Annex VIII of Technical Volume 4
CONVENTIONS, RECOMMENDATIONS,
SAFETY STANDARDS, LAWS AND REGULATIONS

VIII–1. INTERNATIONAL LABOUR ORGANIZATION CONVENTION CONCERNING THE PROTECTION OF WORKERS AGAINST IONINZING RADIATIONS [VIII–1]

Relevant articles from this Convention [VIII–1] include:

"Article 3

1. In the light of knowledge available at the time, all appropriate steps shall be taken to ensure effective protection of workers, as regards their health and safety, against ionizing radiations.
2. Rules and measures necessary for this purpose shall be adopted, and data essential for effective protection shall be made available."

"Article 5

Every effort shall be made to restrict the exposure of workers to ionizing radiations to the lowest practicable level, and any unnecessary exposure shall be avoided by all parties concerned."

"Article 6

1. Maximum permissible doses of ionizing radiations which may be received from sources external to or internal to the body and maximum permissible amounts of radioactive substances which can be taken into the body shall be fixed in accordance with Part I of this Convention for various categories of workers.
2. Such maximum permissible doses and amounts shall be kept under constant review in the light of current knowledge."

"Article 8

Appropriate levels shall be fixed in accordance with Article 6 for workers who are not directly engaged in radiation work, but who remain or pass where they may be exposed to ionizing radiations or radioactive substances."

"Article 9

1. Appropriate warnings shall be used to indicate the presence of hazards from ionizing radiations. Any information necessary in this connection shall be supplied to the workers."

"Article 13

Circumstances shall be specified, by one of the methods of giving effect to the Convention mentioned in Article 1, in which, because of the nature or degree of the exposure or a combination of both, the following action shall be taken promptly:

(a) the worker shall undergo an appropriate medical examination;
(b) the employer shall notify the competent authority in accordance with its requirements;
(c) persons competent in radiation protection shall examine the conditions in which the worker's duties are performed;
(d) the employer shall take any necessary remedial action on the basis of the technical findings and the medical advice."

VIII–2. CONVENTION ON EARLY NOTIFICATION OF A NUCLEAR ACCIDENT [VIII–2]

Article 2 of this Convention [VIII–2] states that in the event of a nuclear accident or radiological emergency the State Party has to:

> "(a) forthwith notify, directly or through the International Atomic Energy Agency (hereinafter referred to as the "Agency"), those States which are or may be physically affected as specified in article 1 and the Agency of the nuclear accident, its nature, the time of its occurrence and its exact location where appropriate; and
>
> (b) promptly provide the States referred to in sub-paragraph (a), directly or through the Agency, and the Agency with such available information relevant to minimizing the radiological consequences in those States…".

Further, with a view to minimizing the radiological consequences, States Parties may notify in the event of nuclear accidents other than those specified in Article 1 of the Early Notification Convention (Article 3) [VIII–2].

Other aspects of this Convention are presented in detail in Technical Volume 3.

VIII–3. CONVENTION ON ASSISTANCE IN THE CASE OF A NUCLEAR ACCIDENT OR RADIOLOGICAL EMERGENCY

Relevant articles from this Convention [VIII–3] include:

"Article 1. General provisions

1. The States Parties shall cooperate between themselves and with the International Atomic Energy Agency (hereinafter referred to as the "Agency") in accordance with the provisions of this Convention to facilitate prompt assistance in the event of a nuclear accident or radiological emergency to minimize its consequences and to protect life, property and the environment from the effects of radioactive releases.
2. To facilitate such cooperation States Parties may agree on bilateral or multilateral arrangements or, where appropriate, a combination of these, for preventing or minimizing injury and damage which may result in the event of a nuclear accident or radiological emergency.
3. The States Parties request the Agency, acting within the framework of its Statute, to use its best endeavours in accordance with the provisions of this Convention to promote, facilitate and support the cooperation between States Parties provided for in this Convention."

"Article 2. Provision of assistance

1. If a State Party needs assistance in the event of a nuclear accident or radiological emergency, whether or not such accident or emergency originates within its territory, jurisdiction or control, it may call for such assistance from any other State Party, directly or through the Agency, and from the Agency, or, where appropriate, from other international intergovernmental organizations (hereinafter referred to as "international organizations").
2. A State Party requesting assistance shall specify the scope and type of assistance required and, where practicable, provide the assisting party with such information as may be necessary for that party to determine the extent to which it is able to meet the request. In the event that it is not practicable for the requesting State Party to specify the scope and type of assistance required, the requesting State Party and the assisting party shall, in consultation, decide upon the scope and type of assistance required.

3. Each State Party to which a request for such assistance is directed shall promptly decide and notify the requesting State Party, directly or through the Agency, whether it is in a position to render the assistance requested, and the scope and terms of the assistance that might be rendered.
4. States Parties shall, within the limits of their capabilities, identify and notify the Agency of experts, equipment and materials which could be made available for the provision of assistance to other States Parties in the event of a nuclear accident or radiological emergency as well as the terms, especially financial, under which such assistance could be provided.
5. Any State Party may request assistance relating to medical treatment or temporary relocation into the territory of another State Party of people involved in a nuclear accident or radiological emergency.
6. The Agency shall respond, in accordance with its Statute and as provided for in this Convention, to a requesting State Party's or a Member State's request for assistance in the event of a nuclear accident or radiological emergency by:
   (a) making available appropriate resources allocated for this purpose;
   (b) transmitting promptly the request to other States and international organizations which, according to the Agency's information, may possess the necessary resources; and
   (c) if so requested by the requesting State, co-ordinating the assistance at the international level which may thus become available."

VIII–4. CONVENTION ON NUCLEAR SAFETY

Relevant articles from this Convention [VIII–4] include:

"Article 15. Radiation protection

Each Contracting Party shall take the appropriate steps to ensure that in all operational states the radiation exposure to the workers and the public caused by a nuclear installation shall be kept as low as reasonably achievable and that no individual shall be exposed to radiation doses which exceed prescribed national dose limits."

"Article 16. Emergency preparedness

Each Contracting Party shall take the appropriate steps to ensure that there are on-site and off-site emergency plans that are routinely tested for nuclear installations and cover the activities to be carried out in the event of an emergency.

For any new nuclear installation, such plans shall be prepared and tested before it commences operation above a low power level agreed by the regulatory body."

VIII–5. JOINT CONVENTION ON THE SAFETY OF SPENT FUEL MANAGEMENT AND ON THE SAFETY OF RADIOACTIVE WASTE MANAGEMENT

Relevant articles from this Convention include [VIII–5]:

"Article 4. General safety requirements

Each Contracting Party shall take the appropriate steps to ensure that at all stages of spent fuel management, individuals, society and the environment are adequately protected against radiological hazards.

