

Basic principles of radiation protection.

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1. Introduction

In 1990, an important step towards international harmonization of radiation protection and safety took place: an Inter-Agency Committee on Radiation Safety (IACRS) was constituted as a forum for consultation on and collaboration in radiation safety matters between international organizations. The IACRS initially comprised the Commission of the European Communities (CEC), the Council for Mutual Economic Assistance (CMEA) (now defunct), the FAO, the IAEA, the ILO, the OECD/NEA, the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) and the WHO. The PAHO joined subsequently. The ICRP, the International Commission on Radiation Units and Measurements (ICRU), the International Electrotechnical Commission (IEC), the International Radiation Protection Association (IRPA) and the International Organization for Standardization (ISO) have observer status on the IACRS. The objective of the IACRS is to promote consistency and co-ordination of policies with respect to the following areas of common interest: applying principles, criteria and standards of radiation protection and safety and translating them into regulatory terms; coordinating research and development; advancing education and training; promoting widespread information exchange; facilitating the transfer of technology and know-how; and providing services in radiation protection and safety.

The Standards are based primarily on the recommendations of the International Commission on Radiological Protection (ICRP). The ICRP is a non-governmental scientific organization founded in 1928 to establish basic principles and recommendations for radiation protection; the most recent recommendations of the ICRP were issued in 1991.

Moreover, in relation to safety, the Standards take account of the principles recommended by the International Nuclear Safety Advisory Group (INSAG) which, under the auspices of the IAEA, has been elaborating nuclear safety concepts since 1985, such as its Basic Safety Principles for Nuclear Power Plants; many of these principles are relevant to radiation sources and installations other than nuclear installations. The quantities and units used in the Standards are primarily those recommended by the ICRU, a sister organization of ICRP.

The Standards are published in the IAEA Safety Series. This series of publications encompasses Safety Fundamentals, Safety Standards, Safety Guides and Safety Practices relating to nuclear safety and radiation protection, including radioactive waste management. The IAEA Safety Series includes other related international standards, such as the Nuclear Safety Standards (NUSS) for nuclear power plants, the Regulations for the Safe Transport of Radioactive Material, and the forthcoming Radioactive, Waste Management Standards (RADWASS). The other organizations of the Joint Secretariat have also produced codes and guides in their respective spheres of activity. Notably, the ILO has issued a code of practice for the radiation protection of workers as well as other

relevant publications; the PAHO and the WHO have issued a number of documents relating to the safety of workers and patients in medical applications of radiation; the FAO and the WHO have established, through the Codex Alimentarius Commission, guideline levels for radioactive substances in foodstuffs moving in international trade; and the OECD/NEA has published documents on specific topics relating to radiation protection and safety.

2. Objectives

The purpose of the Standards is to establish basic requirements for protection against the risks associated with exposure to ionizing radiation (hereinafter termed radiation) and for the safety of radiation sources that may deliver such exposure.

The Standards have been developed from widely accepted radiation protection and safety principles, such as those published in the Annals of the ICRP and the IAEA Safety Series. They are intended to ensure the safety of all types of radiation sources and, in doing so, to complement standards already developed for large and complex radiation sources, such as nuclear reactors and radioactive waste management facilities. For these sources, more specific standards, such as those issued by the IAEA, are typically needed to achieve acceptable levels of safety. As these more specific standards are generally consistent with the Standards, in complying with them, such more complex installations will also generally comply with the Standards.

The Standards are limited to specifying basic requirements of radiation protection and safety, with some guidance on how to apply them. General guidance on applying some of the requirements is available in the publications of the Sponsoring Organizations and additional guidance will be developed as needed in the light of experience gained in the application of the Standards.

3. Scope

The Standards comprise basic requirements to be fulfilled in all activities involving radiation exposure. The requirements have the force that is derived from the statutory provisions of the Sponsoring Organizations. They do not entail any obligation for States to bring their legislation into conformity with them, nor are they intended to replace the provisions of national laws or regulations, or the standards in force. They are aimed rather to serve as a practical guide for public authorities and services, employers and workers, specialized radiation protection bodies, enterprises and safety and health committees.

The Standards lay down basic principles and indicate the different aspects that should be covered by an effective radiation protection programme. They are not intended to be applied as they stand in all countries and regions, but should be interpreted to take account of local situations, technical resources, the scale of installations and other factors which will determine the potential for application.

The Standards cover a broad range of practices and sources that give rise to or could give rise to exposure to radiation, and many of the requirements have therefore been drafted in general terms. It follows that any given requirement may have to be fulfilled differently for different types of practice and source, according to the nature of the operations and the potential for exposures. Not all the requirements will apply to every practice or to every source, and it is up to the appropriate Regulatory Authority to specify which of the requirements are applicable in each case.

