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The principles of radioactive waste management in international law

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Статтю присвячено дослідженню принципів поводження з радіоактивними відходами, виробленими МАГАТЕ та Міжнародною Комісією з радіологічного захисту. Проаналізовано та систематизовано такі норми, визначено їх характер і місце в міжнародному праві.

Статья посвящена исследованию принципов обращения с радиоактивными отходами, разработанных МАГАТЭ и Международной Комиссией по радиологической защите. Проанализированы и систематизированы такие нормы, определен их характер и место в международном праве.

The article is devoted to the study of principles of radioactive waste management elaborated by IAEA and International Commission of radiological protection. Author analyzes and systematizes these rules, defines their nature and place in international law.

Ключові слова: радіоактивні відходи, основні принципи безпеки МАГАТЕ, Міжнародна комісія з радіологічного захисту, принцип захисту майбутніх поколінь, залежність між виробленням радіоактивних відходів та поводженням із ними, захист навколишнього середовища, оптимізація захисту.

Introduction. The beginning of the twentieth century gave birth to the discovery of nuclear energy that is widely applicable in research, medicine, industry and in generation of electricity. These practices generate waste that requires management to ensure the protection of human health and the environment now and in the future, without im-

posing undue burdens on future generations. Radioactive wastes may also result from the processing of raw materials that contain naturally occurring radionuclides. **Radioactive waste** means radioactive material in gaseous, liquid or solid form for which no further use is foreseen by the Contracting Party or by a natural or legal person whose decision is ac-

cepted by the Contracting Party, and which is controlled as radioactive waste by a regulatory body under the legislative and regulatory framework of the Contracting Party (article 2 (h) of Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management [1]).

Responsible radioactive waste management requires the implementation of measures that will afford protection of human health and the environment since improperly managed radioactive waste could result in adverse effects to human health or the environment now and in the future.

The main purpose of this article is to study the principles of radioactive waste management elaborated in international law, compare the work of IAEA and ICRP in this field and to underline the legal status of these principles.

International Commission on radiological protection (ICRP) [2] elaborated a system of principles of radioactive waste management in the form of recommendations that are subject to periodic review. There are three fundamental principles among them [3, 60]:

- No practice shall be adopted unless its introduction produces a positive net benefit;
- All exposures shall be kept as low as reasonably achievable, economic and social factors being taken into account;
- The dose equivalent to individuals shall not exceed the limits recommended for the appropriate circumstances by the Commission.

ICRP published a list of no less important principles. The first one is **protection of the environment**. The necessity of adoption of such a rule was specified by evidence that large doses of radiation are damaging to the health of all living creatures. Radiation is the most damaging to the more biologically sophisticated organisms. Human appears to be one of the categories most sensitive to radiation and protection measures for human will therefore also generally protect other species in the environment [3, 61].

Principle of protection of future generations consists of two elements: future generations should be afforded at least the same degree of radiation protection as given

to the public today and the safety of radioactive waste should not depend on active maintenance of the disposal system by future generations beyond a period of active surveillance. Both rules derive from idea that significant risks, burdens and constraints should not be imposed on future generations after time when institutional control of waste repository is relinquished. Taking into account that doses and risks of radiation can't be forecast, the protection of future generations should be achieved primarily by passive measures at the repository development stage and should not rely duly on active measures in the future [4, 23]. The generations that produce the waste have to seek and apply safe, practicable and environmentally acceptable solutions for its long term management. The generation of radioactive waste must be kept to the minimum practicable level by means of appropriate design measures and procedures such as the recycling and reuse of material [5, 12].

The next principles are **principle of protection of individual members of the public** and **principle of protection of the general population [3, 62-63]**. They guarantee that nobody will be exposed to an unacceptable risk to health from radiation. The limits of radiation should be applied to all members of the public but is of particular relevance to the protection of the group known as the «critical group». This is a group of people who live in the area where radiation exposures are likely to be the highest. The radioactive waste should be managed in such way to guarantee the acceptable level of health protection. The particular attention should be paid to the surveillance over the radioactive waste sources. The states must guarantee that ionizing radiation doesn't exceed the level fixed by national safety rules. They also take into account the safety standards elaborated by IAEA and ICRP when adopting such a safety rules at the national level.