In so doing, each Contracting Party shall take the appropriate steps to:

…….

(iv) provide for effective protection of individuals, society and the environment, by applying at the national level suitable protective methods as approved by the regulatory body, in the framework of its national legislation which has due regard to internationally endorsed criteria and standards;"

"Article 6. Siting of proposed facilities

1. Each Contracting Party shall take the appropriate steps to ensure that procedures are established and implemented for a proposed radioactive waste management facility:

…….

(ii) to evaluate the likely safety impact of such a facility on individuals, society and the environment;"

"Article 11. General safety requirements

Each Contracting Party shall take the appropriate steps to ensure that at all stages of radioactive waste management, individuals, society and the environment are adequately protected against radiological hazards.

In so doing, each Contracting party shall take the appropriate steps to:

…….

(iv) provide for effective protection of individuals, society and the environment, by applying at the national level suitable protective methods as approved by the regulatory body, in the framework of its national legislation which has due regard to internationally endorsed criteria and standards;"

"Article 13. Siting of proposed facilities

1. Each Contracting Party shall take the appropriate steps to ensure that procedures are established and implemented for a proposed radioactive waste management facility:

…….

(ii) to evaluate the likely safety impact of such a facility on individuals, society and the environment, taking into account possible evolution of the site conditions of disposal facilities after closure;"

"Article 24. Operational radiation protection

1. Each Contracting Party shall take the appropriate steps to ensure that during the operating lifetime of a spent fuel or radioactive waste management facility:

…….

(iii) measures are taken to prevent unplanned and uncontrolled releases of radioactive materials into the environment.

…….

3. Each Contracting Party shall take the appropriate steps to ensure that during the operating lifetime of a regulated nuclear facility, in the event that and unplanned or uncontrolled release of radioactive materials into the environment occurs, appropriate corrective measures are implemented to control the release and mitigate its effects."

"Article 25. Emergency preparedness

1. Each Contracting Party shall ensure that before and during operation of a spent fuel or radioactive waste management facility there are appropriate on-site and, if necessary, off-site emergency plans. Such emergency plans should be tested at an appropriate frequency."

VIII–6. INTERNATIONAL GUIDELINES AND RECOMMENDATIONS

VIII–6.1. Pertinent Recommendations by the International Commission on Radiological Protection (ICRP)

VIII–6.1.1. ICRP Publication 60: The 1990 Recommendations

The 1990 Recommendations of ICRP Publication 60 [VIII–6] consolidated the System of Radiation Protection and its three principles of justification, optimization of protection, and application of dose limits. It introduced the terminology of constraints and the concept of risk constraints and provided a framework for advice on radiation protection issues pertaining to accidents and emergencies.

In the 1990 Recommendations, the ICRP recommended dose limits for public exposures. These limits were described as "aimed at ensuring that no individual is exposed to radiation risks that are judged to be unacceptable from [all the relevant] practices in any normal circumstances". Furthermore, "dose limits ... apply only to the sum of dose contribution from a relevant set of exposures and not to those from all sources of radiation", and in particular, the ICRP "defines the scope of its dose limits for public exposure by confining it to the doses incurred as the result of practices. Doses incurred in situations where the only available protective action takes the form of intervention are excluded from the scope of the dose limits". An effective dose limit of 1 mSv in a year was recommended, with the proviso that in special circumstances, a higher value of effective dose could be allowed in a single year, provided that the average over five years does not exceed 1 mSv per year.

VIII–6.1.2. ICRP Reports extending and supplementing Publication 60

ICRP Publication 63 [VIII–7], while aimed at the protection of members of the public, also considered the protection of emergency workers. It expressed recommended intervention levels as a range of optimized intervention values. If the potential averted dose is greater than the upper intervention level then the countermeasure should, if possible under the circumstances, be introduced. If the averted dose falls inside the range then it is recommended to apply the three principles of radiation protection — justification, optimization and the use of dose limits — in order to reach a decision.

Several years later, ICRP Publication 82 [VIII–8] discussed the application of the System of Radiation Protection to prolonged radiation exposures (which could result from accidents) affecting members of the public, and provided generic reference levels for interventions in such situations. It discussed several specific situations, gave various examples of prolonged exposure situations, and provided quantitative recommendations on intervention levels and intervention exemption levels. In particular, it established a range from a total existing annual dose of ~100 mSv, above which intervention would almost always be justifiable, via ~10 mSv, below which intervention would not likely be justifiable, and down to the different concept of an additional annual dose of ~0.01 mSv as an exemption level for practices.

ICRP Publication 96 [VIII–9] discussed the adaptation of the System of Protection and the emergency planning to possible radiation attacks. Similarities to and differences from radiation emergencies due to accidents were enumerated. The report compiled earlier, still valid advice and new observations concerning the management of radiation emergencies and therefore constitutes an accessible practical handbook.

The scope of ICRP Publication 77 [VIII–10] is somewhat different; it provides basic and general guidance on the disposal of radioactive waste, which will usually arise from radiation accidents. In addition, it establishes a generic dose constraint for members of the public from a single installation, 0.3 mSv/y. It also emphasizes the importance when collective doses are presented of also providing information about their disaggregation along dimensions of time, space, individual dose, etc.

In ICRP Publication 91 [VIII–11], the Commission noted that no internationally agreed criteria or policies explicitly addressed protection of the environment from ionizing radiation, and it was difficult to determine or demonstrate whether or not the environment was adequately protected from potential impacts of radiation under different circumstances. The report suggested a framework by which a policy for the protection of non-human species could be achieved. The primary purpose of developing such a framework was to fill a conceptual gap in radiation protection; it did not reflect any particular concern over environmental radiation hazards.

VIII–6.1.3. ICRP Recommendations introduced contemporaneously with the Fukushima Daiichi accident

The current set of fundamental Recommendations of ICRP Publication 103 [VIII–12] was published in 2007. Thus, they were known to regulators and operators. They had been incorporated into the 2011 interim International Basic Safety Standards issued by the IAEA [VIII–13], but they had not yet been implemented in national legislation, neither Japan nor elsewhere.

The 2007 Recommendations of the ICRP extended the scope of optimization of protection in emergency and existing exposure situations, and the Recommendations heralded follow-up reports on optimization in different situations. Those reports appeared in 2009 as ICRP Publication 109 [VIII–14] on emergency exposure situations and ICRP Publication 111 [VIII–15] on existing exposure situations.

