Republic of Serbia

Second National Report

Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management

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EXECUTIVE SUMMARY

The 2nd National Report of the Republic of Serbia in accordance with Article 32 of the Joint Convention on Safety of Spent Fuel Management and on Safety of Radioactive Waste Management contains updated information on the matters covered in the first report, noting significant changes in the applicable national law. It also addresses safety issues that were identified in the previous report, as well as the issues raised during the latest review meeting. The major developments in Serbia in the period after issuing the previous national report are given as follows:

- Adoption of the Law on Radiation and Nuclear Safety and Security by Serbian Parliament in December 2018.
- Draft document of the Spent Nuclear Fuel and Radioactive Waste Management Strategy in preparation
- Functions of the regulatory body have been extended with inspection supervision.

OVERVIEW MATRIX

Type of Liability	Long-Term Management Policy	Funding of Liabilities	Current Practice / Facilities	Planned Facilities
Spent Fuel	No decision on future use of research reactor RB. Once permanently removed from the reactor fuel can be stored in Secure Storage. Policy in preparation	State budget	None	None
Nuclear Fuel Cycle Wastes	No nuclear fuel cycle waste	Not applicable	Not applicable	Not applicable
Application Wastes	Treatment, long term storage and disposal	Users and State Budget	Centralized storage	Waste Processing Facility
Decommissioning	Deccomisioning of old storage facilities, research reactor RA and Radium bunker	State budget	Decission issued by Government for deccomisioning of old storage facilities and research reactor RA No activites on site	Radium bunker
Disused Sealed Sources	Return to the supplier, reuse, recycle or secure storage	Users and State Budget	Return to the supplier, secure storage	Waste Processing Facility

Contents

Section A. Introduction

A.1 Overview

The Republic of Serbia continues its successful cooperation with the International Atomic Energy Agency (IAEA) and aims to apply widely recognized principles and tools for a high-quality safety management of spent fuel and radioactive waste.

The Republic of Serbia ratified the Joint Convention on Safety of Spent Fuel Management and on Safety of Radioactive Waste Management (further referred to as the Convention) in the Parliament in November 2017. The instrument on the ratification was deposited on 18 Dec 2017. The Convention entred into force on 18 May 2018.

According to Article 32, each contracting party has to submit their respective national report periodically to illustrate how the objectives of the Convention have been met. The first Serbian national report was prepared in May 2018 and reviewed at the 6th Review Meeting organized in June in the same year.

This National Report contains the updated information on matters covered in the first report, noting significant changes in the applicable national law. It also addresses the safety issues identified in the previous report, as well as the issues raised during the latest review meeting. As for the form, structure and contents, the report aims to follow the most recent version of the Guidelines Regarding the Form and Structure of National Reports issued in 2014 (INFCIRC/604/Rev.3).

Major developments in Serbia in the period since the previous national report are given as follows:

- Adoption of the Law on Radiation and Nuclear Safety and Security by Serbian Parliament
- Functions of the regulatory body have been extended with inspection supervision
- Development of the Draft Spent Nuclear Fuel and Radioactive Waste Management Strategy
- Development of the Draft Radiation and Nuclear Safety Strategy

The Parliament of the Republic of Serbia adopted, in December 2018, The Law on Radiation and Nuclear Safety and Security [1] (*Official Gazette RS* 95/18 and 10/19). The adoption of the Law provided further progress in the alignment of the national legislation with the EU *acquis*.

According to Law 2018, Serbian Radiation nad Nuclear Safety and Security Directorate (hereinafter referred as: SRBATOM) was established as a succesor of Serbian Radiation and Nuclear Safety Agency. The duties of the regulatory body were further enhanced by their supplementing with the inspection responsibilities.

At the time of writing this report, the documents Draft Spent Nuclear Fuel and Radioactive Waste Management Strategy and Draft Radiation and Nuclear Safety Strategy were prepared and ready for the review by an international expert in the frame of EU project PLAC III (Policy and Legal Advice Centre)[2].

A.2 Legal framework

The legal framework is based on **The Law on Radiation and Nuclear Safety and Security**. The adoption of the Law 2018 provided further progress in the alignment of the national legislation with the EU regulations, which is deemed as a key priority in the accession to the European Union. This particularly refers to Council Directive 2013/59/Euratom of 5 December 2013 laying down basic safety

[1] In the text below: Law 2018

[2] The scope of PLAC III project is to provide support to the relevant national institutions in charge of the alignment of the national legal acts with the European Union *acquis* and to contribute to further building of capacities of the relevant national structures for successful carrying out of the accession negotiations.

standards for protection against the dangers arising from exposure to ionising radiation, and repealing Directives 89/618/Euratom, 90/641/Euratom, 96/29/Euratom, 97/43/Euratom and 2003/122/Euratom (OJ L 13, of 17 January 2014, p. 1); Council Directive 2009/71/Euratom establishing a Community framework for the nuclear safety of nuclear installations (OJ L 172, of 2 July 2009, p. 18); Council Directive 2014/87/Euratom of 8 July 2014 amending Directive 2009/71/Euratom establishing a Community framework for the nuclear safety of nuclear installations (OJ L 172, of 2 July 2009, p. 18); Council Directive 2011/70/Euratom of 19 July 2011 establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste (OJ L 199, of 2 August 2011, p. 48); and Council Directive 2006/117/Euratom of 20 November 2006 on the supervision and control of shipments of radioactive waste and spent fuel (OJ L 337, of 5 December 2006, p. 21).

The Law 2018 represents a solid basis for a successful involvement into both European and global trends in the area of radiation and nuclear safety and security, as well as for the application of the international regulations, standards and technical rules, and the acceptance of the international practise in this area as a guarantee of achieving the highest standards within the field of radiation and nuclear safety and security in the Republic of Serbia.

The Law 2018 also provided for a basis for the establishment of SRBATOM as a separate and independent regulatory body conducting regulatory, expert and other related duties in the field of radiation and nuclear safety and security, and related executive duties in the same field. In order to provide for professional and efficient execution of the radiation and nuclear safety and security measures and to control the practices regulated by Law 2018, the functions of SRBATOM have been defined. Moreover, its powers in terms of regulatory and inspection functions have been precisely determined, as well as the powers to pass any bylaws and other enactments serving to fully regulate the field of radiation and nuclear safety and security in the country.

Construction of nuclear power plants, nuclear fuel production plants and plants for reprocessing spent nuclear fuel for nuclear power plants is forbidden by **Law on banning the construction of nuclear power plants in SFR Yugoslavia** (*Official Gazette SFRY*, 35/89), later adopted in Republic of Serbia as **Law on banning the construction of nuclear power plants in FR Yugoslavia** (*Official Gazette FRY* 12/95 and *Official Gazette RS* 85/05-other law).

Regulations and rulebooks in the field of spent fuel and radioactive waste management safety are:

- Regulation on the security measures of nuclear facilities and nuclear materials (*Official Gazette RS* 39/14)
- Rulebook on performance of nuclear activities[3] (*Official Gazette RS* 37/11)
- Rulebook on conditions for obtaining licence to perform nuclear activity[4] (*Official Gazette RS* 37/11)
- Rulebook on radioactive waste management[5] (*Official Gazette RS* 60/11)
- Rulebook on limits of exposure to ionizing radiation and measurements for assessment of the exposure levels (*Official Gazette RS* 86/11 and 50/18)
- Rulebook on radioactivity monitoring (*Official Gazette RS* 97/11)
- Rulebook on limits of radioactive contamination of people, working and living environment and ways of performing decontamination (*Official Gazette RS* No. 38/11)

Security of nuclear facilities is regulated by **Regulation on the security measures of nuclear facilities and nuclear materials**. This Regulation prescribes the security measures applied by licensee for performing nuclear activities in order to secure nuclear facilities and nuclear materials.

[3] In the text below: Rulebook PNA

[4] In the text below: Rulebook COLPNA

[5] In the text below: Rulebook RWM

Rulebook on performance of nuclear activities regulates and governs reporting about the operation of nuclear facilities; conditions regarding staff qualifications and the integral quality management system for the performance of nuclear activities.

Rulebook on conditions for obtaining licence to perform nuclear activity prescribes the documentation submitted with the licence application for performing nuclear activities.

Rulebook on radioactive waste management prescribes the method of storage of radioactive waste generated in operation; the manner and conditions under which the radioactive waste is kept, collected, recorded, stored, processed and disposed and the manner of keeping records about radioactive waste and timelines for delivering the records to the regulatory body.

Rulebook on limits of exposure to ionizing radiation and measurements for assessment of the exposure levels prescribes types, manner and time interval of measurements for assessment of levels of exposure to ionizing radiation of professionally exposed persons, patients and population; content of the report of measurements for assessment of levels of exposure to ionizing radiation of professionally exposed persons, patients and population; manner of keeping records, records retention period, the procedure to inform the competent authorities as well as exposure limits for professionally exposed persons, persons on trainning and population.

Rulebook on radioactivity monitoring stipulates the methods and requirements for the systematic environmental radioactivity monitoring and systematic environmental radioactivity monitoring in surroundings of the nuclear facility.

Compete list of all relevant legal acts is given in Annex L.2.

A.3 Institutional framework

Legal decisions adopted in 2009 and 2018 allowed for the establishment of the institutional framework consisting of a regulatory body and a nuclear facilities operator including radioactive waste management facilities. **Serbian Radiation and Nuclear Safety and Security Directorate (SRBATOM)** is a functionally independent regulatory body with inspection powers. **Public Company Nuclear Facilities of Serbia (PC NFS)** as an operator has the responsibility over the management of radioactive waste and spent nuclear fuel in the territory of the Republic of Serbia.

A.4 Past and present practices and activities

The extensive use of radioactive sources and materials in the Republic of Serbia started after the establishment of Vinča Institute near Belgrade in late 1940's. Radioactive sources and materials have been used since then all around the country for medical, industrial and research purposes.

The research in the field of nuclear technologies and radioactive waste management generated in the course of applying such technologies had its start in the territory of SFRY, that is, the Republic of Serbia shortly after the end of World War II. Highly intensive research into this field of science led to the construction of two nuclear research reactors in the Vinca Institute in the 1950s, one of which was completely designed and built by national scientists (reactor RB). The intensive research and ambitious projects were, however, brought to a halt by the adoption of the Law on banning the construction of nuclear power plants in the SFR Yugoslavia.

The only nuclear fuel cycle facilities in the Republic of Serbia are research reactors RA and RB, and former uranium mine with associated hydrometallurgical plant in Gabrovnica near Kalna.

Radioactive waste management facilities are storage hangars H0, H1, H2, H3 and Secure Storage, liquid radioactive waste storage tanks VR1-VR4, Waste Processing Facility and so-called Radium Bunker. Until early 1990's all radioactive waste generated in former Yugoslavia was stored in these facilities. Radioactive waste generated in the Republic of Montenegro was also stored in these facilities until the

breakup of the State Union of Serbia and Montenegro. All radioactive waste generated in the Republic of Serbia is nowadays stored in these facilities.

Under the IAEA SRB9005 TC Project „Establishing a Reference Center for Radioactive Waste Treatment and Disused Radioactive Sources Conditioning for Small Facilities“, PC NFS together with the IAEA procured, constructed and equipped three mobile units for a segregation of radioactive waste and conditioning of sealed radioactive sources. The objective of this project is to implement a safer and more secure approach to the treatment of radioactive waste and conditioning of disused radioactive sources, so as to protect the public and the environment from the effects of ionizing radiation. The Law 2018 provides for a legal basis for construction and operation of mobile and modular units.

Figure 1 shows the layout of Vinča site. The locations of the facilities operated by PC NFS are shaded in red.

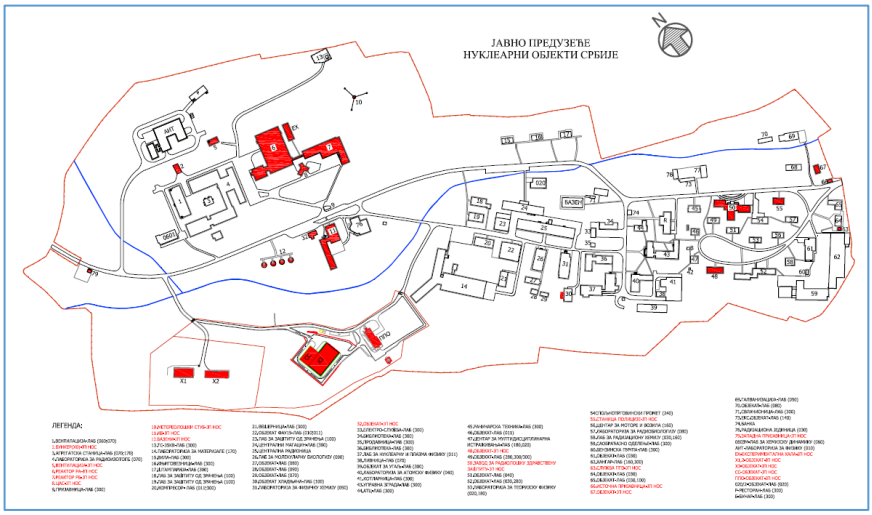

Figure 1. Vinča site

Nuclear research reactor RA was constructed in the second half of the 1950's, based on the Soviet design. This is a 6.5 MW tank type reactor using heavy water as a primary coolant and as a moderator. (**Error! Reference source not found.**). The facility went critical in December 1959 and was shut down in August 1984 for reconstruction and never restarted. During the period of operation, the reactor was successfully used for scientific, research and commercial purposes.

Figure 2. Reactor RA

In July 2002, the Government of the Republic of Serbia adopted a decision to shut down the reactor RA permanently. The fresh fuel elements were transported to the Russian Federation in August 2002. In 2004 the Government of the Republic of Serbia adopted a decision on repatriation of spent nuclear fuel from research reactor RA and its decommissioning. The spent nuclear fuel was repatriated to Russian Federation in December 2010.

Neutron induced activities in the graphite reflector, reactor aluminum and stainless steel vessels, and barite sand are very high. It was also found that the induced Wigner energy in a part of the graphite blocks needs to be removed.

Storage of spent nuclear fuel elements in the spent fuel pool resulted in a large leakage of ^{137}Cs. There is curently a significant contamination with ^{137}Cs and ^{90}Sr in about 200 m^3 of spent nuclear fuel pool water. The removal of ^{137}Cs from the water during repackaging activities was conducted by means of water contamination control system with ion exchange resins that were subsequently stored inside the pool. In addition, there is about 2 m^3 of water in stainless steel channel holders used for the storage of spent fuel elements contaminated with ^{137}Cs. The stainless steel channel holders and supporting structure are also placed inside the storage pool. There is also a significant quantity of radioactive and contaminated materials in the dry pool next to the spent fuel pool. The total volume of 5.5 m^3 of heavy water stored in the heavy water tank has significant amount of tritium. There is a certain amount of sealed and unsealed ^{60}Co sources stored in the hot cells of reactor RA.