The fourth **principle is optimization of protection**. Protection must be optimized to provide the highest level of protection. The safety measures that applied to facilities and activities that give rise to radiation risks are considered optimized if they provide the highest level of safety that can reasonably be

achieved throughout the lifetime of the facility or activity without unduly limiting its utilization. The interdependences between related actions and their associated risks must be taken into account. There are some factors that influence a system of protection: the number of people (workers and public) who may incur a risk, the likelihood of incurring exposures, the magnitude and distribution of radiation doses received, radiation risks arising from foreseeable events, economic, social and environmental factors.

The optimization of protection also means using good practices and common sense to avoid radiation risks as far as is practical in day to day activities.

Principle № 5 is **radiological assessment** [4] of disposal system to consider various possibilities for human exposure. Processes, which could lead to human exposures, have to be identified on a site-specific basis. Some natural processes (corrosion, seismic events etc.) may result in a gradual release of radionuclides to the environment. So states must take in account all environmental and natural factors, the likelihood of above-mentioned natural processes at different stages of radioactive waste management (especially at the stage of site selection).

Human actions may also disrupt a waste disposal system. A human action affecting repository integrity and potentially having radiological consequences is known as human intrusion. The states must take all necessary steps to prevent such human intrusion.

IAEA improved and extended the system of principles of radioactive waste management. In general it is the following:

Principle 1 Protection of Human Health
Principle 2 Protection of the environment
Principle 3 Protection beyond national borders
Principle 4 Protection of future generations
Principle 5 Burdens on future generations
Principle 6 National legal framework
Principle 7 Control of radioactive waste generation
Principle 8 Radioactive waste generation and management interdependencies
Principle 9 Safety of facilities

As you may see some principles are the same as in the system of principles introduced by ICRP. Let's focus on other, so-called newly developed principles.

Principle of protection beyond national borders means that the radioactive waste should be managed in such a manner to assure that the possible impact on the health of population and environment beyond the national border is taken into consideration. It is based on terms that each state is obligated to act responsibly and not to cause to the health of population and environment of other state more harmful effects than those within its own territory.

The next principle is **national legal framework**. Radioactive waste shall be managed within an appropriate national legal framework including clear allocation of responsibilities and provision for independent regulatory functions. The states producing or using radionuclides have to develop a legal framework that includes laws, regulations and directives concerning radioactive waste management having in mind national strategies of radioactive waste management. Powers of each party or organization involved should be exactly defined. The separation of regulatory function is also necessary to ensure safe nuclear facility operation. Such a separation can make it possible to carry out independent control and surveillance over the activity connected with radioactive waste. The legal basis must set up the way of separation of powers.

Principle of interdependencies between radioactive waste generation and radioactive waste management provides that interdependency between radioactive waste generation and radioactive waste management should be taken into account. The main steps of radioactive waste management are preprocessing, processing, conditioning, storage and disposal. There is an interdependence between them. Activities at one stage may prevent from some actions at another stage and may have opposite, negative effect. That is why national bodies and officials responsible for each step of radioactive waste and materials management are

advisable to admit interactions and interconnections between stages and thus effectiveness and safety of radioactive waste management.

The next **principle is control of waste generation**. It means that generation of radioactive waste shall be kept to the minimum practicable. It includes selection and control over materials, reprocessing and reuse of materials, introduction of respective management procedures. Different types of waste and materials should be separated to reduce their volume and improve the methods of their management.

Safety of facilities and equipment principle provides that during site selection, design, construction, putting into operation, operation, deactivation or closing of storage all steps to ensure safety should be taken. It includes accidents prevention. The special features of relief, distance to population centers, closeness to water and other resources must be taken into account during site selection. The proper level of population, staff and environment protection must be ensured and kept (if it is possible) during design, construction, operation and decommissioning of waste management facilities.

Moreover International Atomic Energy Agency worked out «Fundamental Safety Principles» which range in scope from engineering safety to transport and waste safety and assist member states. One of the most urgent issues of international nuclear law is a legal status of such rules. The Statute of International Atomic Energy Agency has no definition of their legal character, but it is quite obvious that documents elaborated by experts and published by Agency have no obligatory force for member-states. They come into legal force only when incorporated into bilateral or multilateral agreements of states or their national legislation. We may talk about obligatory force (rather of technical character) of «Fundamental Safety Principles» that is determined by the means of application of such rules by Agency concerning its actions and their consequences in the member-states. Safety principles became more urgent in the field of harmonization of current technical

rules, in filling of gaps caused by the absence of legal rules or their desuetude [7].

