



# Justification and optimization

## *Improving radiation protection in practice*

For any activity involving radiation exposure, the three general principles of radiation protection are:

- **Justification**
- **Optimization**
- **Dose limitation**

The principle of **justification** requires that the introduction of a new source of radiation, or any actions to reduce radiation exposure, have a net overall benefit. This concept is not unique to radiation protection, as many decisions in everyday life involve balancing benefits and risks. Once a decision has been made that a particular action is justified, then the next step is to apply the principle of optimization.

**Optimization** is defined in the IAEA Safety Glossary as the “process of determining what level of protection and safety would result in the magnitude of individual doses, the number of individuals (workers and members of the public)

subject to exposure and the likelihood of exposure being as low as reasonably achievable, economic and social factors being taken into account”.

International standards and national legislation in most countries establish radiation **dose limits** for both workers and members of the public. In the case of medical exposures of patients, dose limits do not apply as the dose received must be that necessary for the diagnosis or treatment in question. However, in these situations dose limits do apply to the medical professionals who are exposed.

Decisions on justification and optimization include economic, societal and environmental considerations. In many instances, the benefits considered in justification or in optimization accrue to society in general rather than to individuals.

1

Justification

2

Optimization

3

Dose limitation

Visit:

[www.iaea.org/resources/rpop/resources/international-safety-standards/justification-and-optimization](http://www.iaea.org/resources/rpop/resources/international-safety-standards/justification-and-optimization)

Email:

[Radiation-Protection-Group.Contact-Point@iaea.org](mailto:Radiation-Protection-Group.Contact-Point@iaea.org)

## What do the IAEA Safety Standards say?

In 2014, the IAEA has published the *General Safety Requirements Part 3: Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards*. This is often referred to simply as the BSS. The BSS is jointly sponsored by eight international organizations with responsibilities in various areas of radiation protection.

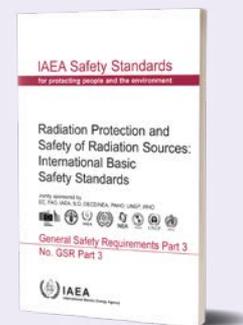
The requirements in the BSS take account of the most recent scientific evidence relating to exposure due to radiation. The BSS is used by many States as the basis for their national regulations dealing with radiation protection and safety.

The three radiation protection principles of justification, optimization and dose limitation are enshrined in the *IAEA Fundamental Safety Principles (SF-1)* and apply to all facilities and activities that give rise to radiation risks.

Requirement 10 of the BSS requires the government or regulatory body to ensure that only justified practices are authorized, while requirement 11 states that “the government or the regulatory body shall establish and enforce requirements for the optimization of protection and safety, and registrants and licensees shall ensure that protection and safety is optimized.”

Guidance on the procedures to be followed in reaching a decision on whether or not a particular practice is justified can be found in the *IAEA Safety Guide: Justification of Practices, Including Non-Medical Human Imaging (GSG-5)*.

In addition to the IAEA, the BSS is jointly sponsored by the European Commission, the Food and Agriculture Organization of the United Nations, the International Labour Organization, the Nuclear Energy Agency of the Organisation for Economic Co-operation and Development, the Pan American Health Organization, the United Nations Environment Programme and the World Health Organization.



## Challenges

Decisions on justification go beyond radiation protection and need to take account of economic, societal and environmental considerations. The concepts of ‘good’ and ‘harm’, often expressed as ‘benefits’ and ‘risks’, are subjective and vary between individuals. Applying the principle of justification therefore involves judgement decisions that are seldom straightforward.

Justification applies not only to the introduction of new sources of radiation, but also to actions designed to reduce radiation exposure. Examples include the remediation of contaminated land and reducing exposure due to radon in buildings. All such actions have associated costs, as well as societal and environmental impacts, which must be considered as part of the decision-making process.

Optimization is directly linked to justification in that the extent to which radiation protection and safety can be optimized is one of the inputs into decisions on justification. Optimization is about ensuring that, under the prevailing conditions, the best possible choices are made. As with justification, optimization needs to take account of more than just the need to reduce radiation doses.



The application of the principles of justification and optimization is reasonably well established when working with radiation sources. This is less the case when dealing with situations involving exposure due to radon, non-medical human imaging and radionuclides in food and drinking water. When managing these exposures, national authorities are not always clear what actions, if any, are justified and, if it is decided that actions are justified, the extent to which exposures should be reduced.

For major decisions – such as initiating a nuclear power programme or remediation of a contaminated site – all interested parties need to be fully consulted and involved in the decision-making process.

## How does the IAEA support Member States?



The IAEA supports its Member States in the implementation of all aspects of the Safety Standards through the organization of national and regional workshops and other training events. [Online webinars](#) are also regularly organized.