Nuclear research reactor RB (**Error! Reference source not found.**) was designed and constructed as an unreflected zero power heavy water - natural uranium critical assembly. First criticality was reached in April 1958. Later, the 2% enriched metal uranium fuel and 80% enriched UO_2 fuel were obtained and used in the reactor core. The modifications of the reactor control, safety and dosimetry systems converted the RB critical assembly to a flexible heavy water reflected experimental reactor with 1 W nominal power, operable up to 50 W.

Power excursion accident, in which six persons were heavy irradiated, one of them fatally, occurred at the reactor only six months after the first start-up. There was no significant damage of the fuel elements and other reactor components or systems.

The only nuclear fuel existing at the time of writing this Report in the Republic of Serbia are natural metal uranium rods placed in the dry storage in reactor hall and LEU fuel elements TVR-S type in the reactor core. The burn-up level of the fuel is very low due to low power.

The activation of the entire construction and all other materials in the reactor vessel and supporting structures is negligible, and activity concentrations are quite below clearance levels. Activity concentration in graphite of thermal column is also below clearance levels.

Figure 3. Research reactor RB

Uranium processing **Hydrometallurgical facility** (Figure 4) was constructed in 1963, in the village Gabrovnica, in the vicinity of uranium mine Kalna, and in the same year it was fully operational. The ore from the mine was of poor quality for that time, which required more expensive methods of extraction and processing. Due to many circumstances, the facility was shut down in 1965. The facilities at Gabrovnica site are in very bad condition, most of them are ruined and useless (Figure 5). The main entrance to the mine tunnel was blocked with concrete wall. There is no decision regarding the future activities at this site. Remediation activities have to be performed in order to improve the safety on the location.

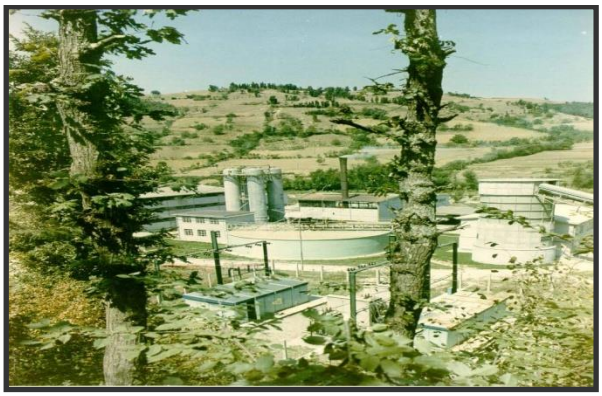

Figure 4. Hydrometallurgical facility in time of operation

Figure 5. Equipment debris

A.5 Spent fuel and radioactive waste management policy and strategy

According to Law 2018, in order to provide for the implementation of the policies in the area of spent fuel and radioactive waste management in the Republic of Serbia, the Spent Fuel and Radioactive Waste Management Strategy shall be passed. The Strategy determines long-term strategic direction and policies in the area of radiation and nuclear safety, and the measures to enhance spent nuclear fuel and radioactive waste management commensurate with the international standards and principles in this area as well as the assumed international commitments.

At the time of writing this report, the draft document was prepared and ready for the review by an international expert in the frame of EU project PLAC III.

A.6 Current spent fuel and radioactive waste management practice

Radioactive waste management facilities in the Republic of Serbia are:

- Hangar H0
- Hangar H1
- Hangar H2
- Hangar H3
- Underground liquid radioactive waste tanks VR-1, VR-2, VR-3 and VR-4
- Radium Bunker

Generation of radioactive waste in the Republic of Serbia started in late 1940's shortly after the Institute of Nuclear Sciences in Vinča near Belgrade had been established. At the beginning, solid radioactive waste generated in whole Yugoslavia was stored in standardized steel drums and buried in a shallow repository in the center of the Vinča site. Later, the purpose of this location was changed and the drums were transferred to a new location near the current Hangar H2 where these were stored in open space and subsequently, during the 1980's, moved to storage facility H2. The radioactive waste generated at that time originated from industrial, medical and research activities. Such radioactive waste demanded measures for safe and secure storage, and in 1968, the first radioactive waste storage facility **Hangar H1** (Figure 6) was built. This facility accepted radioactive waste until 1982 when it was closed due to high dose rates in several areas inside. By that time new storage facility **Hangar H2** (Figure 7) had been built. This facility accepted radioactive waste from 1984 to 2012 when it was closed due to insufficient storage space. Various forms of radium sources are stored in concrete facility covered with lead plates named **Radium Bunker** (Figure 8). During NATO bombing in 1999, an additional concrete bunker without entrance was constructed surrounding the existing bunker and covered with soil.

Figure 6. Hangar H1

By the beginning of the 21st century it had become clear that the existing storage facilities cannot provide enough storage space for the activities planned in the near future. These activities include decommissioning of the research reactor RA, processing of waste stored in the existing waste storages, and decontamination and potential decommissioning of these facilities with subsequent remediation of their locations. As a result, new storage facilities **Hangar H3** (Figure 9) and **Secure Storage** were constructed in the period from 2007 to 2010. Having obtained the license for operation in 2012, these facilities started to accept waste. Radioactive waste that does not fulfil waste acceptance criteria for Hangar H3 can be temporarily kept in separate licensed facility – **Hangar H0** (Figure 10) until the infrastructure for treatment become available.

Figure 7. Hangar H2

Figure 8. Radium bunker

Figure 9. Hangar H3

Figure 10. Hangar H0

Liquid radioactive waste produced during the period of extensive research was stored in four underground liquid waste tanks **VR 1-4** made of stainless steel with concrete shielding (Figure 11). These tanks contain radioactive waste generated in the research reactor RA and Laboratory for radioisotopes of the Vinča Institute to which they are connected by underground piping.

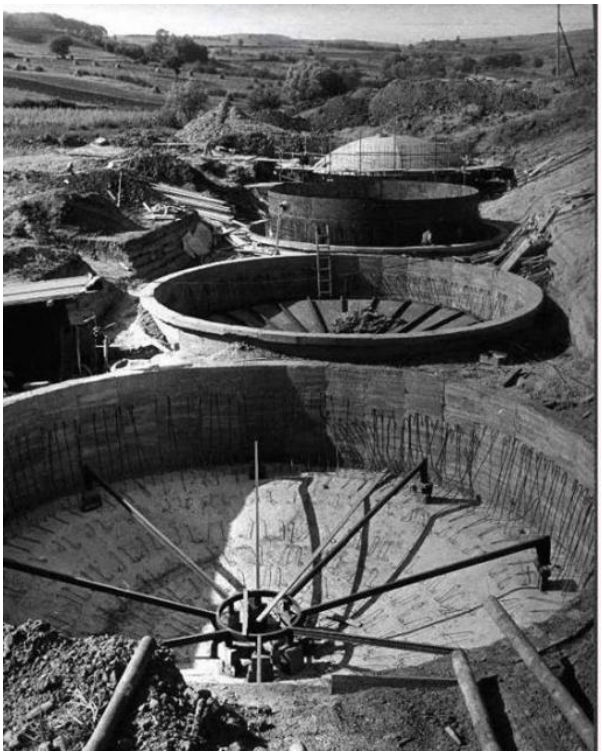

Figure 11. Liquid waste tanks during construction

The detailed description of all radioactive waste management facilities is given in the First National Report.

A.7 Safety of spent fuel and radioactive waste

General safety requirements for safe management of spent fuel and radioactive waste are set out in the Law 2018 and respective bylaws as described in detail in Sections F, G and H.

Safety measures that need to be taken while performing radioactive waste management activities are prescribed by the Law 2018 and bylaws listed in Section A.2. Radioactive waste management is defined

as a nuclear activity. All provisions of the Law 2018 and respective bylaws related to the performance of the nuclear activities are also relevant for the radioactive waste management.

The safety of a nuclear activity is documented in and proven by safety assesment report and a radiation protection programme. Under the current regulatory regime, SRBATOM assesses any application for the licence to perform a nuclear activity, which includes the management of spent fuel and radioactive waste. SRBATOM will not licence the facility until the conditions for safety and security are fulfilled, and until the evidence that the facility does not present a hazard for the people and the environment is provided.

A.8 Inventory of radioctive waste

The inventory of the radioactive waste stored in new storage facilities, Hangar H3 and Secure Storage has been regularly maintained since the start of their operation, which pertains to the inventory of liquid radioactive waste stored in Hangar H0 as well.

The inventory of the radioactive waste stored in old storage facilities – hangars H1 and H2 and their vicinity, four underground liquid waste tanks – VR 1-4 and Radium Bunker is incomplete and only estimates based on former practices and partial records exist. The inventory of the legacy waste in H0 is incomplete.

Changes in inventory of radioactive waste since previous report is given in Section D. Complette inventory of radioactive waste is given in Annex L.1

A.9 Transboundary movement

Based on Article 4 of the Law 2018, it is forbidden to import radioactive waste and spent nuclear fuel of foreign origin on the territory of the Republic of Serbia.

The shipment of spent fuel or radioactive waste to a destination south of latitude 60 degrees South for storage or disposal is forbidden by Article 178 of the Law 2018.

There have been no activities regarding any transit of radioactive waste and spent nuclear fuel of foreign origin through the Republic of Serbia since the last National Report.

A.10 Management of disused sealed sources

Management of disused sealed sources is prescribed by Article 109 of the Law 2018. The licensee for the performance of practices involving sealed radiation sources shall formally declare a sealed source to be disused and take all required measures to return this source to its supplier. At the time of writing this report, there were no capacities in the Republic of Serbia for the management of disused sealed sources except storage.

A.11 General efforts to improve safety

The following actions will facilitate the improvement of the legislative framework in Republic of Serbia:

- Adoption of the full set of bylaws in the field of radiation and nuclear safety and security according to Law 2018;
- Adoption of National Spent Nuclear Fuel and Radiaoctive Waste Management Strategy
- Adoption of National Radiation and Nuclear Safety Strategy.

The establishment of the Radiactive Waste Processing Facility will further improve the safety of the already stored waste as well as of the radioactive waste generated from now on.

A.12 Main safety issues

Main safety issues in the Republic of Serbia remain the same as in the First National Report.

- further improvement of legislative framework and
- improvement of current infrastructure (old waste storage facilities, decommisioning of RA reactor, remediation of old hydrometallurgical plant in Gabrovnica near closed uranium mine "Kalna").

Section B. Policies and Practices

Article 32. Reporting

1. In accordance with the provisions of Article 30, each Contracting Party shall submit a national report to each review meeting of Contracting Parties. This report shall address the measures taken to implement each of the obligations of the Convention. For each Contracting Party the report shall also address its:
   (i) spent fuel management policy;
   (ii) spent fuel management practices;
   (iii) radioactive waste management policy;
   (iv) radioactive waste management practices;
   (v) criteria used to define and categorize radioactive waste.

B.1 Spent fuel and radioactive waste management policy

General principles governing safe management of radioactive waste and spent nuclear fuel in the Republic of Serbia are prescribed in Law 2018, Article 159. Those principles are:

- generation of radioactive waste shall be kept to the minimum which is reasonably practicable, both in terms of activity and volume, by means of appropriate design measures and of operating and decommissioning practices, including the recycling and reuse of materials;
- interdependencies between all steps in spent fuel and radioactive waste generation and management shall be taken into account;
- radioactive waste and spent nuclear fuel shall be safely managed, including in the long term with passive safety features;
- implementation of radiation and nuclear safety and security measures shall follow a graded approach;
- the costs for the management of spent fuel and radioactive waste shall be borne by those who generated such materials;
- an evidence-based and documented decision-making process shall be applied with regard to all stages of the management of spent fuel and radioactive waste.

The Republic of Serbia shall provide for safe and secure storing of radioactive waste, disused radiation sources and spent nuclear fuel in the centralized storage.

The Republic of Serbia shall make arrangements for the safe and secure disposal of radioactive waste, disused radiation sources and spent nuclear fuel.

According to Law 2018, Article 6, in order to provide for the implementation of the policies in the area of spent fuel and radioactive waste management in the Republic of Serbia, the Spent Fuel and Radioactive Waste Management Strategy shall be passed.

The Strategy determines long-term strategic direction and policies in the area of radiation and nuclear safety, and the measures to enhance spent nuclear fuel and radioactive waste management commensurate with the international standards and principles in this area as well as the assumed international commitments.

According to Law 2018, Article 10, Spent Fuel and Radioactive Waste Management Strategy shall be passed with the aim of planning for the implementation of the principles of responsible and safe management of spent fuel and radioactive waste, and shall include the following:

- review, analysis and assessment of spent fuel and radioactive waste management conditions;
- fundamental safety principles in respect of spent fuel and radioactive waste management in accordance with the law;
- general statutory objectives and fundamental principles in respect of spent fuel and radioactive waste management;
- significant milestones and clear timeframes for the achievement thereof in the light of over-arching national strategy objectives;
- inventory of all spent fuel and radioactive waste and estimates for their future quantities, including those from decommissioning, which serve to clearly indicate the location and the amount of radioactive waste and spent fuel in accordance with the appropriate radioactive waste classification;
- concepts and technical solutions for radioactive waste and spent fuel management from generation to disposal;
- concepts or plans for the post-closure period of a disposal facility's lifetime, including the period during which appropriate controls and the means to be employed to preserve knowledge of that facility in the longer term are retained;
- research, development and demonstration activities that are needed in order to implement solutions for the management of spent fuel and radioactive waste;
- responsibility for the implementation of the national programme and the key performance indicators to monitor progress towards implementation;
- assessment of the national programme costs and the underlying basis and hypotheses for that assessment, which must include a profile over time;
- financing scheme and programme of the strategy;
- means and measures for making necessary information available to workers and the public so as to provide their full participation in the decision-making process;
- agreements concluded with other states, if any, on spent fuel and radioactive waste management, including those on the use of radioactive waste disposal facilities;
- manner and schedule in respect of reporting on Strategy realization.

At the time of writing this report, the draft document was prepared and ready for the review by an international expert in the frame of EU project PLAC III.

B.2 Spent fuel and radioactive waste management practice

Detailed description of spent fuel and radioactive waste management practice and facilities is given in the First National Report.