«Fundamental Safety Principles» repeat and extend some of above mentioned and considered principles. But there are also some necessary rules which IAEA worked out. Principle № 1 is **responsibility for safety. The prime responsibility for safety must rest with the person or organization responsible for facilities and activities that give rise to radiation risks**. The licensee is responsible for establishing and maintaining the necessary competences, providing adequate training and information; establishing procedures and arrangements to maintain safety under all conditions, verifying appropriate design and the adequate quality of facilities and activities and of their associate equipment; ensuring the safe control of all radioactive material that is used, produced, stored or transported, ensuring the safe control of all radioactive waste that is generated.

The next principle touches upon the **role of government**. An effective legal and governmental framework for safety including an independent regulatory body must be established and sustained. The government is responsible for the adoption within its national legal system of such legislation, regulations and other standards and measures as may be necessary to fulfill its national responsibilities and international obligations effectively and for the establishment of an independent regulatory body. Government authorities have to ensure that arrangements are made for preparing programmes of actions to reduce radiation risks. Government authorities have to provide for control over sources of radiation for which no other organization has responsibility, such as some natural sources, orphan sources and radioactive residues from some past facilities and activities.

The regulatory body must have adequate legal authority, technical and managerial competence, be effectively independent of licensee and of any other body so that it is free from any undue pressure from interested parties; set up appropriate means of informing the public and other interested parties, mass

media about the safety aspects of facilities and activities. Governments and regulatory bodies thus have an important responsibility in establishing standards and establishing the regulatory framework for protecting people and environment against radiation risks. However, the prime responsibility for safety rests with the licensee.

Principle № 3: Leadership and management for safety. Safety has to be achieved and maintained by means of an effective management system. This system has to integrate all elements of management so that requirements for safety are established and applied coherently with other requirements. The management system also should ensure the promotion of safety culture, the regular assessment of safety performance. The safety assessment involves the systematic analysis of normal operation and its effects, of the ways in which failures might occur and of the consequences of such failures. The process of safety assessment for facilities and activities is repeated in whole or in part as necessary later in the conduct of operations in order to take into account changed circumstances.

Despite all measures taken accidents may occur. The precursors to accidents have to be identified and analyzed, and measures have to be taken to prevent recurrence of accidents. The feedback of operating experience from facilities and activities is a key means of enhancing safety.

The next **principle** is **prevention of accidents**. It means that all practical efforts must be made to prevent and mitigate nuclear or radiation accidents. To ensure that the likelihood of an accident having harmful consequences is extremely low, the following measures have to be taken:

- To prevent the occurrence of failures or abnormal conditions;
- To prevent the escalation of any such failures or abnormal conditions;
- To prevent the loss or the loss of control over radioactive source.

The primary means of preventing and mitigating the consequences of accidents is 'defence in depth'. Defence in depth is imple-

mented primarily through the combination of a number of consecutive and independent levels of protection that would have to fail before harmful effects could be caused to people or to the environment. If one level of protection or barrier were to fail, the subsequent level or barrier would be available. When properly implemented, defence in depth ensures that no single technical, human or organizational failure could lead to harmful effects, and that the combinations of failures that could give rise to significant harmful effects are of very low probability. The independent effectiveness of the different levels of defence is a necessary element of defence in depth.

The principles of international environmental law are also applied. First of all the states are obligated to take all necessary steps govern and regulate the sources of global environmental pollution or transboundary damage within its territory and jurisdiction. The second principle is «polluter pays» principle that means that injured party is entitled to obtain compensation for damage caused and resulted from the activity of other states within their jurisdiction. The third principle of environmental law applied in radioactive waste management is the principle of equal access and non-discrimination. It means that international issues should be settled in the spirit of mutual cooperation on the basis of equality of all states.

Conclusions. Thus the entire system of principles of radioactive waste management consists of four different mutually dependent and mutually complementary systems of principles existing at international level. Namely they are an array of rules elaborated by experts of IAEA and ICRP. Such rules are often the results of common practice, cut and try method. The fundamental safety rules are also applied. Besides that radioactive waste management is an issue of international environmental law concern and principles native to that field of law are also applicable. Thanks to their prestige and universality they come into effect in international treaties, mostly universal conventions elaborated under the aegis of IAEA.

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