The scope of the Standards is limited to the protection of human beings only; it is considered that standards of protection that are adequate for this purpose will also ensure that no other species is threatened as a population, even if individuals of the species may be harmed. Moreover, the Standards apply only to ionizing radiation, namely gamma and X rays and alpha, beta and other particles that can induce ionization. They do not apply to non--ionizing radiation such as microwave, ultraviolet, visible light and infrared radiation. They do not apply either to the control of non--radiological aspects of health and safety. The Standards recognize that radiation is only one of many sources of risk in life, and that the risks associated with radiation should not only be weighed against its benefits but also viewed in perspective with other risks.

The principles of radiation protection and safety are presented in the International Basic Safety for Protection against Ionizing Radiation or in appropriate National Regulations (Standards).

Summary of the principles is as follows:

- practice that entails or that could entail exposure to radiation should only be adopted if it yields sufficient benefit to the exposed individuals or to society to outweigh the radiation detriment it causes or could cause (i.e. the practice must be justified);
- individual doses due to the combination of exposures from all relevant practices should not exceed specified dose limits;
- radiation sources and installations should be provided with the best available protection and safety measures under the prevailing circumstances, so that the magnitudes and likelihood of exposures and the numbers of individuals exposed be as low as reasonably achievable, economic and social factors being taken into account, and the doses they deliver and the risk they entail be constrained (i.e. protection and safety should be optimized);
- radiation exposure due to sources of radiation that are not part of a practice should be reduced by intervention when this is justified, and the intervention measures should be optimized; the legal person authorized to engage in a practice involving a source of radiation should bear the primary responsibility for protection and safety;
- safety culture should be inculcated that governs the attitudes and behavior in relation to protection and safety of all individuals and organizations dealing with sources of radiation; in-depth defensive measures should be incorporated into the design and operating procedures for radiation sources to compensate for potential failures in protection or safety measures; and
- protection and safety should be ensured by sound management and good engineering, quality assurance, training and qualification of personnel, comprehensive safety assessments and attention to lessons learned from experience and research.

4. The legal basis for international co-operation in the event of a nuclear and radiological emergency.

The prime legal instruments that establish an international framework to facilitate the exchange of information in the event of a nuclear accident and radiological emergency is the Convention on Early Notification of a Nuclear Accident

It places specific obligations on the States Parties (99 countries as for Nov. 2006) and the IAEA, with the aim of minimizing consequences of any nuclear or radiological accident for health, property and the environment.

This Convention aims to strengthen international co-operation in order to provide relevant information about nuclear accidents as early as possible in order that radiological consequences can be minimized. States Party commit that, in the event of a nuclear accident that may have transboundary radiological consequences, they will notify (directly or through the IAEA) countries that may be affected, and provide relevant information including: nature of the accident, time of occurrence, exact location, facility or activity involved, assumed cause and foreseeable development relevant to transboundary effects, general characteristics of any release (nature, magnitude, effective height), current and forecast meteorological conditions relevant to transboundary effects, results of environmental monitoring relevant to transboundary effects, off-site protective measures taken or planned, predicted behaviour over time of the release, and further information on the development of the accident. The IAEA in turn forthwith informs States Parties, Member States, other States that may be physically affected and relevant international organizations of a notification received and promptly provides other information on request.

In 2002 the IAEA Board of Governors approved the document “Preparedness and Response for a Nuclear or Radiological Emergency” (GS-R-2). With respect to the international response system, GS-R-2 establishes requirements for international notification and information exchange in the case of a ‘transnational emergency’, i.e. a nuclear or radiological emergency of actual, potential or perceived radiological significance for more than one State.

Following the Article 4.54 of GS-R-2 for facilities in threat nuclear reactor accident the arrangements shall be made, before and during operations, to provide information on the response to a nuclear or radiological emergency to permanent, transient and special population groups or those responsible for them and to special facilities within the precautionary action zone and the urgent protective action planning zone. This shall include information on the nature of the hazard, on how people will be warned or notified and on the actions to be taken in the event of a nuclear or radiological emergency. The information shall be provided in the languages mainly spoken in these emergency zones and the effectiveness of this public information programme shall be periodically assessed.

<http://www.iaea.org:80/Publications/Documents/Conventions/index.html>

<http://www-ns.iaea.org/standards/documents/details.asp?id=6900>

<http://www.iaea.org/Publications/Documents/Conventions/cenna.html>