The 2007 Recommendations also broadened the scope of environmental protection, recognizing that that the environment should be considered not only in planned exposures situations but also in existing and emergency exposures situations, and pointing out that the ICRP approach to environmental protection should be compatible with other approaches being taken to protect the environment, particularly from those risks arising from similar human activities. It also recognized that the underlying objectives for protection of the environment were different from those for protection of humans.

VIII–6.1.4. ICRP Publication 103

The 2007 Recommendations of the ICRP approach radiation protection issues by way of the exposure situation (planned, emergency or existing) rather than processes (practices or interventions). They stress that optimization is the primary means of dose and risk limitation, and that it should be applied similarly in all situations. The Recommendations provide guidance on the concepts of dose and risk constraints, i.e., levels of individual dose/risk to be taken into account, servings as boundaries for the optimization process. Similar concepts of individual dose/risk are also applied in emergency and existing exposure situations, serving as the boundary for optimization in these exposure situations. ICRP uses the term ‘reference level’ in such situations. They thus highlight that optimization of protection is usually multi-dimensional even in strictly planned situations. Similar levels of individual

dose/risk are also applied in emergency and existing exposure situations, but some features are different than in planned situations, and, therefore, the ICRP prefers to use the term 'reference level' in such situations.

The Recommendations define 'public exposure' as "exposure incurred by members of the public from radiation sources, excluding any occupational or medical exposure and the normal local natural background radiation" and 'dose limit' as "the value of the effective dose or the equivalent dose to individuals from planned exposure situations that shall not be exceeded" [VIII–12]. This is conceptually similar to the description of dose limits for public exposure in the 1990 Recommendations as quoted above [VIII–6].

In emergency or existing exposure situations, the issue is whether or not to reduce extant doses, and how much, rather than to control prospectively additional doses that might result from planned operations. In planned exposure situations, the optimization of protection can be 'constrained' by the use of individual dose/risk constraints (to avoid unfair inequalities in dose/risk distribution). In emergency or existing exposure situations it may be impossible to select dose distributions at will, i.e., doses may be greater than values normally considered appropriate when the source is under control. Thus optimization takes place from whatever dose distribution exists. Nevertheless, boundaries on individual dose are applied, and are called reference levels rather than constraints.

The 2007 Recommendations of the ICRP define reference levels as "… the level of dose or risk, above which it is judged to be inappropriate to plan to allow exposures to occur, and below which optimization of protection should be implemented", with the caveat that "the chosen value for a reference level will depend upon the prevailing circumstances of the exposure under consideration". Considering that "at doses higher than 100 mSv, there is an increased likelihood of deterministic effects and a significant risk of cancer", the ICRP recommended that "the maximum value for a reference level is 100 mSv incurred either acutely or in a year", with the caveat that "exposures above 100 mSv incurred either acutely or in a year would be justified only under extreme circumstances, either because the exposure is unavoidable or in exceptional situations such as the saving of life or the prevention of a serious disaster."

This implies that in some (rare) circumstances, reference levels up to 100 mSv in a year might be acceptable, depending upon the prevailing circumstances of the exposure under consideration.

VIII–6.1.5. ICRP Publication 104

The 2007 Recommendations of the ICRP were supplemented with a stand-alone report, ICRP Publication 104 [VIII–16], on the scope of radiation protection. This sets out why and how some exposure situations are excluded from regulatory control (essentially because they cannot be controlled by any reasonable means), and why and how some exposure situations are exempted from some or all regulatory requirements (because the requirements are unwarranted).

Thus, the report describes exclusion criteria for defining the scope of radiation protection regulations, exemption criteria for planned exposure situations, and the application of these concepts in emergency exposure situations and in existing exposure situations.

The report also addresses various specific exposure situations. It provides quantitative criteria, intended only as generic suggestions to regulators for defining the regulatory scope. It points out that an individual dose criterion of ~10 μSv/y has been widely used for the purposes of exemption without further consideration. However, this should not be the sole criterion. The principle of optimization rather than just the triviality of individual doses should be considered as the basis for exemption.

VIII–6.1.6. ICRP Publication 109

This report [VIII–14] discusses reference levels in the context of emergency exposure situations. It points out that more complete protection is offered by simultaneously considering all exposure pathways and all relevant protection options when deciding on the optimum course of action in an overall protection strategy. The report also considers the transition from an emergency exposure situation to an existing exposure situation. This decision may happen at any time during an emergency exposure situation once urgent protective actions are no longer needed and control has been regained over the source. The decision to transition to management as an existing exposure situation may take place at different geographical locations at different times. The transfer should be undertaken in a coordinated and fully transparent manner and should be understood by all parties involved.

VIII–6.1.7. ICRP Publication 111

The companion issue, ICRP Publication 111 [VIII–15], starts where ICRP Publication 109 ends, with the transition from emergency to existing exposure situations. It provides guidance for the protection of people living in long term contaminated areas, resulting from either a nuclear accident or a radiation emergency. It considers the effects of such events on the affected population, including the pathways of human exposure, the types of exposed populations and the characteristics of exposures. Quoting the good results of self-help programmes after the Chernobyl accident, it emphasizes the value of stakeholder involvement and providing the affected population with the means to know and influence doses.

Although the focus is on radiation protection considerations, the report also recognizes the complexity of post-accident situations, which cannot be managed without addressing all the affected domains of daily life, i.e., environmental, health, economic, social, psychological, cultural, ethical, political, etc. ICRP is currently working to address some of the lessons learned from the Fukushima Daiichi accident as updates to ICRP Publications 109 and 111.

VIII–6.1.8. Protection of the environment: ICRP Publications 108, 114 and 124

Practical guidance on environmental protection as envisaged in the 2007 ICRP Recommendations is provided in several reports. ICRP Publication 108 [VIII–17] outlines the concept and use of a small set of reference animals and plants (RAPs). RAPs are, by definition, points of reference, although other organisms could be identified, relevant to each situation and geographic location. A set of Derived Consideration Reference Levels (DCRLs) was also defined that are specific to each of the different types of RAPs. A DCRL can be considered as a band of dose rate, spanning one order of magnitude, within which there is some chance of causing deleterious effects in individuals of a given RAP category arising from exposures to ionizing radiation**.** ICRP Publication 114 [VIII–18] provides transfer parameters for RAPs, and ICRP Publication 124 [VIII–19] discusses protection of the environment under different exposure situations.

VIII–6.1.9. Evolution of ICRP concepts: When to act, what is the goal?