Radioactive waste has been stored on Vinča site since late 1940's on different locations and in different facilities.

Hangar H3 (intended for storage of solid radioactive waste) and Secure Storage (intended for storage of spent sealed radioactive sources) are operational. Radioactive waste that does not fulfill waste acceptance criteria for Hangar H3 can be temporarily kept in a separate part of Hangar H0 until the treatment infrastructure becomes available.

Radioactive waste is generated in medical, industrial and research activities.

Legacy radioactive waste in Serbia is non-treated solid waste in old storage facilities H0, H1 and H2, Radium Bunker for radium sources and liquid waste stored in four underground tanks VR1-4, all situated on the Vinča site.

There is no spent nuclear fuel on territory of the Republic of Serbia. In 2010, all spent fuel from the research reactor RA was repatriated to the Russian Federation in the context of IAEA Russian Research Reactors Fuel Return Programme.The only nuclear fuel existing at the time of writing this Report is

natural metal uranium rods placed in dry storage in reactor hall and LEU fuel elements TVR-S type in the reactor core of the reactor RB. The burn-up level is very low due to low reactor power. Once permanently removed from the reactor RB, this fuel can be stored in the Secure Storage.

B.3 Criteria used to define and categorize radioactive waste

B.3.1 Definitions

The definition of radioactive waste according to the Law 2018, Article 5, is:

> *Radioactive waste* means radioactive material in gaseous, liquid or solid form for which no further use is foreseen or considered*;*

The definition of spent nuclear fuel according the Law 2018, Article 5, is:

> *Spent nuclear fuel* means nuclear fuel that has been irradiated in and permanently removed from a reactor core;

B.3.2 Categorization

The categorization of radioactive waste is given in the Rulebook RWM. The categorization is done according to the IAEA GSG-1 "Classification of Radioactive Waste".

According to Law 2018, Articles 166 and 167, radioactive waste shall be classified pursuant to its physical, mechanical, chemical, radiological and biological properties with a view of its safe and secure management.

New radioactive waste categorization and criteria for radioactive waste classification in accordance with the Law 2018 are in preparation.

Section C. Scope of Application

Article 3: Scope of application

1. This Convention shall apply to the safety of spent fuel management when the spent fuel results from the operation of civilian nuclear reactors. Spent fuel held at reprocessing facilities as part of a reprocessing activity is not covered in the scope of this Convention unless the Contracting Party declares reprocessing to be part of spent fuel management.
2. This Convention shall also apply to the safety of radioactive waste management when the radioactive waste results from civilian applications. However, this Convention shall not apply to waste that contains only naturally occurring radioactive materials and that does not originate from the nuclear fuel cycle, unless it constitutes a disused sealed source or it is declared as radioactive waste for the purposes of this Convention by the Contracting Party.
3. This Convention shall not apply to the safety of management of spent fuel or radioactive waste within military or defence programmes, unless declared as spent fuel or radioactive waste for the purposes of this Convention by the Contracting Party. However, this Convention shall apply to the safety of management of spent fuel and radioactive waste from military or defence programmes if and when such materials are transferred permanently to and managed within exclusively civilian programmes.

C.1 Reprocessing of spent fuel

Reprocessing of spent fuel is a part of spent fuel management according to the Law 2018, articles 5 and 162. According to the Law, the construction of nuclear power plants, and reprocessing of spent nuclear fuel from nuclear power plants are forbidden.

Currently, there is no spent nuclear fuel on the territory of the Republic of Serbia.

C.2 Waste containing naturally occurring radioactive material

The material containing depleted uranium removed from locations affected by NATO bombing of the teritory of Serbia and Montenegro in 1999, is declared as radioactive waste and stored in Hangar H2.

The metal pipes and equipment contaminated with naturally occurring radioactive material from fertilizer industry are stored in old storage facilities hangars H1 and H2 and in ISO containers between them.

C.3 Spent fuel or radioactive waste within military or defence programmes

There is no spent fuel or radioactive waste within military or defence programmes in the Republic of Serbia.

Section D. Inventories and Lists

Article 32 (Reporting), paragraph 2

2. This report shall also include:

(i) a list of the spent fuel management facilities subject to this Convention, their location, main purpose and essential features;

(ii) an inventory of spent fuel that is subject to this Convention and that is being held in storage and of that which has been disposed of. This inventory shall contain a description of the material and, if available, give information on its mass and its total activity;

(iii) a list of the radioactive waste management facilities subject to this Convention, their location, main purpose and essential features;

(iv) an inventory of radioactive waste that is subject to this Convention that:

(a) is being held in storage at radioactive waste management and nuclear fuel cycle facilities;

(b) has been disposed of; or

(c) has resulted from past practices.

This inventory shall contain a description of the material and other appropriate information available, such as volume or mass, activity and specific radionuclides;

(v) a list of nuclear facilities in the process of being decommissioned and the status of decommissioning activities at those facilities.

D.1 Spent fuel management facilities

There are no spent fuel management facilities in the Republic of Serbia.

D.2 Inventory of spent fuel

There is no spent fuel in the Republic of Serbia. The only nuclear fuel in Serbia is the fuel from the Reactor RB. This fuel, once permanently removed from the reactor core, will be the only spent fuel in the Republic of Serbia. This fuel has very low burn-up due to low power of the Reactor RB. Nevertheless, once this fuel has been permanently removed from the reactor core, the safety and security measures have to be in place. The number of items and mass of fuel is in accordance with the Safeguards declaration.

D.3 Radioactive waste management facilities

The detailed description of all radioactive waste management facilities in Republic of Serbia is given in the First National Report.

Solid radioactive waste is stored in four separate storage facilities, namely H0, H1, H2 and H3.

Spent sealed radioactive sources are stored in Secure Storage.

Legacy radium sources are stored in so-called Radium Bunker.

Liquid radioactive waste is stored in four underground liquid waste tanks, namely VR1 – VR4.

The Waste Processing Facility, as well as mobile units for radioactive waste processing, are planned to be put into operation in near future.

D.4 Inventory of radioactive waste

Inventory of radioactive waste stored in new storage facilities Hangar H3 and Secure Storage has been regularly updated since the start of their operation, as well as the inventory of liquid radioactive waste stored in Hangar H0. Since the last Review Meeting, the inventory of radioactive waste and sealed sources has increased as follows:

- Solid waste stored in Hangar H3 – 12.9 m^3
- Liquid waste stored in Hangar H0 – 2 l
- Spent sealed sources in Secure Storage
    - Cat. III and IV – 127 pcs.
    - Cat. V – 467 pcs.
- Spent sealed sources (Cat. V) in Hangar H3
    - Ra sources (compasses, markers etc.) – 19,427 pcs.
    - Am sources (smoke detectors) – 1,209 pcs.

The inventory of the radioactive waste in new storage facilities is given in Section L.1 Annexes, Tables 1 and 2.

The inventory of legacy waste stored in old storage facilities – hangars H0, H1 and H2 and their vicinity, four underground liquid waste tanks VR 1-4 and Radium Bunker is incomplete. Only estimates based on former practices and partial records are available. There have been no changes in this inventory since the previous report. The inventories are given in Section L.1 Annexes, Tables 3-8. The detailed description of waste is given in the First National Report. There are no changes in the inventory of the old storage facilities.

D.5 Facilities in the process of being decommissioned

Facilites that are planned for decommission are research reactor RA and old storage facilities H1 and H2. There have been no changes in their status since the previous report.

Section E. Legislative and Regulatory System

E.1 Implementing measures

Article 18. Implementing measures

Each Contracting Party shall take, within the framework of its national Act, the legislative, regulatory and administrative measures and other steps necessary for implementing its obligations under this Convention.

The legislative, regulatory and other measures taken to fulfill the obligations of the Convention are discussed in this Report.

E.2 Legislative and regulatory framework

Article 19: Legislative and regulatory framework

1. Each Contracting Party shall establish and maintain a legislative and regulatory framework to govern the safety of spent fuel and radioactive waste management.
2. This legislative and regulatory framework shall provide for:
   (i) the establishment of applicable national safety requirements and regulations for radiation safety;
   (ii) a system of licensing of spent fuel and radioactive waste management activities;
   (iii) a system of prohibition of the operation of a spent fuel or radioactive waste management facility without a license;
   (iv) a system of appropriate institutional control, regulatory inspection and documentation and reporting;
   (v) the enforcement of applicable regulations and of the terms of the licenses;
   (vi) a clear allocation of responsibilities of the bodies involved in the different steps of spent fuel and of radioactive waste management.
3. When considering whether to regulate radioactive materials as radioactive waste, Contracting Parties shall take due account of the objectives of this Convention.

E.2.1 Safety of spent fuel and radioactive waste management

In the Republic of Serbia is in force the Law on banning the construction of nuclear power plants. Under this Law, it is forbidden to build nuclear power plants, nuclear fuel production plants and plants for reprocessing of spent nuclear fuel for nuclear power plants. It is also forbidden to make investment decisions, investment programs and technical documentation for the construction of nuclear power plants, production plants for nuclear fuel and plants for reprocessing spent nuclear fuel for nuclear power plants.

In December 2018 the Parliament of the Republic of Serbia adopted the Law 2018. In Article 1 stated that Law regulates the measures of radiation and nuclear safety and security, conditions for conducting practices with radiation sources, response in case of planned, existing and emergency exposure to inonising radiation, and aims at ensuring proper protection of members of the public, the public and the environment from the harmful effect of ionising radiation, now and in the future. It is also stated that the Law provides for the establishment of SRBATOM with the aim of exercising regulatory control over the practices regulated by the Law.

Article 4 of the Law stipulates that the imports of radioactive waste and spent nuclear fuel of foreign origin into the territory of the Republic of Serbia shall be prohibited.

Article 6 of the Law stipulates that the Government, at the proposal of SRBATOM, which should be prepared in cooperation with the ministries responsible for the environmental protection, health, science, defense, emergency situations, and other interested bodies and organizations, shall pass the Radiation and Nuclear Safety Strategy, Spent Fuel and Radioactive Waste Management Strategy, Radiation and Nuclear Security Strategy and Existing Exposure Situation Management Strategy, in order to provide for the implementation of the policies in the area of radiation and nuclear safety and security and the policies of spent fuel and radioactive waste management.

E.2.2 National safety requirements and regulations

According to Article 29 of the Law, the fundamental principles of the Law are justification of application, optimisation of radiation protection (ALARA), and dose limitation.

Under Article 35 of the Law, an authorization holder shall bear prime responsibility for radiation and nuclear safety and security. Authorization holders shall be responsible for all activities conducted by legal entities, physical entities and entrepreneurs they engage, and whose practices can affect radiation and nuclear safety and security. Those responsibilities cannot be delegated.

Authorization holder shall ensure that radiation doses for exposed workers, apprentices, students and the public, as well as the impact of radiation on the environment are, in terms of social and economic factors, as low as reasonably practicable.

Authorization holder shall be responsible for the safety and security of the facility where the practice is performed even if the authorization has expired, as long as the facility, the site, and the parts thereof are not released form the regulatory control.

According to Article 36 of the Law, an authorization holder shall:

1) apply the fundamental principles of radiation and nuclear safety;
2) take all necessary steps to protect people's health and the environment from the harmful effect of ionizing radiation, now and in future, by keeping the exposure level below the specified limits, and take all reasonable steps to minimize, now and in future, the harmful effect on the public;
3) plan and implement technical and organizational measures necessary to ensure the adequate level of radiation and nuclear safety and security;
4) prepare and implement the plan in case of emergency in accordance with the Law;
5) keep relevant records and report to the SRBATOM on emergency events in accordance with the Law;
6) ensure compliance with the prescribed dose limits and monitor the exposure of workers to ionizing radiation;
7) obtain adequate financial and human resources with adequate qualifications and competences necessary to conduct the prescribed radiation and nuclear safety and security measures when conducting practices;
8) ensure that their subcontractors, whose activities can affect radiation and nuclear safety and security, throughout the practice performance provide for required staffing with appropriate qualifications and competences necessary to carry out their activities;
9) provide for continuous education and training of persons participating in the practice performance;
10) provide for adequate financial resources to handle disused radiation sources, radioactive waste management, decommissioning and liability in case of radiological or nuclear damage;
11) enable the inspectors of the SRBATOM to carry out their work without impediment and to have access to the facilities and sites where the practice is conducted;

12) not modify the manner of the performance of the authorized practices in a way that could affect the protection of workers, the public or the environment without previously notifying and obtaining the appropriate authorization from the SRBATOM, and;
13) provide, upon the request of the SRBATOM or in line with the requirements, all information regarding the practice performance that the SRBATOM deems necessary or relevant for radiation and nuclear safety and security.

The SRBATOM shall specify the above requirements.

The prime responsibility for safety also is set out in Article 4 of the Rulebook COLPNA, which states that the licensee for performing a nuclear activity has the primary responsibility for the safety of his or her nuclear facility.

The Law, *inter alia*, includes, with respect to radiation protection areas, provisions on:

- strategies;
- fundamental principles of ionizing radiation protection;
- exemption from notification requirement, notifications and authorizations;
- radiation and nuclear safety;
- preparedness and response in case of a nuclear or radiological emergency;
- trade in radiation sources;
- transport of dangerous goods class 7 ADR/RID/ADN (radioactive material);
- public information and transparency;
- rights, obligations and authorisations of the inspector for radiation and nuclear safety, security and radioactive waste management; and
- criminal provisions (economic offences and misdemeanors).

With respect to the legislative and regulatory framework which covers spent fuel and radioactive waste management, the regulation and rulebooks stated below should be mentioned:

- Rulebook on conditions for obtaining licence to perform nuclear activity;
- Rulebook on performance of nuclear activities;
- Rulebook on radioactive waste management.

E.2.3 Licensing system

A system of licensing of spent fuel and radioactive waste management is provided in the Law 2018.

Article 5 of the Law 2018 states that a nuclear facility means a facility or several of nuclear facilities when they are functionally linked in the same geographically confined territory facility and managed by the same person for processing or for enrichment of nuclear materials or for production of nuclear fuel, a research reactor, a nuclear power-plant and heating plant, a facility for nuclear fuel management or radioactive waste management.

Article 4 of the Law 2018 incorporates a general point which provides that the performance of any practice without previously obtained authorization issued by the SRBATOM shall be prohibited.

Practice, according to the Law 2018, means a human activity that can increase the exposure of individuals to radiation from a radiation source and is managed as a planned exposure situation and includes radiation practices and nuclear activities.

