

THE ROLE OF THE IAEA ON THE CONTROL AND SAFE USE OF RADIATION SOURCES

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Abstract: Radiation sources are widely used all over the world with an increasing trend. Although safety records are claimed to be high, bad accidents with radiation sources have happened, resulting in injury or death to persons. Organized systems of safety and radiation protection for radiation sources are strikingly deficient both at national and international levels. The IAEA, in response to the demand from many Member States, has initiated a programme since 1988 on the control and safe use of radiation sources with the aim to develop and disseminate internationally harmonized regulatory and technical guidance for the control and safe use of radiation sources.

1. Introduction

Public concern about the safety and regulatory control of radiation sources has grown over the past few years particularly following some bad accidents that happened with both industrial and medical radiation sources. The most notable one is that of Goiania in Brazil in 1986 where an accident with medical irradiation source caused death of a number of innocent public including children (1). In Mexico, in 1983, a medical cobalt teletherapy source was declared as a scrap and was sold to a steel manufacturing company which melted this source together with tons of steel and manufactured furniture parts which were exported to the United States of America. There were no casualties in that accident but the logistical consequence was enormous (2).

Over the past 15 years there has been a number of accidents with industrial irradiation sources, for example, in Italy in 1975 (3). Norway 1982 (4), El Salvador in 1989 (5), and Israel in 1990 (6). High radiation exposures resulting from these industrial accidents caused severe radiation injuries which led to death of four operators and amputation of limbs of the fifth one. The question arises as to who were at fault, the designers, manufacturers, regulators or operators? Another question naturally arises as to what measures were missing which could have prevented such accidents?

2. Estimation about radiation sources

Some estimation made by the IAEA about radiation sources reveals large number in use throughout the world (Table). Also, estimates have been made of the magnitude of annual number of shipments of radioactive sources in 20 countries. These shipments cover all kinds of sources. The data are considered incomplete and inaccurate but it is believed that the actual number of shipments could be well over 10 million per year.

TABLE. SOME DATA ON RADIATION SOURCES

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<u>SOURCE</u>	<u>NUMBER</u>	<u>WHEREABOUTS</u>	<u>SOURCE-STRENGTHS</u> <u>AVERAGE</u>
Teletherapy sources	2600	worldwide	Co-60 220 TBq Cs-137 40 TBq
Brachytherapy sources	30000 100000	USA worldwide	20 MBq - 4 GBq
Radiography units	3500 25000	USA worldwide	Ir-192 4-11 TBq Co-60 1.5 TBq
Commercial product irradiators	150	worldwide	Co-60 40000 TBq Cs-137 400000 TBq
Industrial gauges	90000 500000	USA worldwide	-- --

3. Nature of the Problem

The IAEA operates through the national atomic energy organization in its Member States. However, radiation sources used in a country are not all procured through this organization. In most cases radiation sources used in industry, medicine, agriculture, and education are procured through the administrative channels of the relevant authorities. In other cases the user imports them directly from the supplier or the manufacturer (2). There are also cases where foreign companies operate industrial irradiation sources which are brought directly without channeling through the concerned national authorities (7). In many developing countries the national atomic energy organization, may not have any knowledge of all radiation sources or their locations of use. This is mainly because there are no established radiation protection infrastructures. The IAEA Radiation Protection Advisory Team missions revealed that 38 developing Member States have no radiation protection law in force and 50 Member States have inadequate radiation protection standards and/or infrastructures.

4. IAEA programme

4.1. Activities prior to 1988

By recognizing the radiation safety problems, the Agency in 1988 initiated a new programme on the control and safe use of radiation sources. This should not, however, imply that before 1988 the IAEA did not have any programme on the standards of safety and protection. The Agency since 1957 initiated a programme on radiation protection with the objective to ensure safe operation of radiation sources, nuclear installations and the protection of man and his environment from the harmful effects of radiation and radioactive releases. The major functions are the development of safety standards, safety guides, recommendations on practical procedures and also some operational service.