ICRP Publication 82 [VIII–8] proposes the use of generic reference levels of existing annual dose for intervention in ‘prolonged exposure situations’ (such as after a radiation emergency). It concludes that an existing annual dose rising towards 100 mSv will almost always justify intervention, and (somewhat more controversially) that below an existing annual dose of about 10 mSv, intervention is not likely to be justifiable (in radiation protection terms) for some prolonged exposure situations. This position is based on several considerations, including natural background radiation levels and the detriment expected at such radiation levels. There are also many caveats that point out that sometimes intervention will be justified below an annual dose of 10 mSv, and that radiation protection considerations are just one decision aiding input into the decision making.

The 2007 Recommendations of ICRP [VIII–12] recommend the use of reference levels of residual dose (after the application of protective strategies), to be selected between 1 and 20 mSv per year, according to the situation. The main factors to be considered for setting the reference levels are the feasibility of controlling the situation and the past experience with the management of similar situations. A key change with the 2007 Recommendations is the universal application of optimization. Reference levels are not targets to be achieved, but values to guide the optimization process. Optimization must always be considered. In most existing exposure situations, the exposed individuals, as well as the authorities, wish to reduce exposures to levels that are close to what is considered as 'normal'.

Once protective actions have been implemented, the reference level may function as a benchmark against which protection options can be judged retrospectively. The distribution of resulting doses may or may not include exposures above the reference level, depending on the success of the strategy. Efforts should be aimed at reducing exposures that are above the reference level, if possible. The objective is that optimized protection strategies, or a progressive range of such strategies, will reduce individual doses to below the reference level. Exposures below the reference level should not be ignored; these exposure circumstances should also be assessed to ascertain whether protection is optimized. An endpoint for the optimization process must not be fixed a priori; the optimized level of protection will depend on the situation.

ICRP Publication 111 [VIII–15] points out that in most existing exposure situations, the level of exposure is mainly driven by individual behaviour because it is usually not possible to control at the source. This usually results in a very heterogeneous distribution of exposures, which calls for an individual management approach. The concept of an 'average individual' (which may be useful in planned exposure situations) is not appropriate here. Justification of protection strategies applies initially to the fundamental decision at the end of the emergency exposure situation to allow people to live permanently in long term contaminated areas. Several areas may be defined with relevant conditions according to a *graded approach*.

The reference level of residual annual dose for the optimization of protection of people living in contaminated areas should be selected in the lower part of the 1–20 mSv/year band recommended in the 2007 Recommendations of the ICRP. According to ICRP Publication 111, past experience has demonstrated that a typical value used for constraining the optimization process in long term post-accident situations is 1 mSv/year. However, one should take into account the prevailing circumstances and adopt intermediate reference levels to improve the situation progressively.

VIII–6.2. IAEA safety standards

The status of the IAEA safety standards derives from the IAEA's Statute, which authorizes the IAEA to establish or adopt, in consultation and, where appropriate, in collaboration with the competent organs of the United Nations and with the specialized agencies concerned, standards of safety for protection of health and minimization of danger to life and property, and to provide for their application.

With a view to ensuring the protection of people and the environment from harmful effects of ionizing radiation, the IAEA safety standards establish fundamental safety principles, requirements and measures to control the radiation exposure of people and the release of radioactive material to the environment, to restrict the likelihood of events that might lead to a loss of control over a nuclear reactor core, nuclear chain reaction, radioactive source or any other source of radiation, and to mitigate the consequences of such events if they were to occur. The standards apply to facilities and activities that give rise to radiation risks, including nuclear installations, the use of radiation and radioactive sources, the transport of radioactive material and the management of radioactive waste.

For those who are dealing with radiation protection issues, one of these standards is of overriding importance: the so-called the Basic Safety Standards (BSS), described in some detail below.

The IAEA safety standards reflect an international consensus on what constitutes a high level of safety for protecting people and the environment from harmful effects of ionizing radiation. They are issued in the IAEA Safety Standards Series, which has three categories.

VIII–6.2.1. Safety Fundamentals

Safety Fundamentals present the fundamental safety objective and principles of protection and safety, and provide the basis for the safety requirements.

VIII–6.2.2. Safety Requirements

An integrated and consistent set of Safety Requirements establishes the requirements that must be met to ensure the protection of people and the environment, both now and in the future. The requirements are governed by the objective and principles of the Safety Fundamentals. If the requirements are not met, measures must be taken to reach or restore the required level of safety. The format and style of the requirements facilitate their use for the establishment, in a harmonized manner, of a national regulatory framework. Requirements, including numbered 'overarching' requirements, are expressed as 'shall' statements. Many requirements are not addressed to a specific party, the implication being that the appropriate parties are responsible for fulfilling them.

VIII–6.2.3. Safety Guides

Safety Guides provide recommendations and guidance on how to comply with the safety requirements, indicating an international consensus that it is necessary to take the measures recommended (or equivalent alternative measures). The Safety Guides present international good practices, and increasingly they reflect best practices, to help users striving to achieve high levels of safety. The recommendations provided in Safety Guides are expressed as 'should' statements.

VIII–6.2.4. Provisions for the application of the IAEA safety standards

The principal users of safety standards in IAEA Member States are regulatory bodies and other relevant national authorities. The IAEA safety standards are also used by co-sponsoring organizations and by many organizations that design, construct and operate nuclear facilities, as well as organizations involved in the use of radiation and radioactive sources.

The IAEA safety standards are applicable, as relevant, throughout the entire lifetime of all facilities and activities — existing and new — utilized for peaceful purposes and to protective actions to reduce existing radiation risks. They can be used by States as a reference for their national regulations in respect of facilities and activities.

The IAEA's Statute makes the safety standards binding on the IAEA in relation to its own operations and also on States in relation to IAEA assisted operations.

The IAEA safety standards also form the basis for the IAEA's safety review services, and they are used by the IAEA in support of competence building, including the development of educational curricula and training courses.

International conventions contain requirements similar to those in the IAEA safety standards and make them binding on contracting parties. The IAEA safety standards, supplemented by international conventions, industry standards and detailed national requirements, establish a consistent basis for protecting people and the environment. There will also be some special aspects of safety that need to

be assessed at the national level. For example, many of the IAEA safety standards, in particular those addressing aspects of safety in planning or design, are intended to apply primarily to new facilities and activities. The requirements established in the IAEA safety standards might not be fully met at some existing facilities that were built to earlier standards. The way in which IAEA safety standards are to be applied to such facilities is a decision for individual States.

The scientific considerations underlying the IAEA safety standards provide an objective basis for decisions concerning safety; however, decision makers must also make informed judgements and must determine how best to balance the benefits of an action or an activity against the associated radiation risks and any other detrimental impacts to which it gives rise.

