generic and specific activities. Generic activities apply to all countries, and as a first priority cover notification, authorization, and subsequent control of all radiation sources, whatever their use, within the country. Later steps will cover protection of workers, patients receiving medical treatment and the public from environmental releases; emergency plans; transport arrangements; and other areas. Specific activities are tailored to each country's particular needs, such as personnel training or the provision of necessary equipment.

The development of human resources through training is an important component of the model project. It involves not only training in nuclear technologies but covers the training of administrators, regulators, radiation protection specialists, and medical personnel. The establishment and sustainability of a sound infrastructure for assuring radiation and waste safety depends upon national capabilities in these areas.

Better basis for improvements

The complete system in support of the model project is targeted for implementation by the end of 1997. It will provide the IAEA with a fully documented on-line system for assessing the current status of any country with respect to its radiation and waste safety infrastructure and a prioritized and agreed set of needs that should form the basis of future technical assistance projects. There will also be enough data to assess the capacity of the country to assure the safety of other developments of technology or requested items of equipment that could pose radiation hazards.

Over time, the system should provide a firmer basis for the IAEA's co-operative work with its Member States and provision of technical assistance in areas of radiation and waste safety. Efforts can be better directed towards achieving a situation in which no Member State that actively co-operates with the IAEA has an inadequate radiation and waste safety infrastructure. Under an agreed action plan, this work will encompass measures for improving the identification of needs and requirements; and enhancing the use of resources to further strengthen national capabilities for ensuring safety in the peaceful applications of nuclear and radiation technologies. ❐

Radiation Safety Standards

Regardless of their own stage of nuclear technological development, every country has a stake and role to play in ensuring the safe use of radiation applications and the disposal of radioactive waste. To control the radiation exposure of workers, medical patients, and the public, many countries have laws and rules in place that are supported by administrative measures and enforced by inspectors. Just as important are internationally agreed standards for radiation safety. In co-operation with the World Health Organization, International Labour Organization, Food and Agriculture Organization, Nuclear Energy Agency of the Organization for Economic Co-operation and Development, and Pan American Health Organization, the IAEA has worked to develop the *International Basic Safety Standards for Protection Against Ionizing Radiation and for the Safety of Radiation Sources* (BSS). An updated edition was issued in 1996.

Protection under the BSS is based on principles of the International Commission on Radiological Protection, which can be summed up as follows:

Justification of the practice. No practice involving exposure to radiation should be adopted unless it produces a benefit that outweighs the harm it causes or could cause.

Optimization of protection. Radiation doses and risks should be kept as low as reasonably achievable, economic and social factors being taken into account. Constraints should be applied to dose or risk to prevent an unfair distribution of exposure or risk.

Limitation of individual risk. Exposure of individuals should not exceed specified dose limits above which the dose or risk would be deemed unacceptable.