Nuclear activities are phases of a lifetime of nuclear facility, namely: siting, design, construction, trial run or commissioning, operation, decommissioning (other than for disposal facility) or closure (for disposal facility) of nuclear facilities and remediation of their sites. Thus, a nuclear facility may be sited, designed, constructed, put into trial run or commissioning, operated and decommissioned (other than for disposal facility) or closed (for disposal facility) only with a previously obtained licence for

performing a nuclear activity. Since the facilities for storage, treatment and disposal of radioactive waste are defined by the Law 2018 as nuclear facilities, the entire spectrum of licensing requirements (for each nuclear activity) have to be taken into consideration by the applicant.

The license may be issued after it had been established that all required nuclear safety measures have been met, based on the nuclear safety report, radiation protection programme and other prescribed documentation, which for each and every nuclear activity shall be stipulated by the regulatory body. The license shall be issued under a decision within 180 days following the duly submitted license application, with validity of no longer than ten years, except in case of a license for a trial run of nuclear facility which is issued for time period no longer than two years. The decision under which a licence is issued shall be published in the *"Official Gazette of the Republic of Serbia"*.

The application for the licence and the required documentation shall be submitted by a legal entity to the regulatory body. In addition to the application for the licence, the applicant shall also deliver an opinion of the authority responsible for the environmental protection regarding the environmental impact assessment for the nuclear facility, and the consent from the Ministry of Interior to the Security Plan, as well as the proof that the integrated management system is established, maintained and implemented.

Article 42 of the Law 2018 prescribes that the licensee shall report to the SRBATOM, without undue delay, and within eight days the latest, any change in the data on the fulfilment of conditions that served as the basis for a license issuance.

A legal entity undertakes, not later than 180 days before expiration of the license for performing a nuclear activity, to file for its extension to the regulatory body. SRBATOM shall issue the decision on extension when it has been affirmed that all conditions serving as the basis for issuing the license and all radiation and nuclear safety and security measures have been met. The fulfilment of radiation and nuclear safety and security measures shall be affirmed based on the report on periodic review and audit of the Safety Analysis Report, and based on all reported changes in the data on the fulfilment of conditions serving as the basis for license issuance. The extension of the license for performing a nuclear activity shall be done for the same time period and under the same conditions that served as the basis for issuing the previous licence.

The SRBATOM may modify the decision on license issuance at the request of the authorization holder or based on the inspection findings.

The SRBATOM may suspend the decision on issuing a license for the period no longer than 12 months if:

1) the authorization holder temporarily ceases to fulfil any of the conditions established by the decision on authorization issuance;
2) the inspection oversight determines that the authorization holder has failed to take radiation and nuclear safety and security measures or has failed to implement them in the schedule prescribed by the SRBATOM;
3) the inspector issues a decision to prohibit nuclear activity performance;
4) the authorization holder fails to provide the SRBATOM with all the data serving to affirm the fulfilment of radiation and nuclear safety and security measures;

By suspending the authorization, the SRBATOM orders the authorization holder to remedy all detected deficiencies, and establishes the schedule for the authorization holder to do so. During suspension, the authorization holder cannot perform the practice the suspension was issued for.

The SRBATOM shall revoke the decision on registration or license issuance if the authorization holder:

1) ceases to fulfil some of the requirements serving as the basis for license issuance;
2) fails to report to the SRBATOM an emergency event during practice performance;

3) following suspension, fails to timely meet the requirements arising from the suspension;
4) fails to conduct the prescribed measurement, withholds or reports inaccurate data in connection with the implementation of radiation and nuclear safety and security measures;
5) submits the application for the termination of the license;
6) fails to review and audit the Safety Analysis Report or fails timely to submit to the SRBATOM the report on the review and audit of the Safety Analysis Report;
7) fails timely to submit the application for the license extension.

The decision on the license issuance shall be terminated:

1) if the validity of the license expires and the licensee does not apply for the extension within the prescribed schedule;
2) in case of bankruptcy or liquidation of the licensee;
3) if the proceedings have been canceled in the event of the owner's demise and the rights, duties and legal interests cannot be transferred to the successors;
4) in case of revocation of the license, and
5) in instances stipulated by this Law

License for each of the phases of the life-cycle of the nuclear facility is also terminated when the license for the next phase is issued.

Any decisions issued by the SRBATOM are deemed as final and cannot be appealed to. However, the administrative dispute can be initiated within 30 days as of the day of a decision delivery.

According to Article 43 of the Law 2018, the Safety Analisys Report shall contain:

1) description of the practice;
2) description and features of the premises, facility and site, and any other location where the practice is performed;
3) conditions for and limitations to the performance of the practice;
4) safety assessment of the practice performance for normal and abnormal operations, including emergency events, and assessment of possible initial events that could lead to deviation from the intended manner of work;
5) evaluation of potential emergency events and measures for their prevention and mitigation as well as remediation in case of emergency.

The licensee undertakes to modify and supplement the Safety Analysis Report commensurate with the changes occurring as the practice is conducted so that the report would always reflect the current status of the practice performance.

The licensee shall perform systematic and periodic revisions of Safety Analysis Report on which they shall submit the report to the SRBATOM. Such revision shall entail review, verification and improvement of radiation and nuclear safety measures, emergency event prevention measures and emergency event remediation measures, if necessary. If the circumstances justify so, the SRBATOM may require the licensee to conduct an extraordinary revision of the Safety Analysis Report and submit the report on it to the SRBATOM.

According to Article 43 of the Law 2018 the Radiation Protection Programme, shall particularly include:

1) assignment of responsibilities to all management levels in case of occupational exposure to ionizing radiation, which in case of external workers can also include appropriate organizational cooperation and the allocation of responsibilities between external workers and legal entities or entrepreneurs as authorization holders;
2) designation of controlled and supervised areas;
3) establishment of rules for workers to follow and supervision of their work;

4) arrangements for individual monitoring of exposed workers and the workplace, including the acquisition and maintenance of radiation protection instruments;
5) system of recording and reporting of all relevant information related to the control of ionizing radiation exposure, decisions on measures of radiation protection, and individual monitoring of exposed workers;
6) education and training programme on the nature of hazards, radiation protection measures and radiation and nuclear safety measures;
7) methods and schedule for periodically reviewing and auditing the performance of the Radiation Protection Programme;
8) plans to be implemented in case of emergency events;
9) health surveillance programme;
10) requirements for the implementation and assurance of quality control.

Law 2018 also prescribed manner of licensing of all activities related to mobile units for processing of radioactive waste i.e construction, trial run, operation and decommissioning of mobile units for processing of radioactive waste.

E.2.4 System of prohibition of the operation of a spent fuel or radioactive waste management facility without a license

The radioactive waste management facilities are defined by the Law 2018 as nuclear facilities. Consequently, all relevant licenses are needed, including the operating license. The operation of such a facility without a license is prohibited according to Article 4 of the same law which prescribes that the performance of any practice without previously obtained authorization issued by the SRBATOM shall be prohibited.

In Article 233 of the Law 2018 it is foreseen that the fine amounting from RSD 1,500,000 to 3,000,000 shall be imposed for an economic offence on a legal person if such legal person perform of any practice without previously obtained authorization issued by the SRBATOM . For the same economic offence, the responsible person of the legal person shall be also fined the amount from RSD 200,000 to 500,000.

E.2.5 System of appropriate institutional control, regulatory inspection and documentation and reporting

Under Article 211 of the Law, regulatory inspection oversight over the implementation of the provisions of the Law and pertaining subsidiary legislation shall be performed by SRBATOM through the inspector for radiation and nuclear safety and security, within the remit established by the Law.

It is also stated that, unless this Law states otherwise, the inspection oversight is subject to a special law governing inspection oversight.

Under Article 211, the inspection oversight is conducted according to the Annual Inspection Oversight Plan that shall be published on the website of SRBATOM until 31 December of the current year for the following year.

Article 214 of the Law stipulates that in performing inspection oversight over the implementation of nuclear safety and security, the inspector has the right and duty to determine:

- whether the requirements for nuclear activity performance have been met;
- whether the prescribed measures of ionising radiation protection for the exposed workers, the public and the environment have been implemented;
- whether the prescribed measures of nuclear safety and security have been implemented;

- whether the records of nuclear material and other records as prescribed by the Law and the applicable international agreements have been duly kept;
- whether other measures prescribed by this Law have been implemented.

Regarding authorisations of the inspector for radiation and nuclear safety and security in Article 215 of the Law is prescribed that the inspector shall be empowered to:

- inspect the work premises, facilities, plants and sites that are in connection with the radiation practice performance;
- inspect the sites, buildings and facilities that are in connection with the nuclear practice performance;
- gain insight into the technical specification of the equipment;
- gain insight into the employment documentation of the exposed workers;
- gain insight into the documentation on vocational qualifications and fulfillment of health requirements for the exposed workers;
- gain insight into the documentation on education and training of the exposed workers;
- gain insight into ledgers, records, official documents, electronic documents and other documentation in connection with the practice;
- scan and copy ledgers, records, official documents and electronic documents subject to inspection oversight;
- identify the exposed workers, ionizing radiation protection officers and other individuals found at locations where the inspection oversight is performed by inspecting their personal photographic identification documents or other public photographic identification instruments;
- extract written and oral statements from the persons performing the practice, i.e. witnesses and officials, and instruct such persons to make statements on matters of significance for inspection oversight;
- take photographs and make video recordings of locations where inspection oversight is performed, as well as the ionizing radiation sources, radioactive and nuclear material or other items subject to inspection oversight ;
- collect data and information that are of relevance for the inspection oversight ;
- request a court warrant to search the residential or work premises if in possession of information that such premises are being used for illicit or non-compliant practices;
- request the assistance and presence of the police, i.e. community police, if reasonably deemed as necessary by the circumstances of a particular case;
- perform radioactivity measurements by means of radiation monitors;
- attend reference sampling, measurements and decontamination of persons, work and living environment;
- temporarily impound the goods subject to inspection oversight , as well as the documentation and other items to ascertain the facts of a particular case and secure evidence, and issue a certificate of temporary impounding;
- engage authorized legal entities to implement urgent measures, perform radioactivity measurements and give expert opinion in the area of radiation and nuclear safety and security;
- engage experts in the area of radiation and nuclear safety and security;
- engage court expert witnesses in the area of radiation and nuclear safety and security;
- take other measures in accordance with the law.

Under Article 230 of the Law 2018, each inspector shall keep a record of inspection oversight, which shall contain, in particular:

- identification of the type and form of the instance of the inspection oversight performed;
- information on the inspector, i.e. the inspectors performing the instance of the inspection oversight ;

- information on the legal entity, entrepreneur or physical entity, i.e. their statutory representatives or responsible officers;
- information on the type of practice;
- information on the assessed radiation risk;
- statutory grounds for the instance of the inspection oversight ;
- description of the subject-matter and purpose of the instance of the inspection oversight ;
- duration of the instance of inspection oversight (start and end dates of the instance of inspection oversight);
- description of actions taken in the course of the instance of the inspection oversight ;
- information on the minutes of inspection oversight and objections to such minutes;
- information on the measures imposed, or note to the effect that no measures were ordered, with an indication of whether there were no grounds or need to order any measures;
- information on criminal charges, economic offence charges, and misdemeanor charges brought and misdemeanor orders issued;
- information on the outcomes of actions by judicial bodies with regard to misdemeanor charges, economic offence charges and criminal charges brought by the inspection body and outcomes of misdemeanor orders issued by the inspection body.

SRBATOM shall prescribe the template of the record of inspection oversight and the manner of keeping such record.

E.2.6 Enforcement of the applicable regulations and the terms of the licenses

Reagrding measures of the inspector, Article 216 of the Law sets forth that the inspector shall be empowered to order nuclear safety and security measures to be taken given as follows:

- forbid a nuclear activity unless all requirements have been met;
- forbid the trade in nuclear materials unless all requirements have been met;
- forbid the work of the exposed workers in the nuclear facility not meeting the prescribed professional or health conditions, or not having the required training and education;
- order the exposed worker to have the appropriate health examination in accordance with the regulations governing occupational medicine;
- order the exposed worker to have periodic retraining and acquire the required skills and knowledge to implement radiation protection measures;
- order the establishment of radiation protection service, except in case of the license for a nuclear facility siting, design and construction;
- order the establishment and implementation of the integrated management system;
- order the requirements to be met and the detected faults that can have harmful effect on the health of people, work and living environment to be remedied;
- order the faults in connection with the radioactive waste management to be remedied;
- order the faults in connection with spent nuclear fuel management to be remedied;
- order the faults in physical protection and a nuclear facility security to be remedied;
- order the prescribed measures in case of nuclear emergency to be implemented;
- order environmental radioactivity monitoring in the vicinity of the facility;
- order record keeping of data on a nuclear facility and the site thereof, management of radioactive waste, nuclear and other material, and the entire documentation necessary to establish civil liability in accordance with the international convention on the civil liability for nuclear damage;
- order decommissioning of a nuclear facility;
- order the site and soil remediation;
- order record keeping and control of nuclear material;
- order the prescribed nuclear security to be implemented;

– order other measures of nuclear safety and security;

The enforcement of the applicable regulations and the terms of the licenses is ensured by the application of penal provisions related to the issuing, extending and revoking licences for performing nuclear activity, as provided for in the Law 2018.

E.2.7 Allocation of responsibilities

As described above, the legislative framework, especially the Law 2018 and mentioned bylaws, provides a clear allocation of responsibilities of the bodies involved in different steps in the area of nuclear safety and security (licence holder, mandatory state-owned public services, regulatory body), as well as a system of documentation and reporting.

A comprehensive overview of the legislative and regulatory framework which governs radiation and nuclear safety and security is attached to this report in Annex L.2. The list consists of the national legal framework, as well as the international instruments (multilateral and bilateral treaties, conventions, agreements/arrangements) to which the Republic of Serbia is a party.

E.3 Regulatory body

Article 20: Regulatory body

1. Each Contracting Party shall establish or designate a regulatory body entrusted with the implementation of the legislative and regulatory framework referred to in Article 19, and provided with adequate authority, competence and financial and human resources to fulfil its assigned responsibilities.
2. Each Contracting Party, in accordance with its legislative and regulatory framework, shall take the appropriate steps to ensure the effective independence of the regulatory functions from other functions where organisations are involved in both spent fuel or radioactive waste management and in their regulation.

E.3.1 Regulatory body – Serbian Radiation Protection and Nuclear Safety and Security Directorate

SRBATOM was established by the Law 2018, for the purpose of providing the environment for a professional and efficient regulatory control of practices regulated by the Law 2018.

According to Article 13 of the Law 2018, SRBATOM was established as an independent and separate regulatory body with regulatory, expert and associated executive functions in the area of radiation and nuclear safety and security.