VIII–6.2.5. Interaction with other international organizations

The findings of the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) and the recommendations of international expert bodies, notably the International Commission on Radiological Protection (ICRP), are taken into account in developing the IAEA safety standards. Some safety standards are developed in cooperation with other bodies in the United Nations system or other specialized agencies, including the Food and Agriculture Organization of the United Nations (FAO), the United Nations Environment Programme, the International Labour Organization (ILO), the OECD Nuclear Energy Agency (OECD/NEA), the Pan American Health Organization (PAHO) and the World Health Organization (WHO).

VIII–6.3. IAEA Safety Standards applicable in March 2011

The key Safety Standards addressing radiation protection in March 2011 were:

— Safety Fundamentals: IAEA Safety Standards Series No. SF-1: Safety Principles (2006) [VIII–20];
— Safety Requirements: International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources, Safety Series No. 115 (the BSS) (1996) [VIII–21];
— Safety Requirements: Preparedness and Response for a Nuclear or Radiological Emergency, IAEA Safety Standards Series No. GS-R-2 (2002) [VIII–22];
— Safety Guide: Arrangements for Preparedness for a Nuclear or Radiological Emergency, IAEA Safety Standards Series No. GS-G-2.1 (2007)[1] [VIII–24].

Related Safety Requirements include Governmental, Legal and Regulatory Framework for Safety, IAEA Safety Standards Series No. GSR Part 1 (2010) [VIII–25].

The most relevant features of these standards are summarized below. They are also discussed in considerable detail in a 2013 paper by González et al. [VIII–25]. That paper points out that the system of radiation protection is not tailored to people who are involved in protection operations after an accident, but who are not typical ‘radiation’ workers (e.g., ‘rescuers’ and ‘volunteers’ intervening in the aftermath of an accident).

VIII–6.3.1. Safety Fundamentals SF-1

The Fundamental Safety Principles state: “The fundamental safety objective is to protect people and the environment from harmful effects of ionizing radiation”. This objective must be achieved without unduly limiting the operation of facilities or the conduct of activities that give rise to radiation risks. Therefore, the system of protection and safety aims to assess, manage and control exposure to

[1] Criteria for Use in Preparedness and Response for a Nuclear or Radiological Emergency: General Safety Guide, IAEA Safety Standards Series No. GSG-2, was published on 17 March 2011 [VIII–23].

radiation so that radiation risks, including risks of health effects and risks to the environment, are reduced to the extent reasonably achievable.

The three general principles of radiation protection, which concern justification, optimization of protection and application of dose limits, are expressed in Safety Principles 4 (justification of facilities and activities), 5 (optimization of protection), 6 (limitation of risks to individuals) and 10 (protective actions to reduce existing or unregulated radiation risks).

Protection of the environment is covered in Safety Principle 7 (protection of present and future generations), which states that the general intent of the measures taken for the purposes of environmental protection has been to protect ecosystems against radiation exposure that would have adverse consequences for populations of a species.

VIII–6.3.2. Safety Requirements No. SS 115 (1996): International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources (the BSS)

The Safety Requirements No. SS 115 (the BSS) [VIII–21] were published in 1996, co-sponsored by FAO, ILO, OECD/NEA, PAHO and WHO and based primarily on the 1990 ICRP Recommendations. The BSS established basic requirements for the protection of people and the environment against the risks of exposure to ionizing radiation, and for the safety of sources that deliver such exposure.

At the time of the Fukushima Daiichi NPP accident, the 1996 Edition of the BSS was in the final stages of revision. The revised BSS was published in November 2011 as an interim version [VIII–13]; the final version was published in 2014 [VIII–26].

The BSS incorporates the concepts of practices and interventions from ICRP Publication 60 [VIII–6]. The BSS includes emergency situations, such as those created by environmental contamination in the aftermath of an accident. The situations that may require intervention include: chronic exposure to naturally occurring sources of radiation such as radon in dwellings and to radioactive residues from past activities and events; and emergency situations such as those created by environmental contamination in the aftermath of an accident.

The requirements for practices include requirements for administration, radiation protection, management, technical arrangements and verification. The radiation protection requirements for practices include justification of practices, dose limits for individuals, optimization for protection and safety, and dose constraints for sources.

The dose limits for practices established by the BSS are as follows:

— Dose limits for occupational exposure:
  - an effective dose of 20 mSv per year averaged over five consecutive years;
  - an effective dose of 50 mSv in any single year;
  - an equivalent dose to the lens of the eye of 150 mSv in a year;
  - an equivalent dose to the extremities (hands and feet) or the skin of 500 mSv in a year.
— Dose limits for members of the public:
  - an effective dose of 1 mSv in a year;
  - in special circumstances, an effective dose of up to 5 mSv in a single year provided that the average dose over five consecutive years does not exceed 1 mSv per year;
  - an equivalent dose to the lens of the eye of 15 mSv in a year;
  - an equivalent dose to the skin of 50 mSv in a year.

The requirements for intervention include requirements for administration and for radiation protection. The radiation protection requirements for intervention include justification of intervention, optimization of intervention, and action levels.

TABLE VIII–1 ACTION LEVEL OF DOSE FOR ACUTE EXPOSURE

Organ or tissue	Projected absorbed dose to the organ or tissue in less than 2 days (Gy)
Whole body (bone marrow)	1
Lung	6
Skin	3
Thyroid	5
Lens of the eye	2
Gonads	3

The possibility of deterministic effects for doses greater than about 0.1 Gy (delivered over less than 2 days) to the foetus should be taken into account in considering the justification and optimization of actual intervention levels for immediate protective action.

An intervention is justified if it is expected to achieve more good than harm, having regard to health, social and economic factors. Regarding the protection of workers undertaking an intervention, the BSS requires that

> "when undertaking intervention…, all reasonable efforts shall be made to keep doses to workers below twice the maximum single year dose limit, except for life saving actions, in which every effort shall be made to keep doses below ten times the maximum single year dose limit in order to avoid deterministic effects on health. In addition, workers undertaking actions in which their doses may approach or exceed ten times the maximum single year dose limit shall do so only when the benefits to others clearly outweigh their own risk." [VIII–21]

TABLE VIII–2 ACTION LEVEL OF DOSE RATE FOR CHRONIC EXPOSURE

Organ or tissue	Equivalent dose rate (Sv/y)
Gonads	0.2
Lens of the eye	0.1
Bone marrow	0.4

The BSS states that protective actions will almost certainly be justified if the projected dose or the dose rate to any individual is otherwise likely to lead to serious injury.

