TRANSPOSITION OF REQUIREMENTS SET OUT IN THE BASIC SAFETY STANDARDS FOR NUCLEAR FACILITIES IN LITHUANIA

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ABSTRACT

The legal basis for radiation protection allowing to protect people and the environment from the harmful effects of ionizing radiation is established by the Law on Radiation Protection of the Republic of Lithuania (1999). The basic radiation protection requirements are described in [4]. The requirements set out by [4] related to occupational radiation protection of nuclear power plant workers are established and explained by [5], which sets out requirements for radiation protection of workers working at the nuclear power plant and for radiation protection of members of the public during the nuclear power plant operation. Radiation protection of outside undertakings is regulated by the [6]. Limitation of discharges of radionuclides into the environment from operation of nuclear facilities is regulated by [7]. The requirements of the above mentioned legal acts are in compliance with international standards and recommendations.

Introduction

Lithuania has one nuclear power plant – Ignalina NPP, which contains two RBMK-1500 reactors (actual thermal power output – 4200 MW, electrical power capacity – 1500 MW). The first Unit of Ignalina NPP went into operation at the end of 1983, the second Unit in August 1987. After Lithuania regained it's independence in 1990, because of changed political thinking, when old standards have been replaced by national, constantly the "new" thinking is being implemented. This is also happened in the field of radiation protection. A number of new laws, Government Resolutions, regulatory documents (Hygiene Standards and Orders of Ministers) have been established which forms the legal basis for radiation protection in Lithuania. It shall be considered that one of tools which allows to keep the national radiation protection requirements in accordance with international standards, is the harmonisation of national legislation with the international requirements and recommendations.

The radiation protection requirements set out by the relevant Lithuanian radiation protection legislation directly related to nuclear facilities are presented in the paper.

Regulatory Framework of Radiation Protection and Responsibilities of the Radiation Protection Centre

The hierarchical structure of the Lithuanian legislation related to radiation protection is presented in the Figure 1.

Figure 1. The hierarchical structure of the Lithuanian legislation related to radiation protection

The list of main regulatory documents in force on nuclear safety, radiation protection and radioactive waste management related to nuclear facilities operation in Lithuania includes following laws, basic regulations and standards:

- Law on Radiation Protection (No. VIII-1019, 1999);
- Law on Nuclear Energy (No I-1613, 1996, as amended 1999);
- Law on the Management of Radioactive Waste (No. VIII-1190, 1999);
- Law on Environmental Protection (No. I-1352, 1992, No. I-2223, 1996, 1999);
- Hygiene Standard HN 73:2001 "Basic Standards of Radiation Protection" (2001);
- Hygiene Standard HN 87:2001 "Radiation Protection in Nuclear Power Plant" (2001);
- Hygiene Standard HN 83:1998 "Radiation Protection and Safety of Outside Workers" (1998);
- Normative Document LAND 42 – 2001 “Limitation of Radioactive Discharges from Nuclear Facilities, Permitting of Discharges and Radiological Monitoring” (2001) and other legal acts.

The main law establishing the legal basis for radiation protection allowing to protect people and the environment from the harmful effects of ionizing radiation is the Law on Radiation Protection No. VIII-1019 adopted on 12 January 1999 [3]. The Law regulates relations of legal persons, enterprises without the status of a legal person, and natural persons arising from activities involving sources of ionizing radiation and radioactive waste management.

According to Article 3 of [3], all practices shall be authorised and conducted in accordance with the following basic principles of radiation protection:

1) the principle of justification of the operation of sources of ionising radiation - the economic, social and other benefits yielded by all types of practices involving operation of sources of ionising radiation to individuals or society must outweigh the detriment radiation causes to human health and the environment;

2) the principle of optimisation - any kind of exposure of individuals and society must be as low as reasonably achievable, economic and social factors being taken into account;

3) the principle of limitation - the sum total of doses resulting from all types of practices may not exceed the fixed value, with the exception of a personal dose received by a patient for his own health care and an individual (other than as part of his occupation) voluntarily helping a patient or participating in medical and biomedical research.

According to the Article 7 of the [3], the Radiation Protection Centre is a body co-ordinating the activities of executive and other bodies of public administration and local government in the field of radiation protection, exercising state supervision and control of radiation protection, monitoring and expert examination of public exposure. As regards the nuclear facilities, one of the main aims of the Radiation Protection Centre is to supervise, control and to demand that the activities carried out at nuclear power plant are in compliance with radiation protection requirements, established by [3], [4], [5], [6] and other legal acts.

Requirements for Occupational Radiation Protection in Nuclear Power Plant

The main regulation which sets out requirements for occupational radiation protection of workers working at the nuclear power plant and for radiation protection of members of the public during the nuclear power plant operation, is the Lithuanian Hygiene Standard HN 87:2001 "Radiation Protection in Nuclear Power Plant" [5]. It was approved by the Order of the Minister of Health and came into force on 1 April 2001. The Hygiene Standard shall be applied for all legal and natural persons conducting their activities at the NPP. The requirements of the Hygiene Standard are in compliance with the requirements and recommendations established by [1], [2].