Under Article 14 of the Law 2018, SRBATOM shall be responsible to the Government of the Republic of Serbia. In addition, SRBATOM is a legal entity.

According to Article 15 of the Law 2018, the bodies of SRBATOM are the Board and the Director, appointed by the Government. The Board consists of five members.

Under Article 20 of the Law 2018, the resources of SRBATOM are provided from the budget of the Republic of Serbia, as proposed by SRBATOM, the income SRBATOM acquires from the activities within its remit, donations, grants and other sources pursuant to law. The SRBATOM shall independently use the above resources, pursuant to the Law 2018.

Moreover, Article 20 states that SRBATOM shall take into employment the appropriate number of employees with relevant qualifications, experience and expertise, and may use external resources and expertise in support of its regulatory functions.

SRBATOM shall ensure staff training programmes in the field of radiation and nuclear safety and security, and preparedness to respond in case of an emergency event.

Internal organization, remit and manner of work, manner of planning, performing activities and other issues of relevance for SRBATOM shall be regulated by the Statute of SRBATOM and other general legal enactments pursuant to the Law 2018.

According to Article 21 of the Law 2018, SRBATOM shall, at least once every 10 years, arrange for periodic self-assessment of compliance of national legal, regulatory and institutional framework with the international standards in the area of radiation and nuclear safety and security and radioactive waste and spent nuclear fuel management.The assessment of compliance shall be arranged by inviting the international peer review groups of relevant segments of radiation protection and nuclear safety and other fields of peaceful use of nuclear energy that SRBATOM proposes to the Government.

SRBATOM shall ensure the implementation of the appropriate additional and follow-up measures based on relevant findings resulting from the peer review process from other states and international organizations, and ensure the publication of relevant reports with regards to the peer review process, when available.

Under Article 22 of the Law 2018, the functions of SRBATOM are:

- to prepare draft Strategies and Action plans for their implementation under Article 6 and 8 of the Law 2018;
- to prepare draft regulations adopted by the Government pursuant to the Law 2018;
- to pass Rulebooks and other guides pursuant to the Law 2018;
- to pass the Environmental Radioactivity Monitoring Programme, monitor the level of radioactivity and the changes thereof, evaluate the effects of radioactivity on the public and the environment, give instructions on the implementation of the appropriate measures, monitor the implementation of such measures, and publish the annual report on the level of public exposure to ionizing radiation in the Republic of Serbia;
- to prepare draft Response plan in case of nuclear and radiological emergency situation;
- to lay down protective measures for a member of the public, the public and the environment from the harmful effect of ionizing radiation;
- to establish requirements for protection against increased exposure of workers, members of the public and the public to naturally occurring radiation;
- to bring decisions on issuing, suspending or revoking authorizations for practices, use of radiation sources, approvals to perform radiation protection, permits for trade in radiation sources and permits for the transport of dangerous goods class 7 ADR/RID/ADN (radioactive material), and for the exemption of duty to obtain authorization pursuant to the Law 2018;
- to issue, suspend or revoke certificates pursuant to the Law 2018;
- to issue certificate of entry into records and deletion from the records of radiation sources;
- to lay down criteria for the exemption from the obligation of notification;
- to lay down criteria for the release from regulatory control;
- to verify the competence of persons responsible for the implementation of radiation protection measures;
- to define the obligations, including the financial ones, of authorization holders;
- to ensure continuous professional cooperation in the performance of duties by engaging consultants, preparing projects or establishing permanent and ad hoc advisory bodies;

- to establish and keep registry of applications, issued authorization and certificates and persons responsible for the implementation of radiation protection measures, registry of radiation sources and their users, exposed workers, external workers and other data relevant for radiation protection and radiation and nuclear safety;
- to establish and keep records of facilities, radiation sources and radioactive waste, as well as other data relevant for radiation and nuclear safety and security;
- to establish a system of control over radiation sources and devices with such sources as their integral part to ensure their safe and secure management and protection during and at the end of their useful lives;
- to establish categorization of radiation sources based on their possible impact and harmful effect on the health and lives of people and the environment;
- to establish categorization of nuclear and radioactive material based on the evaluation of possible damage in case of theft or unauthorized use of certain type and amount of material, or in case of sabotage of the facility where nuclear or radioactive material is generated, processed, used, stored or disposed, and to prescribe appropriate protective measures for different categories of material;
- to lay down the requirements for security of nuclear and radioactive material and facilities in which such material is used, including the measures of prevention, detection and response in case of unauthorized and malicious activities involving such material and facilities;
- to participate in defining design bases and design basis accidents for the purpose of implementing radiation and nuclear safety and security measures;
- to cooperate with other state bodies and organizations within their competences;
- to cooperate, independently or in coordination with other competent state bodies and organizations, with the International Atomic Energy Agency and other international organizations, bodies and competent authorities of other countries with respect to the enforcement of this Law and other international obligations assumed by the Republic of Serbia;
- to establish and implement, in cooperation with the ministries and services responsible for foreign affairs, defense, internal affairs, economy and customs, a system of control of the export and import of nuclear and other radioactive material, radiation sources, equipment, special equipment and non-nuclear material, information, and technology for the purpose of fulfilling international obligations assumed by the Republic of Serbia;
- to cooperate with other relevant institutions of the Republic of Serbia in establishing and maintaining nuclear and radiological emergency response plan in accordance with the National Emergency Protection and Rescue Plan;
- to give opinion at the request of competent state authorities regarding joining the international conventions and other agreements in the area of radiation and nuclear safety and security;
- to establish appropriate mechanisms and procedures for informing the public and consulting other interested bodies and organizations in the area of radiation and nuclear safety and security;
- to fulfil any other commitments deemed as necessary to establish protection of the public and the environment in the Republic of Serbia;
- to initiate enhancement of the national framework in the area of radiation and nuclear safety and security, based on operational experience, insights gained in the decision-making process and technology and research related development;
- to carry out regulatory control and inspection oversight of the implementation of radiation and nuclear safety and security measures;
- to control the fulfilment of conditions serving as the basis for the issuance of authorizations pursuant to the Law 2018;
- to review, observe and assess the practices to verify their compliance with the Law 2018, applicable regulations and the requirements for obtaining authorizations;

- to take actions, require and monitor the implementation thereof in the event of non-compliance with the law, bylaws and other applicable regulations regarding the requirements for obtaining authorizations;
- to establish and maintain the system of accountancy and control of nuclear material;
- to perform other statutory duties.

E.3.1.1 Organisation

SRBATOM is divided into three divisions. These are:

- Division of Radiation and Nuclear Safety and Security
- Division of Legal, Financial, Common Affairs and Human Resources and International Cooperation
- Division of Inspection

Organizational chart of SRBATOM is given in Figure 12.

SRBATOM currently has 35 permanent employees.

The staff of SRBATOM is interdisciplinary, consisting of employees with different educational backgrounds: physicists and physical-chemists, electrical/nuclear engineers, lawyers, economists and administrative workers.

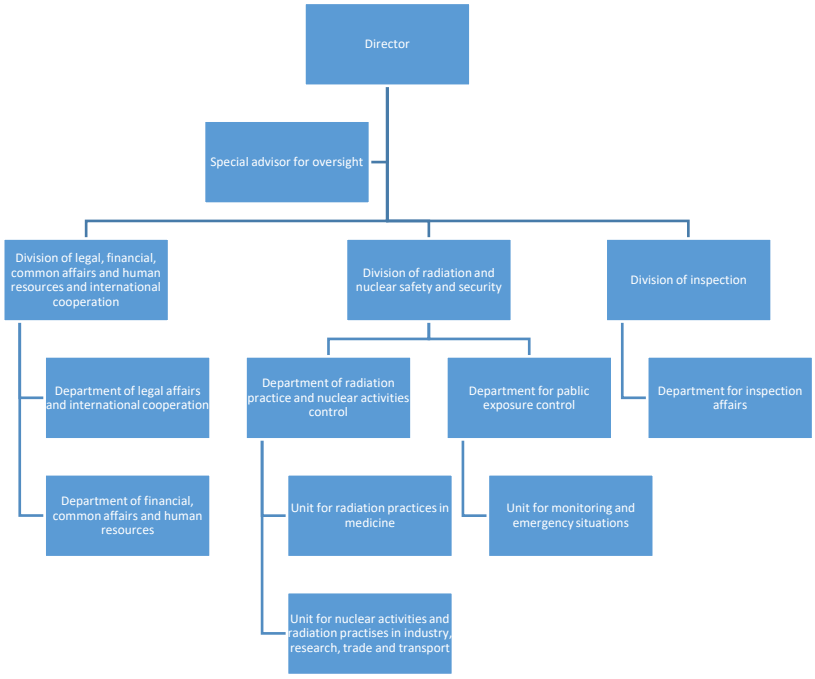

Figure 12. Organizational chart of SRBATOM

The structure of the employees by October 2020 was as follows: the director, who is appointed by the Government, 3 assistant directors, 1 special adviser, 1 adviser, 3 department heads, 4 unit heads, 1 security advisor, 1 EU integration advisor, 15 specialists including 5 inspectors, 2 associates, 2 employees engaged by service contract and 4 members of technical staff.

Regulatory matters related to radioactive waste management are dealt with by the Division of Radiation and Nuclear Safety and Security.

E.3.2 Effective independence

As stated above, according to Article 13 of the Law 2018, SRBATOM was established as an independent and separate regulatory body with regulatory, expert and associated executive functions in the area of radiation and nuclear safety and security.

Under Article 14 of the Law 2018, SRBATOM shall be responsible to the Government of the Republic of Serbia.

The internal organization, remit and manner of work, manner of planning, performing activities and other issues of relevance for SRBATOM shall be regulated by the Statute of SRBATOM and other general legal enactments pursuant to Law.

Under Article 211 of the Law 2018, regulatory inspection oversight over the implementation of the provisions of the Law 2018 and pertaining subsidiary legislation shall be performed by SRBATOM through the inspector for radiation and nuclear safety and security, within the remit established by the Law 2018.

According to Article 24 of the Law 2018, the decisions issued by the SRBATOM are final and cannot be appealed to. However, an administrative dispute can be initiated within 30 days as of the day of decision delivery.

Section F. Other General Safety Provisions

F.1 Responsibility of the licence holder

Article 21. Responsibility of the licence holder

1. Each Contracting Party shall ensure that prime responsibility for the safety of spent fuel or radioactive waste management rests with the holder of the relevant licence and shall take the appropriate steps to ensure that each such licence holder meets its responsibility.
2. If there is no such licence holder or other responsible party, the responsibility rests with the Contracting Party which has jurisdiction over the spent fuel or over the radioactive waste.

The responsibility of the licensee for safe management of spent fuel and radioactive waste is set out in Article 161 of the Law 2018. Under this Article, the authorization holder whose practices give rise to radioactive waste or spent nuclear fuel shall bear prime responsibility for safe and secure radioactive waste and spent nuclear fuel management until its delivery to the centralized storage, processing or reprocessing facility, or radioactive waste or spent nuclear fuel disposal facility.

The licensee for the operation of facility for storage, processing or reprocessing and disposal of radioactive waste and spent nuclear fuel shall bear prime responsibility for the safe and secure management of stored, processed, reprocessed and disposed radioactive waste or spent nuclear fuel.

According to Article 163, the authorization holder shall:

- collect, record and keep radioactive waste and spent nuclear fuel in an appropriate way and in accordance with the requirements, and deliver it to the licensee for the operation of the nuclear facility for processing or reprocessing, storage or disposal of radioactive waste and spent nuclear fuel;
- ensure that the facilities and premises where the radioactive waste and spent nuclear fuel is collected, recorded and kept fulfil all technical requirements, and radiation and nuclear safety and security measures;
- implement the measures that will prevent contamination of the environment from the radioactive waste and spent nuclear fuel.

According to Article 165, the authorization holder can temporarily keep radioactive waste and spent nuclear fuel generated in the course of practice in its own storage until it is delivered to the licensee for the operation of nuclear facility for processing or reprocessing, storage and disposal of radioactive waste and spent nuclear fuel, or until it is released from the regulatory control.

The authorization holder can place radioactive waste or spent nuclear fuel in a storage in accordance with the authorization requirements for the practice that gives rise to the aforementioned radioactive waste and spent nuclear fuel generation.

F.2 Human and financial resources

Article 22. Human and financial resources

Each Contracting Party shall take the appropriate steps to ensure that:

(i) qualified staff are available as needed for safety-related activities during the operating lifetime of a spent fuel and a radioactive waste management facility;

(ii) adequate financial resources are available to support the safety of facilities for spent fuel and radioactive waste management during their operating lifetime and for decommissioning;
(iii) financial provision is made which will enable the appropriate institutional controls and monitoring arrangements to be continued for the period deemed necessary following the closure of a disposal facility.

F.2.1 Availability of qualified staff

Accroding to Article 36 of the Law 2018, the authorization holder shall obtain adequate financial and human resources with adequate qualifications and competences necessary to conduct the prescribed radiation and nuclear safety and security measures when conducting practices.

The obligations prescribed by the rulebooks PNA and COLPNA remain the same as the ones described in the previous report. In short, these obligations are:

- licence holder shall provide a sufficient number of qualified staff with the corresponding level of education, training and additional training for all activities related to the safety of the nuclear facility and nuclear activities;
- licence holder is oblige to prepare and implement plan and programme of professional training of employees;
- applicant or licensee should prove in their licensing application that they have in place and that they will continue to provide adequate human resources for safe construction, maintenance, operation and decommissioning of the nuclear facility, as well as that the regulatory requirements and nuclear safety requirements are met and will continue being met throughout the whole lifetime of the facility.

PC NFS as the only licensee for radioactive waste management had around 120 employees at the time of reporting, around 30 of which are directly involved in the activities related to the storage of radioactive waste. The rest of the employees are staff employed in two research reactors, radiation protection, security, firefighters, medicine and administration.

F.2.2 Availability of adequate financial resources

Accroding to Article 36 of the Law 2018, the authorization holder shall provide for adequate financial resources to handle disused radiation sources, radioactive waste management, decommissioning, and liability in case of radiological or nuclear damage.

PC NFS IS state owned. Company is financed from the state budget.

F.2.3 Financial provision and monitoring arrangements following the closure of a disposal facility

According to Article 152 of the Law 2018, the licensee for a nuclear activity, prior to the commencement of a nuclear facility construction, shall provide for financial arrangements that will be available for decommissioning, including the management of radioactive waste arising from decommissioning activities, and for the closure of a disposal facility.