TABLE VIII–3 URGENT PROTECTIVE ACTIONS

Action	Avertable dose
Sheltering	10 mSv in a period of no more than 2 days
Iodine prophylaxis	100 mGy (committed absorbed dose to the thyroid)
Evacuation	50 mSv in a period of no more than 1 week

TABLE VIII–4 GENERIC ACTION LEVELS FOR FOODSTUFFS (CONSISTENT WITH CODEX ALIMENTARIUS COMMISSION GUIDELINE LEVELS FOR RADIONUCLIDES IN FOOD MOVING IN INTERNATIONAL TRADE FOLLOWING ACCIDENTAL CONTAMINATION)

Radionuclides	Foods destined for general consumption (kBq/kg)	Milk, infant foods and drinking water (kBq/kg)
Cs-134, Cs-137, Ru-103, Ru-106, Sr-89	1	1
I-131	—	0.100
Sr-90	0.10	—
Am-241, Pu-238, Pu-239	0.01	0.001

TABLE VIII–5 LONG TERM ACTIONS

Action	Avertable dose
Initiating temporary relocation	30 mSv in a month
Terminating temporary relocation	30 mSv in a month
Considering permanent resettlement	1 Sv in a lifetime

VIII–6.3.3. Safety Requirements GS-R-2: Preparedness and Response for a Nuclear or Radiological Emergency (2002)

IAEA Safety Standards No. GS-R-2 [VIII–22] establishes the requirements for an adequate level of preparedness and response for a nuclear or radiological emergency in any State. Their implementation is intended to minimize the consequences for people, property and the environment of any nuclear or radiation emergency. The fulfilment of these requirements will also contribute to the harmonization of arrangements in the event of a transnational emergency. The requirements are intended to be applied by authorities at the national level by means of adopting legislation, establishing regulations and assigning responsibilities.

The types of practices and sources covered by these requirements include: fixed and mobile nuclear reactors; facilities for the mining and processing of radioactive ores; facilities for fuel reprocessing and other fuel cycle facilities; facilities for the management of radioactive waste; the transport of radioactive material; sources of radiation used in industrial, agricultural, medical, research and teaching applications; facilities using radiation or radioactive material; and satellites and radiothermal generators using radiation sources or reactors. The requirements also cover emergencies arising from radiation sources of an unknown or untraceable origin.

The requirements for radiation protection in GS-R-2 are taken from the BSS (Safety Series No. 115) [VIII–21] as presented above.

VIII–6.3.4. Safety Requirements WS-R-3: Remediation of Areas Contaminated by Past Activities and Accidents (2003)

IAEA Safety Standards No. WS-R-3 [VIII–27] establishes the requirements for the remediation of areas affected by radioactive residues as a result on uncontrolled events, such as accidents, and certain types of past activities.

The situations dealt with in this publication are intervention situations in which areas, including land and industrial sites, have been contaminated as a result of human activities, and this contamination could cause the prolonged exposure to radiation of workers and members of the public. The requirements in this publication apply to contamination resulting from past events (such as activities at former weapon testing sites) and former authorized activities that are no longer under the provisions of an operational authorization or licence and for which there are no provisions for proper closure. The requirements also apply to past practices that were not adequately controlled, accidents at nuclear facilities, and discharges and disposals that were managed in accordance with less stringent requirements than those that applied later.

For contamination resulting from past activities and accidents, WS-R-3 requires that the level of remediation be established on a site specific basis and in accordance with the radiation protection principles that apply to intervention situations. Consequently, the remedial measures and protective actions that are to be implemented thereafter shall be justified and optimized.

WS-R-3 states:

> "A generic reference level for aiding decisions on remediation is an existing annual effective dose of 10 mSv from all sources, including the natural background radiation. This will normally be assessed as the mean dose for an appropriately defined critical group. Remedial measures would often be justified below the generic reference level and national authorities may define a lower reference level for identifying areas that might need remediation." [VIII–27]

VIII–6.3.5. Safety Guide RS-G-1.7: Application of the Concepts of Exclusion, Exemption and Clearance

IAEA Safety Standard No. RS-G-1.7 [VIII–28] provides guidance to national authorities, including regulatory bodies, and operating organizations on the application of the concepts of exclusion, exemption and clearance as established in the BSS. The Safety Guide includes, in Table 1, specific values of activity concentration for both radionuclides of natural origin and, in Table 2, those of artificial origin that may be used for bulk amounts of material for the purpose of applying exclusion or exemption. It also elaborates on the possible application of these values to clearance.

RS-G-1.7 states that "national and international trade in commodities containing radionuclides with activity concentrations below the values of activity concentration provided in Tables 1 and 2 should not be subject to regulatory control for the purposes of radiation protection." In addition, RS-G-1.7 states:

> "Confirmation that the activity concentration values given in Tables 1 and 2 are not exceeded should be obtained at the first point of entry into trade. This does not imply the need for systematic monitoring of materials, but authorities in exporting States should ensure that systems are in place to prevent unrestricted trade in material with higher activity concentrations. In general, it should not be necessary for each importing State to set up its own

routine measurement programme solely for the purpose of monitoring commodities, particularly if there is confidence in the controls exercised by the exporting State." [VIII–28]

VIII–6.4. Revision of the BSS and other standards at the time of the accident

At the time of the accident, international requirements on emergency preparedness and response were contained in GS-R-2 [VIII–22] and the 1996 edition of the BSS (SS No. 115) [VIII–21]. Revision of the BSS commenced in 2007 and an interim edition of the update, GSR Part 3 was published in November 2011 [VIII–26]. Throughout this period, the existing requirements remained in place.

The structure of GSR Part 3 follows the recommendations of the ICRP, and all circumstances of radiation exposure are considered. Chapter 4 covers emergency exposure situations, and Chapter 5 deals with existing exposure situations. Criteria for use in emergency preparedness and response are covered in Schedule IV. Generic criteria for protective actions and other response actions in emergency exposure situations to reduce the risk of stochastic effects are provided in an Annex. These parts of the BSS are particularly applicable when evaluating the radiation consequences of the Fukushima Daiichi accident.

The major changes from SS No. 115 to GSR Part 3 are:

— The terminology of ICRP Publication 103 (planned exposure situations, emergency exposure situations, and existing exposure situations) has been introduced and the concept of reference level to replace the concepts of action level and intervention level.
— The activity concentration values from RS-G-1.7 are included in Schedule I of the GSR Part 3 as levels of exemption for bulk amounts of solid material and for clearance of solid material.
— The dose limit for the lens of the eye in terms of equivalent dose of 20 mSv per year averaged over 5 consecutive years and of 50 mSv in a single year.
— Strengthened requirements for human imaging using radiation for purposes other than medical diagnosis, medical treatment or biomedical research.
— Strengthened requirements for the safety of radioactive sources by including some of the provisions in the Code of Conduct for Safety and Security of Radioactive Sources.
— Including basic requirements for the protection of the environment, consideration of environmental protection criteria and the assessment of radiological impact, taking into account explicitly the protection of flora and fauna when deemed necessary by the national authorities.
— Strengthened requirements for medical exposure, including for justification of medical exposures.
— Requirements for emergency exposure situations made consistent with the ICRP Publications 103 and 109, including a reference level for residual dose in range of 20-100 mSv.