According to Article 10 of [3], where the responsibilities of a licensed legal person are described, the main responsibilities for ensuring the radiation protection of nuclear power plant workers are delegated to the license holder.

As regards the limitation of occupational exposure, the license holder shall ensure that doses of nuclear power plant workers do not exceed the dose limits established by [4], excluding exceptional circumstances. [4] establishes dose limits for occupational and public exposure which are in compliance with [1] and are presented in Table 1.

Table 1
Dose limits for occupational and public exposure

Application	Dose limit	
	Occupational	Public
Effective dose	100 mSv in a consecutive 5 year period, subject to a maximum effective dose of 50 mSv in any single year	1 mSv in a year, in special circumstances-up to 5 mSv in a single year provided that the average dose over 5 consecutive years does not exceed 1 mSv per year
Annual equivalent dose:		
in the lens of the eye	150 mSv	15 mSv
for the skin	500 mSv	50 mSv
for the extremities (hands and feet)	500 mSv	

The [5] requires the license holder to establish the investigation levels and dose constraints for nuclear power plant workers. The investigation levels shall be established in order to fix the achieved real level of exposure and to ensure optimal measures for protection of workers against the dangers of sources, used during the nuclear power plant operation. Investigation levels shall be regularly reviewed taking into account the radiation protection conditions at the nuclear power plant.

As regards the limitation of public exposure that might cause the nuclear power plant operation, [5] establishes the dose constraints for the members of public. The annual effective dose constraint for the members of public because of operation of nuclear power plant is 0.2 mSv. The annual dose constraint is used by [7] for setting the maximum permitted levels of discharges.

According to requirements set out in the [5], the radiation protection programme shall be established in the nuclear power plant, where a set of measures shall be implemented in order to protect workers from the negative impact that may cause the ionizing radiation. Following items shall be included in the programme:

- classification of working areas and access control;
- local rules, measures of supervision of safety at work and order of organisation of work;
- procedures of monitoring of workplaces and individual monitoring of workers;
- individual protective equipment and rules for their application;
- main premises, control systems for assurance of radiation protection;
- requiremenets for management of radioactive waste;
- radiation protection measures applied during the accident;
- application of optimisation principle (ALARA) and measures on exposure reduction;
- programs of health surveillance;
- mandatory training of workers and their instructions.

The establishment of a comprehensive radiation protection programme is also recommended by the [1].

The license holder shall ensure that all management procedures assigned for the implementation of the radiation protection programme at NPP, are performed in accordance with the requirements of the quality assurance programme.

According to requirements of [5], the premises of the NPP shall be divided into controlled and supervised areas. Controlled area is an area subject to special rules for the purpose of protection against ionising radiation or of preventing the spread of radioactive contamination and to which access is controlled. The supervised area is defined as an area subject to appropriate supervision for the purpose of protection against ionising radiation. Depending on the dose rate, surface and air contamination levels, the premises of the controlled area are divided into three categories (Table 2). The license holder shall delineate the boundaries of controlled area by physical and other means, acceptable from the point of view of radiation protection, post warning symbols, appropriate instructions shall be at the entrances and in other appropriate locations within the controlled area. The access to controlled area is restricted by means of physical barriers and is organized through sanitary cleaning points.

Table 2
Classification of premises of controlled area of NPP

Category of premises		I	II	III
Controlled values	Dose rate, μSv/h	>56	12 - 56	<12
	α contamination of surface, $Bq \cdot cm^{-2}$	>20	4 - 20	<4
	β contamination of surface, $Bq \cdot cm^{-2}$	>266	40 - 266	<40
	Concentration of airborne activity, $Bq \cdot m^{-3}$	>1110	185 - 1110	<185

All procedures within the controlled area, which may cause increased exposure of workers, shall be determined by the license holder and shall be performed by using the appointments-permits and assignments. The license holder is required to make the list of works, which shall be performed according to appointments-permits and assignments.

The license holder is responsible for organisation, implementation, carrying out and improvement of workplace monitoring and of individual monitoring of every worker, working within controlled area. The license holder is reponsible for preparation of the program for individual monitoring and monitoring of workplaces. The programme shall be agreed with the Radiation Protection Centre. Taking into account the changed working conditions, the license holder shall regularly review and, if necessary, renew the programme of workplace and individual monitoring.

All workers working within controlled area, depending on radiation situation in workplaces, shall be provided with individual protective equipment.

The nuclear power plant workers and outside workers shall be regularly trained and instructed in the field of radiation protection and safety. The frequency of training and instructing is established by the Order No. 171 of the Minister of Health "On Procedure of Mandatory Training and Instructing for Persons, Responsible for Radiation Protection and Workers, whose Work Involves Sources of Ionizing Radiation" (1999). 240, 60 and 30 hours training is required before starting the work first time, for persons responsible for radiation protection and for workers accordingly. The frequency of training is 5 years. The training programs shall be agreed with the Radiation Protection Centre.