According to Article 149, the licensee for radioactive waste disposal facility closure shall prepare and periodically review and update the plan for radioactive waste disposal facility closure. This plan shall include active and passive measures of control and assessment of financial arrangements for the facility closure.

There were no disposal facilities in the Republic of Serbia at the time of reporting.

F.3 Quality assurance

Article 23. Quality assurance

Each Contracting Party shall take the necessary steps to ensure that appropriate quality assurance programmes concerning the safety of spent fuel and radioactive waste management are established and implemented.

Quality assurance is defined in the Law 2018 as all planned and systematic actions necessary to provide the adequate assurance that a structure, system, component or procedure will perform satisfactorily in compliance with agreed standards. Quality control is a part of quality assurance.

Rulebook PNA prescribes the methodology for the development of the quality assurance programmes for nuclear facilities.

PC NFS, as the only licensee for the radioactive waste management in the Republic of Serbia, have in place integrated management system.

F.4 Operational radiation protection

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:
   (i) the radiation exposure of the workers and the public caused by the facility shall be kept as low as reasonably achievable, economic and social factors being taken into account;
   (ii) no individual shall be exposed, in normal situations, to radiation doses which exceednational prescriptions for dose limitation which have due regard to internationally endorsed standards on radiation protection; and
   (iii) measures are taken to prevent unplanned and uncontrolled releases of radioactive materials into the environment.
2. Each Contracting Party shall take appropriate steps to ensure that discharges shall be limited:
   (i) to keep exposure to radiation as low as reasonably achievable, economic and social factors being taken into account; and
   (ii) so that no individual shall be exposed, in normal situations, to radiation doses which exceed national prescriptions for dose limitation which have due regard to internationally endorsed standards on radiation protection.
3. Each Contracting Party shall take appropriate steps to ensure that during the operating lifetime of a regulated nuclear facility, in the event that an unplanned or uncontrolled release of radioactive materials into the environment occurs, appropriate corrective measures are implemented to control the release and mitigate its effects.

F.4.1 ALARA principle and dose limitation

ALARA principle and dose limitation are listed as fundamental principles of radiation protection under Article 29 of the Law 2018. These principles are:

1) *Justification*: Decisions introducing a practice shall be justified in the sense that such decisions shall be taken with the intent to ensure that the individual or societal benefit resulting from the practice outweighs the health detriment that it may cause. Decisions

introducing or altering an exposure pathway for existing and emergency exposure situations shall be justified in the sense that they should do more good than harm;

2) *Optimization* - Radiation protection measures of individuals subject to public or occupational exposure shall be optimized with the aim of keeping the magnitude of individual doses, the likelihood of exposure and the number of individuals exposed as low as reasonably achievable taking into account the current state of technical knowledge and economic and societal factors. The optimization of the protection of individuals subject to medical exposure shall apply to the magnitude of individual doses and be consistent with the medical purpose of the exposure;
3) *Dose limitation* - In planned exposure situations, the sum of doses to an individual shall not exceed the dose limits laid down for occupational exposure or public exposure. Dose limits shall not apply to medical exposures.

Article 68 of the Law 2018 assumes that the effective and equivalent dose received by the occupationally exposed persons and a member of the public shall not exceed the prescribed exposure limits.

The effective dose received by students younger than 18 years of age, except students and apprentices older than 18 years of age that undergo regular training and education for the purpose of performing radiation protection duties, shall not exceed the prescribed limits for the public exposure.

Authorization holder shall provide such radiation protection level so as to prevent the exposure of the employed women during pregnancy above the limits stipulated for the public.

Breastfeeding women shall not occupy a work post with a likelihood of internal or external contamination.

The exposure limits for occupationally exposed persons, persons on training and the public are prescribed by the Rulebook on limits of exposure to ionizing radiation and measurements for assessment of the exposure levels (*Official Gazzete RS* 86/11 and 50/18). The effective dose limits for occupationally exposed persons is 100 mSv for five consecutive years (average value 20 mSv per year), with the additional restriction that in any year it does not exceed a value of 50 mSv. The effective dose limits for persons between 16 and 18 years old, using sources during education is 6 mSv per year. The effective dose limits for a member of the public is 1 mSv per year. Any persons under 16 years are prohibited from occupational exposure. Any persons under the age of 18 are prohibited from working in the controlled area, except during training and regular education, and under mandatory supervision.

According to Article 106, the authorization holder shall promptly report to the SRBATOM and other competent authorities about any loss, theft, sabotage, significant leakage, unauthorized use or unauthorized release of radioactive material into the environment.

F.4.2 Limitation of discharges

According to Article 88, the authorization holder shall obtain the consent form the SRBATOM for every instance of deliberate discharge of radioactive effluents into the environment.

Prior to authorization issuance, the SRBATOM shall approve of the dose limits and requirements for discharging radioactive effluents as effective annual doses for a representative person taking into account good practice of handling the same or similar facilities.

The SRBATOM shall authorize discharge of radioactive effluents at the request of a licensee, and based on the fulfilment of the requirements for health protection of a member of the public, the public and the environment.

Accordig to Article 89, the authorization holder shall undertake to monitor permitted discharges of radioactive effluents, and to report regularly the results of such monitoring to the SRBATOM .

Article 13 of the Rulebook on Radioactivity Monitoring (*Official Gazzete RS* 97/11) prescribes that the control of the level of radioactive contamination of the environment in the surroundings of the nuclear facility is performed by controlling the emission of radioactive effluents from the nuclear facility and the radionuclide contents in the environment in regular conditions and in case of an emergency.

The Rulebook on Limits of Radioactive Contamination of People, Working and Living Environment and Ways of Performing Decontamination (*Official Gazzete RS* 38/11) prescribes that the material may not be disposed of in the living environment without further supervision of SRBATOM, if the content of radionuclides of artificial origin in that material is higher than the prescribed limits for clearance from the regulatory control. Exceptionally, SRBATOM may approve the disposal in the living environment if that material poses no hazard to the public and the living environment. Dilution of the material, in order to achieve activity that is below the clearance level, is not allowed. The limits of radioactive contamination of fluid and gaseous radioactive effluents which may be released into the living environment shall be separately defined for each location and facility where radioactive effluents appear, on the basis of the impact to the living environment and the annual limit of public exposure.

F.4.3 Implementation of corrective measures to control the release and mitigate its effects

The implementation of the corrective measures is forseen in the safety analysis reports for all radioactive waste management activities performed in PC NFS.

F.5 Emergency preparedness

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.
2. Each Contracting Party shall take the appropriate steps for the preparation and testing of emergency plans for its territory insofar as it is likely to be affected in the event of a radiological emergency at a spent fuel or radioactive waste management facility in the vicinity of its territory.

SRBATOM is the national coordinating authority in the field of preparedness for radiological and nuclear emergencies in the Republic of Serbia.

The document serving as the basis of the preparedness and response to a nuclear or radiological emergency is the Law 2018.

The responsibilities of the SRBATOM according to Article 22 of the Law 2018, among others, are the implementation of the Programme for Early Warning of an Emergency and preparation of the draft National Radiation Emergency Plan (NREP).

The Law on Disaster Risk Reduction and Emergency Management (*Official Gazette of RS* 87/2018), as a fundamental document for all emergency situations, defines the activities, declaration and management in emergency situations; the system of protection and rescue of citizens, material and cultural goods from natural and manmade disasters; the rights and obligations of citizens, state agencies, autonomous provinces, local governments, companies and other legal persons and entrepreneurs; the inspection and supervision of the international cooperation and other issues relevant to the organization and functioning of the protection and rescue system.

The National Radiation Emergency Plan (NREP) (*Official Gazette of RS* 30/18), which was prepared in accordance with national laws and regulations, and relevant documents of the IAEA and the European Commission, was adopted by the Government in 2018. The Plan is intended to be updated every three years.

According to the NREP, the Republic Disaster Response Headquarters makes decisions on the actions in response to an emergency affecting the whole or a large part of the territory of the Republic of Serbia. The SRBATOM, together with an expert operational team, is responsible for the assessment of the situation in case of a transboundary release of radioactive material.

Article 78 of the Law 2018 stipulates, among other things, that a licensee in the course of their practice shall provide for the exposed workers, persons engaged in emergency response, persons engaged in remediation activities, students and apprentices, and workers exposed to radon at their workplace education and training and information on the relevant parts of the emergency response plans and procedures.

According to the NREP, the training of the emergency response personnel is mandatory.

Exercises are conducted periodically to test the emergency response plans. The NREP foresees a national full-scale exercise to be conducted once in five years. The national full-scale exercise is prepared and conducted by SRBATOM in cooperation with the Ministry of Interior, Sector for Emergency Management. The exercises are evaluated and the results of their evaluation are taken into account in the revision of the emergency response plan.

The Rulebook PNA forsees that a licensee shall prepare the Action Plan in case of an emergency in the nuclear facility and during the performance of nuclear activities, which is subject to periodical reviews, and which shall encompass all activities that must be executed in case of an emergency. For new nuclear facilities, the plan must be prepared and tested before the beginning of operation and approved by SRBATOM.

The Rulebook PNA forsees that response procedures must be established for events for which it is assumed that they could occur during regular operation as well as in emergencies. Any emergency that is important for the safety must be reported to SRBATOM within the statutory period of time.

Article 23 of the Rulebook COLPNA prescribes that the nuclear facility operator shall submit to SRBATOM the action plan for emergency situations.

PC NFS as the only operator of radioactive waste management facilities in Serbia has developed the Plan in case of an emergency for each facility.

F.6 Decommissioning

Article 26. Decommissioning

Each Contracting Party shall take the appropriate steps to ensure the safety of decommissioning of a nuclear facility. Such steps shall ensure that:

(i) qualified staff and adequate financial resources are available;
(ii) the provisions of Article 24 with respect to operational radiation protection, discharges and unplanned and uncontrolled releases are applied;
(iii) the provisions of Article 25 with respect to emergency preparedness are applied; and
(iv) records of information important to decommissioning are kept.

According to Article 141 of the Law 2018, the licensee for a nuclear facility decommissioning shall:

- prepare and implement procedures ensuring radiation and nuclear safety and security;
- apply good engineering practice;
- ensure that staff are properly trained, qualified and have necessary competences;
- keep the required records;
- choose decontamination and dismantling techniques so that the protection of workers, the public and the environment is optimized and the generation of waste as low as reasonably achievable;
- establish arrangements for action in case of emergency;
- establish and maintain physical protection measures for the facility during decommissioning;
- ensure safe and secure management of radioactive waste arising from decommissioning activities until its disposal.

Once the decommission has been completed, the licensee for a nuclear facility decommissioning shall prepare the Decommissioning Report demonstrating that decommissioning end state has been achieved commensurate with the Decommissioning Plan, and the report on final radiological survey of the facility and the site, which are submitted to the SRBATOM .

Article 143 of the Law 2018 stipulates that financial arrangements for the completion of decommissioning is a part of the Decommissionig Plan.

Pursuant to Article 152 of the Law 2018, the licensee for a nuclear activity shall provide, prior to the commencement of a nuclear facility construction, the financial arrangements that will be available for decommissioning, including the management of radioactive waste arising from decommissioning activities, and for the closure of a disposal facility.

In case of the existing nuclear facilities, the Government shall provide for financial means to cover the decommissioning costs, including the management of the resulting radioactive waste.

Section G. Safety of Spent Fuel Management

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:

(i) ensure that criticality and removal of residual heat generated during spent fuel management are adequately addressed;
(ii) ensure that the generation of radioactive waste associated with spent fuel management is kept to the minimum practicable, consistent with the type of fuel cycle policy adopted;
(iii) take into account interdependencies among the different steps in spent fuel management;
(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;
(v) take into account the biological, chemical and other hazards that may be associated with spent fuel management;
(vi) strive to avoid actions that impose reasonably predictable impacts on future generations greater than those permitted for the current generation;
(vii) aim to avoid imposing undue burdens on future generations.

Article 5. Existing facilities

Each Contracting Party shall take the appropriate steps to review the safety of any spent fuel management facility existing at the time the Convention enters into force for that Contracting Party and to ensure that, if necessary, all reasonably practicable improvements are made to upgrade the safety of such a facility.

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 spent fuel management facility:
   (i) to evaluate all relevant site-related factors likely to affect the safety of such a facility during its operating lifetime;
   (ii) to evaluate the likely safety impact of such a facility on individuals, society and the environment;
   (iii) to make information on the safety of such a facility available to members of the public;
   (iv) to consult Contracting Parties in the vicinity of such a facility, insofar as they are likely to be affected by that facility, and provide them, upon their request, with general data relating to the facility to enable them to evaluate the likely safety impact of the facility upon their territory.
2. In so doing, each Contracting Party shall take the appropriate steps to ensure that such facilities shall not have unacceptable effects on other Contracting Parties by being sited in accordance with the general safety requirements of Article 4.

Article 7. Design and construction of facilities

Each Contracting Party shall take the appropriate steps to ensure that:

(i) the design and construction of a spent fuel management facility provide for suitable measures to limit possible radiological impacts on individuals, society and the environment, including those from discharges or uncontrolled releases;

(ii) at the design stage, conceptual plans and, as necessary, technical provisions for the decommissioning of a spent fuel management facility are taken into account;

(iii) the technologies incorporated in the design and construction of a spent fuel management facility are supported by experience, testing or analysis.

Article 8. Assessment of safety of facilities

Each Contracting Party shall take the appropriate steps to ensure that:

(i) before construction of a spent fuel management facility, a systematic safety assessment and an environmental assessment appropriate to the hazard presented by the facility and covering its operating lifetime shall be carried out;

(ii) before the operation of a spent fuel management facility, updated and detailed versions of the safety assessment and of the environmental assessment shall be prepared when deemed necessary to complement the assessments referred to in paragraph (i).

Article 9. Operation of facilities

Each Contracting Party shall take the appropriate steps to ensure that:

(i) the licence to operate a spent fuel management facility is based upon appropriate assessments as specified in Article 8 and is conditional on the completion of a commissioning programme demonstrating that the facility, as constructed, is consistent with design and safety requirements;

(ii) operational limits and conditions derived from tests, operational experience and the assessments, as specified in Article 8, are defined and revised as necessary;

(iii) operation, maintenance, monitoring, inspection and testing of a spent fuel management facility are conducted in accordance with established procedures;

(iv) engineering and technical support in all safety-related fields are available throughout the operating lifetime of a spent fuel management facility;

(v) incidents significant to safety are reported in a timely manner by the holder of the licence to the regulatory body;

(vi) programmes to collect and analyse relevant operating experience are established and that the results are acted upon, where appropriate;

(vii) decommissioning plans for a spent fuel management facility are prepared and updated, as necessary, using information obtained during the operating lifetime of that facility, and are reviewed by the regulatory body.