VIII–6.4.1. Arrangements for Preparedness for a Nuclear or Radiological Emergency: Safety Guide. IAEA Safety Standards No. GS-G-2.1[2]

IAEA General Safety Guide No. GS-G-2.1 [VIII–24] provides recommendations and guidance on the implementation of selected requirements established in IAEA Safety Standards Series No. GS-R-2 [VIII–22]. This guide describes appropriate responses (so called concepts of operations) to a range of nuclear or radiological emergencies and includes:

[2] Criteria for Use in Preparedness and Response for a Nuclear or Radiological Emergency: General Safety Guide. IAEA Safety Standards No. GSG-2, was published on 17 March 2011 [VIII–23]. The generic criteria in GSG-2 and the revised BSS are similar and the approach and terminology are consistent. The guide includes Table IV-1 and Table A-1 of the revised BSS GSR Part 3 [VIII–26]. A reference level of 20–100 mSv is presented. GSG-2 also presents Operational Intervention Levels (OILs) and Emergency Action Levels (EALs). Appendix II of GSG-2 includes default OILs for deposition, individual contamination, and contamination of food, milk and drinking water.

— Description of emergency zones and areas and their suggested radius.
— Description of abnormal facility conditions associated with specific emergency class and immediate actions to be taken on-site and off-site upon declaration of the emergency class.
— Description and overview of urgent protective actions and other response actions.
— Description of adequate emergency related facilities and locations necessary to support emergency response.

VIII–6.5. Codex Alimentarius guideline levels for radionuclides in food

The Codex Alimentarius Commission, established by FAO and WHO in 1963, develops harmonized international food standards, guidelines and codes of practice to protect the health of consumers and ensure fair practices in the food trade. The commission also promotes coordination of all food standards work undertaken by international governmental and non-governmental organizations. Collaboration between the World Trade Organization (WTO) and the Codex Alimentarius concerns the use of international food safety standards in the context of the Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement). The SPS Agreement and the Agreement on Technical Barriers to Trade (the TBT Agreement) try to ensure that regulations, standards, testing and certification procedures do not create unnecessary obstacles, while also providing members of the public with the right to implement measures to achieve legitimate policy objectives, (such as the protection of the human environment), within the separate areas of their legal coverage. Both agreements encourage the international harmonization of food standards. Importantly, the SPS Agreement cites the food safety standards, guidelines and recommendations of the Codex Alimentarius for facilitating international trade and protecting public health.

The reference made to the food safety standards of the Codex Alimentarius in the SPS Agreement means that the Codex has far reaching implications for resolving trade disputes. WTO members that wish to apply stricter food safety measures than those set by the Codex may be required to justify these measures scientifically.

The Codex General Standard for Contaminants and Toxins in Food and Feed provides guideline levels that apply to radionuclides contained in foods destined for human consumption and traded internationally, which have been contaminated following a nuclear or radiological emergency. These guideline levels apply to food after reconstitution or as prepared for consumption, i.e. not to dried or concentrated foods, and are based on an intervention exemption level of 1 mSv in a year[3]. As far as generic radiological protection of food consumers is concerned, when radionuclide levels in food do not exceed the corresponding guideline levels, the food should be considered as safe for human consumption. When the guideline levels are exceeded, national governments decide whether and under what circumstances the food should be distributed within their territory or jurisdiction. National governments may wish to adopt different values for internal use within their own territories where the assumptions concerning food distribution that have been made to derive the guideline levels may not apply, e.g. in the case of wide-spread radioactive contamination. For foods that are consumed in small quantities, such as spices, that represent a small percentage of total diet and hence a small addition to the total dose, the guideline levels may be increased by a factor of 10.

The Codex guideline levels are given in Table VIII–6.

[3] The concept of exemption was introduced in ICRP Publication 60 [VIII–6] and explained in Publication 82 [VIII–8], which advises on situations of prolonged radiation exposure and proposes a generic intervention exemption dose limit of around 1 mSv annually for members of the public from radionuclides in major commodities such as food. Publication 104 [VIII–16] provides additional guidance on exemption.

TABLE VIII–6. CODEX REVISED GUIDELINE LEVELS FOR RADIONUCLIDES IN FOODS CONTAMINATED FOLLOWING A NUCLEAR OR RADIOLOGICAL EMERGENCY FOR USE IN INTERNATIONAL TRADE

Radionuclides in Foods	Guideline Level (Bq/kg)	
	Infant Foods*	Other foods
Pu-238, Pu-239, Pu-240, Am-241	1	10
Sr-90, Ru-106, I-129, I-131, U-235	100	100
S-35**, Co-60, Sr-89, Ru-103, Cs-134, Cs-137, Ce-144, Ir-192	1 000	1 000
H-3***, C-14, Tc-99	1 000	10 000

* When intended for use as such.
** This represents the value for organically bound sulphur.
*** This represents the value for organically bound tritium.

In deriving the guideline levels, it is assumed that adults consume 550 kg of food and infants 200 kg of food per year. It is assumed that 10% of all food consumed in the year following the emergency is contaminated, although it is noted that this may not apply to infants. The most conservative values of the radionuclide specific and age specific ingestion dose coefficients from [VIII–21] have been used.

The following additional points apply to the Codex guideline levels:

— Infant foods are defined as those foods prepared and packaged specifically for infants in their first year of life.
— Activity concentrations from specific radionuclides should be summed within radionuclide groups but each group should be treated independently.
— The guideline levels apply to food as it is consumed. For instance, dried food should be reconstituted before comparison of measured levels of radionuclides with the guideline levels.
— 'Higher levels' should be applied to foods such as spices, which are eaten in small volumes.

VIII–7. JAPANESE REGULATORY INSTRUMENTS

These comprise laws issued by the National Diet (the Japanese Parliament), ordinances issued by various ministries of the Japanese government, regulations issued by central and prefectural authorities, and internal rules set by the operating organization, TEPCO.

There were some issues which were not fully covered in the regulatory system of Japan. For such issues, Japanese regulators looked to other sources — e.g., the ICRP 2007 Recommendations and the IAEA 2011 interim BSS [VIII–13].