The medical examination of workers shall be carried out once per year before the starting of activities with sources of ionizing radiation and during the work according to the requirements of the Order No. 301 of the Minister of Health "On Prophylactic Medical Examinations at the Institutions of Health Care" (2000). Depending on the contra-indications detected, activities within the controlled area are either forbidden or limited.

The [5] also establishes requirements for optimization of radiation protection. The establishment and implementation of the ALARA programme is required. The main aim of the programme is to ensure that the exposure of workers is being kept as low as reasonably achievable, social and economical factors taking into account. There is the ALARA group established at the plant. The main tasks of the group are to carry out comprehensive analyses and prepare proposals for exposure reductions, prepare the dose budget for the following year, plan the dose commitments for outages, prepare reports of implementation of ALARA programme, etc.

Following conditions are subject to successful implementation of ALARA programme:

- proper work organization;
- improvement of working conditions;
- perfection of technological processes;
- training of personnel;
- implementation of quality assurance programme;
- improvement of safety culture;
- evaluation of influence of "human factor".

Decontamination of systems and components are carried out before starting the activities that may lead to increased exposure, e.g., the decontamination of the main circulation circuit is one of methods for the reduction of doses. The activities, during which higher exposure is expected to be received, are carried out by application of following means: installation of lead blankets, application of distance equipment, video-control systems etc. The successful implementation of the ALARA principle is reflected in the workers exposure results.

The occupational exposure results of Ignalina NPP workers and outside workers during the period from 1995 to 2001 are presented in Figure 2.

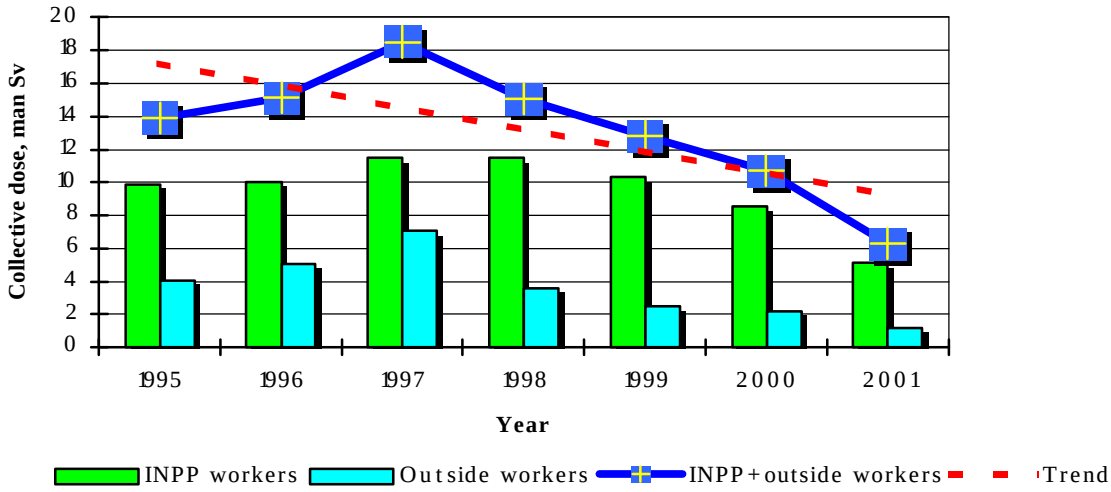

Figure 2. Occupational exposure results of Ignalina NPP and outside workers during the period 1995-2001

From 1995 the occupational exposure results of NPP workers and outside workers have decreasing inclination. During the period 1995-2001 the collective dose reduces in average of 1.33 man Sv each year.

Conclusion

The requirements of Lithuanian radiation protection legislation directly related to nuclear facilities are in compliance with international requirements and recommendations.

References

[1] International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources. Safety Series No. 115, IAEA, Vienna, 1996.

[2] European Council Directive 96/29/EURATOM of 13 May 1996 laying down Basic Safety Standards for the Protection of the Health of Workers and the General Public Against the Dangers arising from Ionizing Radiation, No. L 159, vol. 39.

[3] Law on Radiation Protection of the Republic of Lithuania, Vilnius (1999).

[4] Lithuanian Hygiene Standard HN 73:2001 “Basic Standards of Radiation Protection", Vilnius (2001).

[5] Lithuanian Hygiene Standard HN 87:2001 “Radiation Protection in Nuclear Power Plant", Vilnius (2001).

[6] Lithuanian Hygiene Standard HN 83:1998 “Radiation Protection of Outside Workers”, Vilnius (1998).

[7] Lithuanian Normative Document LAND 42 – 2001 “Limitation of Radioactive Discharges from Nuclear Facilities, Permitting of Discharges and Radiological Monitoring” (2001).