Article 10. Disposal of spent fuel

If, pursuant to its own legislative and regulatory framework, a Contracting Party has designated spent fuel for disposal, the disposal of such spent fuel shall be in accordance with the obligations of Chapter 3 relating to the disposal of radioactive waste.

The Republic of Serbia has:

- no nuclear power reactors,
- no defence reactors for research or other purposes,
- no spent nuclear fuel in storage or awaiting treatment.

Spent nuclear fuel from the research reactor RA was repatriated to the Russian Federation in 2010.

There are no plans for siting, designing, construction or operating of spent fuel facilities.

Safety provisions for spent nuclear fuel are the same as the safety provisions for radioactive waste management described in Section H.

Section H. Safety of Radioactive Waste Management

H.1 General safety requirements

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 and other hazards. In so doing, each Contracting Party shall take the appropriate steps to:

(i) ensure that criticality and removal of residual heat generated during radioactive waste management are adequately addressed;
(ii) ensure that the generation of radioactive waste is kept to the minimum practiceable;
(iii) take into account interdependencies among the different steps in radioactive waste management;
(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;
(v) take into account the biological, chemical and other hazards that may be associated with radioactive waste management;
(vi) strive to avoid actions that impose reasonably predictable impacts on future generations greater than those permitted for the current generation;
(vii) aim to avoid imposing undue burdens on future generations.

General requirements for safety of spent fuel and radioactive waste management are given in the Law 2018 and the Rulebooks COLPNA, PNA and RWM.

H.1.1 Criticality and removal of residual heat

Article 170 of the Law 2018 prescribes that the licensee for the operation of radioactive waste and spent nuclear fuel storage facility shall provide for such conditions and implement such measures to prevent criticality.

H.1.2 Generation of radioactive waste is kept to the minimum practicable

"Generation of radioactive waste shall be kept to the minimum which is reasonably practicable, both in terms of activity and volume, by means of appropriate design measures and of operating and decommissioning practices, including the recycling and reuse of materials" is one of the general principles governing safe management of radioactive waste and spent nuclear fuel prescribed in Article 159 of the Law 2018.

Under the Law 2018, Article 164, the measures to control the generation of radioactive waste that are applied by the authorization holder are in particular:

- reduction of radioactive waste generation;
- reuse of radioactive waste;
- radioactive waste recycling.

H.1.3 Interdependencies among the different steps in radioactive waste management

According to the Law 2018, Article 159, "Interdependencies between all steps in spent fuel and radioactive waste generation and management shall be taken into account" is one of the general principles governing safe management of radioactive waste and spent nuclear fuel.

The issue of such interdependencies is described in safety analysis report for each nuclear facility, which is an obligatory part of the documentation in the licensing process.

H.1.4 Effective protection of individuals, society and the environment

General measures for effective protection of the individuals, society and the environment in the Republic of Serbia are laid down in the relevant legislation, particularly:

- Law on Radiation and Nuclear Safety an Security
- Rulebook on Radioactive Waste Management
- Rulebook on Performance of Nuclear Activities
- Rulebook on Conditions for Obtaining Licence to Perform Nuclear Activity
- Rulebook on Limits of Exposure to Ionizing Radiation and Measurements for Assessment of the Exposure Levels
- Rulebook on Radioactivity Monitoring

The Fundamental Principles of Radiation and Nuclear Safety listed in the Law 2018, Article 66 are given as follows:

- prime responsibility for radiation and nuclear safety must rest with the legal entity or entrepreneur responsible for practices and facilities that give rise to elevated radiation risk;
- establishment and maintenance of effective legal and institutional framework for radiation and nuclear safety, including the establishment of an independent regulatory body in the field of radiation and nuclear safety.
- establishment and maintenance of effective management system of radiation and nuclear safety by the legal entities or entrepreneurs whose practices give rise to the elevated risk of radiation exposure;
- practices that give rise to elevated risk of radiation exposure must yield an overall benefit;
- radiation protection must be optimized to provide the highest level of radiation and nuclear safety that can reasonably be achieved;
- measures of radiation risk control must ensure that no individual bears an unacceptable risk of harm from exposure to ionizing radiation;
- protection of the public and the environment from radiation risk, now and in the future;
- all practical efforts must be made to prevent and mitigate the impact of nuclear or radiation emergencies;
- arrangements for emergency preparedness and response in case of nuclear or radiation emergencies;
- protective actions to reduce the existing or unregulated radiation exposure risks must be justified and optimized.

In order to ensure the protection of individuals from the harmful effects of ionizing radiation, the licensee shall, according to Law 2018, Article 86, in the facilities where the practices are performed, implement radiation and nuclear safety and security measures with particular regard to:

- examination and approval of the proposed siting and design of the facility from a radiation protection point of view, taking into account relevant demographic, meteorological, geological, hydrological and ecological conditions, as well as environmental protection conditions;

- acceptance into service of the facility subject to the requirement of adequate protection against radiation exposure or radioactive contamination;
- examination and approval of plans for the discharge of radioactive effluents;
- measures to control the access of members of the public to the facility.

The effective protection of individuals, society and the environment is described in a safety analysis report for each nuclear facility wich is obligatory part of the documentation in the licensing process.

H.1.5 Taking into account the biological, chemical and other hazards

According to the Rulebook RWM, the generator of the radioactive waste and the licensee of radioactive waste management facility are obliged to take into account any biological, chemical and other characteristics of radioactive waste, and to take protective measures in order to prevent such hazards.

H.1.6 Avoidance of actions that impose reasonably predictable impacts on future generations

The protection of the members of the public, the public and the environment from the harmful effect of ionising radiation, now and in the future is highlited in the Article 1 (Subject Matter) of the Law 2018.

According to Law 2018, Article 36 the authorization holder shall take all necessary steps to protect people's health and the environment from the harmful effect of ionizing radiation, now and in future, by keeping the exposure level below the specified limits, and take all reasonable steps to minimize, now and in future, the harmful effect on the public.

One of the Fundamental Principles of Radiation and Nuclear Safety prescribed in the Law 2018, Article 66 is the protection of the public and the environment from radiation risk, now and in the future.

H.1.7 Avoidance of imposing undue burdens on future generations

The Law 2018 does not clearly provide for the avoidance of imposing undue burdens on future generations. Such principle is intended to be provided as one of the basic principles in the National Policy which is a part of the National Spent Fuel and Radioactive Waste Management Strategy.

The issue of avoidance of the actions that can impose undue burdens on the future generations is described in a safety analysis report for each nuclear facility which is an obligatory part of the documentation in the licensing process.

H.2 Existing facilities and past practices

Article 12. Existing facilities and past practices

Each Contracting Party shall in due course take the appropriate steps to review:

(i) the safety of any radioactive waste management facility existing at the time the Convention enters into force for that Contracting Party and to ensure that, if necessary, all reasonably practicable improvements are made to upgrade the safety of such a facility;

(ii) the results of past practices in order to determine whether any intervention is needed for reasons of radiation protection bearing in mind that the reduction in detriment resulting from the reduction in dose should be sufficient to justify the harm and the costs, including the social costs, of the intervention.

The existing facilities at the time of writing this Report are hangars H0, H1, H2, H3 and Secure Storage, underground liquid waste tanks VR1-VR4 and Radium Bunker. There are no changes regarding the situation in these facilities, which were described in the previous report.

H.3 Siting of proposed facilities

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:
   (i) to evaluate all relevant site-related factors likely to affect the safety of such a facility during its operating lifetime;
   (ii) to evaluate the likely safety impact of such a facility on individuals, society and the environment;
   (iii) to make information on the safety of such a facility available to members of the public;
   (iv) to consult Contracting Parties in the vicinity of such a facility, insofar as they are likely to be affected by that facility, and provide them, upon their request, with general data relating to the facility to enable them to evaluate the likely safety impact of the facility upon their territory.
2. In so doing, each Contracting Party shall take the appropriate steps to ensure that such facilities shall not have unacceptable effects on other Contracting Parties by being sited in accordance with the general safety requirements of Article 11.

According to the Law 2018, Article 118, the procedure for site selection includes the analysis of:

- all relevant factors in connection with the site, particularly the effects of external events occurring in the region of a particular site, either of natural origin or human induced;
- the characteristics of the site and its environment that could influence the transfer of radioactive material that has been released to the public and the environment;
- the population density and population distribution and other characteristics of the external zone in so far as they may affect the possibility of implementing emergency measures and the need to evaluate the risks to the population and the environment.
- the impact of the proposed nuclear facility on the safety of the public and the environment.

The licensee undertakes to prepare the report on a nuclear facility site selection that contains particularly the following elements:

- the analysis of potential sites for the construction of a nuclear facility with regards to the social and economic factors;
- the data on the most appropriate site for the construction of a nuclear facility and the results of initial radiological testing;
- the design concept of a nuclear facility;
- the analysis of the impact of the most appropriate site on the safety of the nuclear facility design concept;
- financial and other guarantees for a nuclear facility construction.

Public hearings are mandatory in the process for the approval of the environmental impact assessment report for nuclear facilities according to the Law on Environmental Impact Assessment (*Official Gazette RS* 135/2004, 36/2009).

The Republic of Serbia is a signatory of Aarhus Convention and will take due account of all relevant aspects of the requirements for consultation with Contracting Parties in accordance with that convention.

Proposed facilities

There were no proposed radioactive waste management facilities and facilities in the process of site selection at the time of writing this Report.

H.4 Design and construction of facilities

Article 14. Design and construction of facilities

Each Contracting Party shall take the appropriate steps to ensure that:

(i) the design and construction of a radioactive waste management facility provide for suitable measures to limit possible radiological impacts on individuals, society and the environment, including those from discharges or uncontrolled releases;
(ii) at the design stage, conceptual plans and, as necessary, technical provisions for the decommissioning of a radioactive waste management facility other than a disposal facility are taken into account;
(iii) at the design stage, technical provisions for the closure of a disposal facility are prepared;
(iv) the technologies incorporated in the design and construction of a radioactive waste management facility are supported by experience, testing or analysis.

According to Law 2018, Article 121, a nuclear facility design shall ensure that:

- the nuclear facility and associated structures, systems and components relevant for the safety and security have the appropriate characteristics to allow for the safety and security functions performance with necessary reliability;
- the facility can be operated safely within the operational limits and conditions for its entire lifetime and in case of failures;
- the nuclear facility can be decommissioned in a safe and secure manner;
- the harmful effect on people and the environment is as low as reasonably achievable.

According to Law 2018, Article 122 the licensee for a nuclear facility design is obliged to prepare and submit to SRBATOM for consent the report on a nuclear facility design that includes the following elements:

- nuclear facility design basis assessment;
- nuclear facility site boundaries
- protection against external and internal hazards that can lead to an emergency event;
- ionizing radiation protection measures;
- safety and reliability analysis of the associated structures, systems and components relevant for the safety and security of a nuclear facility;
- routine radioactive discharges from the nuclear facility;
- evidence of learning from operating experience in designing a nuclear facility;
- evaluation of human and organizational resources necessary for the safety and security of the nuclear facility.

The Government, based on previously obtained consent from the National Assembly shall decide on the construction of a nuclear facility.

According to Law 2018, Article 127, a nuclear facility can be constructed only on the site with a spatial and urbanistic plan, issued construction permit and other documentation pursuant to the laws governing urban planning and construction, and the assessment of the environmental effect. In addition to this, the license for a nuclear facility construction is issued with previously obtained consent to the report on a

nuclear facility design and the decision by the Government of the Republic of Serbia on the construction of a nuclear facility.

The licensee will also ensure that:

- the integrated system of management has been established;
- all subcontractors have also established the integrated system of management;
- organizational and financial arrangements for decommissioning and radioactive waste and spent nuclear fuel management are in place.

Any nuclear facility has to be constructed in a manner which allows for its decommissioning to be conducted in a safe and secure manner.

The licensee for a nuclear facility construction shall ensure that all structures, systems and components are constructed, installed, reviewed and tested in accordance with the applicable standards and regulations throughout all stages of construction.

Facilities under design and construction

Waste Processing Facility was in the process of equipment installation at the time of writing this Report.

Under the IAEA SRB9005 TC Project „Establishing a Reference Center for Radioactive Waste Treatment and Disused Radioactive Sources Conditioning for Small Facilities“, PC NFS together with the IAEA procured, constructed and equipped three mobile units for a segregation of radioactive waste and conditioning of sealed radioactive sources.

H.5 Assessment of safety of facilities

Article 15. Assessment of safety of facilities

Each Contracting Party shall take the appropriate steps to ensure that:

(i) before construction of a radioactive waste management facility, a systematic safety assessment and an environmental assessment appropriate to the hazard presented by the facility and covering its operating lifetime shall be carried out;
(ii) in addition, before construction of a disposal facility, a systematic safety assessment and an environmental assessment for the period following closure shall be carried out and the results evaluated against the criteria established by the regulatory body;
(iii) before the operation of a radioactive waste management facility, updated and detailed versions of the safety assessment and of the environmental assessment shall be prepared when deemed necessary to complement the assessments referred to in paragraph (i).

Under the current regulatory regime, SRBATOM will assess any application for the licence for the radioactive waste management facility. The obligatory part of the licencing documentation in all stages of the facility lifetime is a safety assessment report and the opinion about the environmental impact assessment obtained from the relevant Ministry. SRBATOM will not licence the facility until the conditions for safety and security are fulfilled and until the provision of evidence that the respective facility does not pose hazard for the people and the environment. All applications will have to take due account of the standards for such facilities as promulgated by the IAEA.

According to Article 43 of the Law 2018, the Safety Analysis Report shall include:

- description of the practice;

- description and features of the premises, facility and site, and any other location where the practice is performed;
- conditions for and limitations to the performance of the practice;
- safety assessment of the practice performance for normal and abnormal operations, including emergency events, and assessment of possible initial events that could lead to deviation from the intended manner of work;
- evaluation of potential emergency events and measures for their prevention and mitigation as well as remediation in case of emergency.

The licensee undertakes to modify and supplement the Safety Analysis Report commensurate with the changes occurring as the practice is conducted so that the report would always reflect the current status of the practice performance.

The licensee has to perform systematic and periodic revisions of Safety Analysis Report according to Article 44 on which they submit the report to the SRBATOM. Such revision shall entail review, verification and improvement of radiation and nuclear safety measures, emergency event prevention measures and emergency event remediation measures, if necessary.

If the circumstances justify so, the SRBATOM may require the licensee to conduct an extraordinary revision of the Safety Analysis Report.