VIII–7.1. Relevant laws

VIII–7.1.1. The Atomic Energy Basic Law [VIII–29]

The Atomic Energy Basic Law states that its objectives are to secure energy resources for the future and to promote the research, development and use of nuclear energy for peaceful purposes (Chapter 1). It goes on to establish a framework for the regulation of nuclear activities, specific aspects of which are to be dealt with in subsequent, separate acts. The Basic Law in Chapter 2 created the Atomic Energy Commission and the Nuclear Safety Commission. Its provisions also deal in very

broad terms with the mining of nuclear source materials (Chapter 4), control over nuclear fuel materials (Chapter 5), control over nuclear reactors (Chapter 6), protection from radiation hazards (Chapter 8) and compensation for damage caused by nuclear activities (Chapter 9). These provisions, in effect, only demonstrate the state's intention to exercise regulatory powers in these areas by means of subsequent legislation.

VIII–7.1.2. Laws governing radiation protection: The Prevention Law [VIII–30] and the Regulation Law [VIII–31]

The Prevention Law regulates the use, sale, lease, disposal or any other handling of radioisotopes and ionizing radiation-generating equipment in order to prevent ionizing radiation hazards and to secure public safety (Section 1). Pursuant to this law, applications must be submitted to the Nuclear Regulation Authority (NRA) (until April 2013 to the Ministry of Education, Culture, Sports, Science and Technology (MEXT)) for any activity connected with radioisotopes or equipment that was generating ionizing radiation. Granting of the licence depends on whether the site, structure and equipment proposed conform to the standards laid down by the Ordinance of the Prime Minister (No. 56, 30 September 1960), and whether potential hazards from ionizing radiation have been dealt with satisfactorily (Sections 6, 7 and 7-2).

Under the Reactor Regulation Law, Ministerial Ordinances and other regulations are established — such as the Notice on Dose Limits related to radiation protection, which sets out dose limits for exposure to ionizing radiation for nuclear power plant and nuclear related facilities. The Prevention Law also sets out dose limits for radioisotope facilities. In addition, there are also the Regulations on the Prevention of Ionizing Radiation Hazards [VIII–32].

Under the relevant laws, the Radiation Council established in MEXT (moved to the NRA after its establishment in September 2012) recommended dose limits for radiation workers and radiation workers engaged in emergency situations, based on the penultimate (1990) fundamental Recommendations of the ICRP [VIII–6].

VIII–7.2. Relevant Ordinances

VIII–7.2.1. Protection of persons occupationally exposed to ionizing radiation

This is covered by the Ordinance on Prevention of Ionizing Radiation Hazards [VIII–32]. This ordinance contains, among other topics, dose limits for workers, including special limits for women, for pregnant women and for emergency situations, as shown in Table VIII-7 below. This particular ordinance covers only exposure to ionizing radiation from radioactive substances. However, the same dose limits are also provided in several other ordinances, under laws dealing with other sources of radiation. All regulatory documents concerning ionizing radiation, regardless of which law is involved, are scrutinized by the Radiation Council established in the NRA so as to ensure full consistency.

TABLE VIII–7. DOSE LIMITS FOR RADIATION WORKERS

Quantity	Normal working conditions	Emergencies[f]
Effective dose	100 mSv/5 years[a]	100 mSv in an event
	50 mSv in a year[b]	—
	Women[c] 5 mSv/3 months[d]	—
	Pregnant women[e]:	
	External exposure 2 mSv	—
	Internal exposure 1 mSv	—
Equivalent dose	Lens of the eye: 150 mSv in a year[b]	Lens of the eye: 300 mSv in an event
	Skin: 500 mSv in a year[b]	Skin: 1000 mSv in an event
	Pregnant women[e]:	—
	Abdominal surface 2 mSv	—

[a] Five-year periods beginning 1 April 2001;
[b] Year beginning 1 April 2001;
[c] Unless diagnosed as unable to become pregnant;
[d] Quarters of a year beginning 1 April, 1 July, 1 October, 1 January;
[e] From being diagnosed as pregnant until birth;
[f] Women must not be engaged in emergency work involving high doses unless diagnosed as unable to become pregnant.

For normal working conditions, the dose limits as applied to male workers are fully in line with the 1990 [VIII–6] and 2007 [VIII–12] ICRP Recommendations and the IAEA 1996 [VIII–21] and 2011 [VIII–13]. The limits for pregnant women are expressed in roughly the same way as in the 1990 ICRP Recommendations and thus aim to achieve broadly the same level of protection for the foetus as for members of the public, in line with the intention of all of these ICRP and IAEA documents.

However, there are also some significant deviations from the international guidance, all in the direction of the Japanese regulations being stricter. The most important difference is that there are formal dose limits for emergencies. The international guidance points out that dose limits are not intended for emergency situations. The limit on effective dose in the Japanese regulations, 100 mSv, corresponds to a reference level in the international guidance, exposures above which would only be justifiable if the exposure is unavoidable or in exceptional situations such as life-saving or prevention of serious disasters. For such situations, the guidance is that every effort shall be made to keep effective doses below 500 mSv.

Furthermore, in Japan women are barred from emergency work involving high doses unless they are unable to become pregnant; the international guidance is that females who have declared that they are pregnant or nursing should not participate in such activities. Also, for normal working conditions, there is a limit on dose rate to women of reproductive capacity. The ICRP recommends no special occupational dose limit for women in general, and there is no such limit in the BSS.

The ordinance also covers many other topics, among them education and training of workers and their medical examinations.

VIII–7.2.2. Protection of the public from ionizing radiation

A dose limit for members of the public of 1 mSv in a year, in line with ICRP Recommendations and IAEA Basic Safety Standards, is provided for exposures due to radioactive sources (including nuclear installations) in the Prevention Law. Operators' internal rules and guidelines.

A regulatory system does not just include the government components. The internal rules and guidelines decided by the operator in order to ensure compliance and safe, reliable operation also form an important part of the regulatory system.

TEPCO has a comprehensive set of manuals on radiation protection topics. These reiterate the existing regulations and the dose limits that apply and set out the operating procedures required to ensure compliance with those regulations. The following areas are covered:

— Basic issues (three manuals, comprising in all some 250 pages, on radiation protection management basics, radiation work management, and dose control management);
— Controlled areas (three manuals, covering RCA management, registration procedures and materials);
— Management of personal radiation protection equipment;
— Management of radiation measurement equipment;
— Management of calibration sources;
— Management of environmental monitoring.

The manuals are quite detailed and include comprehensive specifications of responsibilities and accountabilities within the organization. They emphasize the importance of optimization of radiation protection and keeping doses as low as reasonably achievable.

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