The IAEA Basic Safety Standards for Radiation Protection, issued in 1967 was revised jointly with WHO, ILO, and OECD/NEA in 1982 (Safety Series No.9). Following 1990 recommendations of the ICRP the IAEA initiated the revision of the Basic Safety Standards for Radiation Protection jointly with WHO, ILO, FAO, OECD/NEA and Pan American Health Organization, with a plan to publish it in 1993. Prior to 1988 the IAEA initiated two safety series documents related to the control of radiation sources: Safety Series No.101 on Operational Radiation Protection and Safety Series No.102 on the Recommendations for the Safe Use and Regulation of Radiation Sources in Industry, Medicine, Research and Agriculture, both published in 1990.

4.2. The programme initiated in 1988

There are three projects under this subprogramme namely, control and safe use of radiation sources, information on irradiation sources and application of the probabilistic safety criteria. The first task was the revision of the already existing Safety Series No.1 on Safe Handling of Radionuclides, by combining Safety Series No.20 on Safe Handling of Radioisotopes in Hydrology, Safety Series No.23 on Radiation Protection Standards for Radioluminized Time Pieces, and Safety Series No.40 on Safe Use of Radioactive Tracers in Industrial Processes. This combined document, now ready for publication, will serve as a parent document in the whole series of guides issued in the area of the control of radiation sources. One task initiated in 1989 is on regulatory guidance to assist and advise Member States on how to prepare the regulatory infrastructure and regulatory provisions for the control of radiation sources and a document will be published in the near future.

Radiation protection in hospitals is one important subject which was dealt with jointly by IAEA, WHO and ILO since many years. Five documents on this subject area were published jointly in 1970s. This time the Agency has taken the initiative to revise these documents jointly with ILO, WHO, FAO, OECD/NEA, and PAHO with a plan to publish the revised documents in 1993. Radiation safety aspects of specific uses of industrial and medical radiation sources is an important component of the activity under this programme. Six documents have been already prepared which are under publication and these are: Practical Radiation Safety Manuals on (1) Shielded Enclosures, (2) Gamma Radiography, (3) Nuclear Gauges, (4) High Energy Teletherapy, (5) Brachytherapy and (6) Therapeutic Uses of I-131.

Development of complementary resource materials for various technical documents, radiation protection principles for the handling and disposal of radiation sources no longer in use, development of guidance material for information of the public and standardization of international marketing system for sealed sources are the other on-going activities. Other activities are publication of a bulletin or news letter on the safe use of radiation sources, development of database on radiation sources and devices specifications, database on radiation accidents and publication of reports, exchange of practical regulatory information applicable to the control of radiation sources, co-ordinated research programme on the safety problems associated

with the design and CRP on radiation doses in diagnostic radiology and methods of reduction are two important activities.

Regional training courses have been organized in order to provide the Member States with the up to date knowledge on various regulatory and technical measures for the control of radiation sources. The organization of such training courses will remain as a continuing activity.

The project on the probabilistic safety assessment techniques to improve the safety of radiation sources has two components, one on identification of data requirements for PSA and means for data collection, and the other on the preparation of a manual on use of PSA in radiation source safety.

During 1993-1994 an activity will be initiated to develop an international register for radiation sources with significantly high activities, other than unsealed sources; simultaneously, competent authorities will be urged to develop national register for radiation sources, including data base on radiation source specification. Emphasis will be given to strengthen means of providing information to Member States on radiation accidents and lessons learned from such accidents. To assist Member States in providing high standards of training to workers, and regulatory and management staff, the Agency will develop appropriate training manuals and complementary resource material for such national and international training courses. Also, the Agency is going to place emphasis on the implementation of Radiation Protection Advisory Team recommendations to ensure establishment of regulatory infrastructure in those Member States where such infrastructures are non-existent at present.

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