According to Law 2018, Article 134, the licensee for a disposal facility operation shall, during the operation of facility, periodically review and update the initial closure plan.

H.6 Operation of facilities

Article 16. Operation of facilities

Each Contracting Party shall take the appropriate steps to ensure that:

(i) the licence to operate a radioactive waste management facility is based upon appropriate assessments as specified in Article 15 and is conditional on the completion of a commissioning programme demonstrating that the facility, as constructed, is consistent with design and safety requirements;

(ii) operational limits and conditions, derived from tests, operational experience and the assessments as specified in Article 15, are defined and revised as necessary;

(iii) operation, maintenance, monitoring, inspection and testing of a radioactive waste management facility are conducted in accordance with established procedures. For a disposal facility the results thus obtained shall be used to verify and to review the validity of assumptions made and to update the assessments as specified in Article 15 for the period after closure;

(iv) engineering and technical support in all safety-related fields are available throughout the operating lifetime of a radioactive waste management facility;

(v) procedures for characterisation and segregation of radioactive waste are applied;

(vi) incidents significant to safety are reported in a timely manner by the holder of the licence to the regulatory body;

(vii) programmes to collect and analyse relevant operating experience are established and that the results are acted upon, where appropriate;

(viii) decommissioning plans for a radioactive waste management facility other than a disposal facility are prepared and updated, as necessary, using information obtained during the operating lifetime of that facility, and are reviewed by the regulatory body;

(ix)	plans for the closure of a disposal facility are prepared and updated, as necessary, using information obtained during the operating lifetime of that facility and are reviewed by the regulatory body.

Prior to the nuclear facility commissioning, licensee must perform a trial run which consist of two phases:

- non-nuclear testing (before the introduction of nuclear or certain types of radioactive material) and
- nuclear testing (after the introduction of nuclear or certain types of radioactive material).

According to Article 128 of the Law 2018 the licensee must submit a trial run programme to SRBATOM. The trial run serves to confirm the quality of completed and installed systems, structures and components relevant for the safety and security.

According to Law 2018, Article 134, the licensee for a nuclear facility operation shall ensure that:

- nuclear facility is operated within the operational limits and conditions established by the Safety Analysis Report;
- in-service inspection, surveillance and testing of structures, systems and components relevant for safe operation of the facility are established and implemented;
- the maintenance programme for the structures, systems and components relevant for safe operation of the facility is established and implemented;
- review and analysis of any changes in the procedures and the integrated system of management, and changes in the structures, systems and components important for the safety of the facility are implemented before submitting the application for modification of the license;
- the adequate number of duly competent and trained staff have been engaged and the training programme has been in place;
- the safety and physical protection measures have been implemented and maintained during nuclear facility operation.

According to Law 2018, Article 36, the licensee for a nuclear facility operation keeps any relevant records and reports to SRBATOM on emergency events.

The licensee for a nuclear facility operation shall, during the operation of a nuclear facility, periodically review and update the radioactive waste management plan, the initial decommissioning plan for all nuclear facilities except for the radioactive waste disposal facility, and the initial closure plan for a radioactive waste disposal facility.

Nuclear facilities which are recommissioned after cessation or reconstructions and modifications due to changes in operational technology are subject to the obligation to perfom trial run as prescribed in Article 132 of the Law 2018.

Nuclear facility can be temporarily shut down due to any justified reason that was not devised by the Safety Analysis Report for a nuclear facility operation. SRBATOM gives consent to the nuclear facility temporary shut-down.

The licensee ensures safe and secure management of a nuclear facility during temporary shut-down, particularly in terms of radioactive waste, spent fuel and radiation sources management, and fire protection and suppression.

Pursuant to the Law, SRBATOM may require the licensee to perform a nuclear facility trial run after its temporary shut-down.

H.7 Institutional measures after closure

Article 17. Institutional measures after closure

Each Contracting Party shall take the appropriate steps to ensure that after closure of a disposal facility:

(i) records of the location, design and inventory of that facility required by the regulatory body are preserved;

(ii) active or passive institutional controls such as monitoring or access restrictions are carried out, if required; and

(iii) if, during any period of active institutional control, an unplanned release of radioactive materials into the environment is detected, intervention measures are implemented, if necessary.

According to Law 2018, Article 147, the closure of radioactive waste disposal facility shall include the activities of decontamination, dissembling and demolishing of structures, systems and components and bringing the facility in a state that ensures long-term safety of disposed radioactive waste.

The licensee for the closure of radioactive waste disposal facility shall establish and implement measures of control at the site of closed radioactive waste disposal facility.

The measures of control particularly include:

- prevention of unauthorized use of the site and human intrusion into the disposal facility after closure;
- environmental radioactivity monitoring and surveillance of the closed disposal facility site;
- maintenance and remedial actions, if necessary;
- mechanism of transfer of knowledge to future generations.

According to Article 149, the licensee for a radioactive waste disposal facility closure shall prepare and periodically review and update the plan for radioactive waste disposal facility closure. This plan shall particularly include:

- manner of closing the radioactive waste disposal facility;
- description and types of radioactive waste disposed and its location within the facility;
- description and sequence of the activities for radioactive waste facility closure;
- active and passive measures of control;
- timing of radioactive waste disposal facility closure actions;
- assessment of financial arrangements for the facility closure.
- description of the final engineered barriers and site markers preventing discharges into the environment;
- type of site markers used after the closure;
- tools used for communication with the public.

According to Article 151, the licensee for the closure of radioactive material disposal facility, shall submit to SRBATOM the report on the radioactive waste disposal facility closure and the report on the completion of the final radiological survey of the facility and the site. SRBATOM shall review, control and supervise the facility and the site in order to verify that the requirements stipulated by the plan for radioactive waste disposal facility closure have been fulfilled.

The Rulebook RWM, under Article 31 prescribes that the operator of a near-surface disposal facility undertakes to deliver to SRBATOM the project of performed works, the records about disposed

radioactive waste and geodetic survey of the location. The operator of a near-surface disposal facility undertakes to ensure its active maintenance for the period of five years following closure of the disposal units.

Section I. Transboundary Movement

Article 27: Transboundary movement

1. Each Contracting Party involved in transboundary movement shall take the appropriate steps to ensure that such movement is undertaken in a manner consistent with the provisions of this Convention and relevant binding international instruments.

   In so doing:

   (i) a Contracting Party which is a State of origin shall take the appropriate steps to ensure that transboundary movement is authorised and takes place only with the prior notification and consent of the State of destination,
   (ii) transboundary movement through States of transit shall be subject to those international obligations which are relevant to the particular modes of transport utilised,
   (iii) a Contracting Party which is a State of destination shall consent to a transboundary movement only if it has the administrative and technical capacity, as well as the regulatory structure, needed to manage the spent fuel or the radioactive waste in a manner consistent with this Convention,
   (iv) a Contracting Party which is a State of origin shall authorise a transboundary movement only if it can satisfy itself in accordance with the consent of the State of destination that the requirements of subparagraph
   (v) are met prior to transboundary movement,
   (vi) a Contracting Party which is a State of origin shall take the appropriate steps to permit re-entry into its territory, if a transboundary movement is not or cannot be completed in conformity with this Article, unless an alternative safe arrangement can be made.
2. A Contracting Party shall not license the shipment of its spent fuel or radioactive waste to a destination south of latitude 60 degrees South for storage or disposal.
3. Nothing in this Convention prejudices or affects:
   (i) the exercise, by ships and aircraft of all States, of maritime, river and air navigation rights and freedoms, as provided for in international Act,
   (ii) rights of a Contracting Party to which radioactive waste is exported for processing to return, or provide for the return of, the radioactive waste and other products after treatment to the State of origin,
   (iii) the right of a Contracting Party to export its spent fuel for reprocessing,
   (iv) rights of a Contracting Party to which spent fuel is exported for reprocessing to return, or provide for the return of, radioactive waste and other products resulting from reprocessing operations to the State of origin

Based on Article 4 of the Law 2018, it is forbidden to import radioactive waste and spent nuclear fuel of foreign origin to the territory of the Republic of Serbia.

According to Law 2018, Article 178, any radioactive waste or spent nuclear fuel generated in the territory of the Republic of Serbia may be exported only with the previously obtained permit from SRBATOM, and the consent of the competent authority of the importing state. This permit shall be issued if:

- the country where the radioactive waste and spent nuclear fuel is exported to has been notified about the export prior to its arrival and if the relevant country has consented thereto;

- the country where the radioactive waste and spent nuclear fuel is exported to is a signatory of the Joint Convention on the Safety of Spent Fuel Management and the Safety of Radioactive Waste Management;
- the export of radioactive material is in line with the relevant international obligations in all transit countries;
- the country where radioactive waste and spent nuclear fuel is exported to has commissioned a relevant storage before sending the shipment and has regulatory infrastructure and administrative and technical capacities necessary for certain radioactive waste and spent nuclear fuel management in a way that preserves its safety and security in line with international standards.

SRBATOM shall not issue the permit for the export of radioactive waste and spent nuclear fuel intended for storage and disposal if:

- the export destination is south of latitude 60 degrees south;
- it deems that the importing country does not have administrative or technical capacities necessary for safe management of radioactive waste and spent nuclear fuel.

According to Article 179, the Republic of Serbia shall remain responsible for safe disposal of radioactive waste exported for processing, spent nuclear fuel exported for reprocessing, and any radioactive waste by-product resulting from processing or reprocessing.

According to Article 180, SRBATOM shall issue the permit for the import of radioactive waste resulting from radioactive waste processing or spent nuclear fuel reprocessing occurring in another country whose origin is in the Republic of Serbia.

SRBATOM shall issue the permit for reshipment of radioactive waste and spent nuclear fuel if the export has not been completed.

According to Article 181, at the request of a consignor from another country, SRBATOM shall issue the permit for transit of radioactive waste and spent nuclear fuel shipments through the Republic of Serbia. The application shall contain verification that the consignor from another country has entered into contract with a consignee in the third country, that it has been authorized by competent authorities in both countries, and that it obliges the consignor to reaccept the radioactive waste and spent nuclear fuel if the shipment cannot be fully completed.

There have been no activities regarding the transit of radioactive waste and spent nuclear fuel of foreign origin in the Republic of Serbia since the previous Report.

Section J. Disused Sealed Sources

Article 28. Disused sealed sources

1. Each Contracting Party shall, in the framework of its national law, take the appropriate steps to ensure that the possession, remanufacturing or disposal of disused sealed sources takes place in a safe manner.
2. A Contracting Party shall allow for reentry into its territory of disused sealed sources if, in the framework of its national law, it has accepted that they be returned to a manufacturer qualified to receive and possess the disused sealed sources.

According to the Law 2018, Article 109, the licensee for the performance of practices involving sealed radiation sources shall formally declare a sealed source to be disused and take all required measures to return this source to its supplier.

Provided that return to supplier is not possible, a disused source can be recycled, its ownership transferred to another licensee, or declared to be radioactive waste.

A licensee can keep a disused source in their own storage, but not longer than one year when they are obliged to transfer it to the centralized storage.

At the time of writing this report, there were no capacities in the Republic of Serbia for the management of disused sealed sources except storage.

Imports in the territory of the Republic of Serbia of radioactive waste and spent nuclear fuel of foreign origin are forbidden by the Law 2018. This provision is applicable to any type of radioactive waste, and, thus to disused sealed radioactive sources declared as radioactive waste.

Section K. General Efforts to Improve Safety

K.1 Summary of safety issues and planned future actions

Safety issues remain the same as in the previous report. The Republic of Serbia needs to substantially improve its legislative framework and existing infrastructure in the field of spent nuclear fuel and radioactive waste management.

K.1.1 Improvement of the legislative framework

Following actions will facilitate the improvement of the legislative framework in Republic of Serbia:

- adoption of the full set of new bylaws prescribed by the Law 2018 including the rulebooks in the field of decommissioning and disused sield sources;
- adoption of Spent Fuel and Radioactive Waste Management Strategy;
- adoption of Radiation and Nuclear Safety Strategy.

K.1.2 Improvement of the infrastructure

The establishment of a waste processing facility is still one of the priorities.

The conditions of the old waste facilities are unacceptable, and waste inventories are incomplete. Finalizing the construction of a radioactive waste processing facility and its equipping will enable the onset of the process of emptying the old storages and their later decommissioning.

In order to provide for further safe and secure storage of radioactive waste, the waste processing facility will serve the purpose of treatment of:

- radioactive waste currently stored in the existing storage facilities;
- radioactive waste that is expected to be generated in the course of decommissioning of RA research reactor;
- newly generated radioactive waste.

Sources category III, IV and V will be conditioned in this facility.

K.2 Previous review meetings

Republic of Serbia participated in the 6th Review Meeting.

K.2.1 Challanges identified in 6th Review Meeting

1) Human and financial resources to address the very ambitious programme of improvements

This challenge is still valid, Serbia faces lack of human and financial resources available for an ambitious programme of improvements.

2) Serbia reports challenges with aging and brain-drain and the ability to retain technically knowledgeable and experienced staff.

This challenge is still valid, aging and brain-drain is a continious problem.

3) Serbia reports there is no national strategy for the management of spent fuel, radioactive waste and disused sealed radioactive sources.

Draft Spent Fuel and Radioactive Waste Management Strategy was prepared by SRBATOM at the time of writing this Report.

4) Serbia reports incomplete inventories for legacy waste storage facilities.

This challenge is still valid, there has been no improvement since the last Review Meeting.

5) The legal framework for decommissioning in Serbia needs to be improved.

The Law 2018 addresses the issue of decommisioning. A relevant bylaw needs to be adopted.

6) The legal framework for disused sealed radioactive sources in Serbia needs to be developed

The Law 2018 addresses the issue of disused sealed sources. A relevant bylaw needs to be adopted.

7) Condition of old waste facilities

This challenge is still valid

K.2.2 Suggestions from 6th Review Meeting

1) Serbia is encouraged to invite IRRS and ARTEMIS missions

Invitation of IRRS and ARTEMIS missions is planned after drafting relevant bylaws and strategies.

K.3 International peer review missions

The Republic of Serbia did not host International peer review missions.

K.4 Openness and transparency

This national report is available on web site of SRBATOM.

Section L. Annexes

L.1 Inventory of radioactive waste

Table 1. Inventory of solid and liquid radioactive waste in Hangar H3 and Hangar H0

LLW	Radionuclides	Volumes [m^3]
Solid in H3	^{137}Cs, ^{226}Ra, ^{238}U, ^{232}Th, ^{3}H, ^{241}Am, ^{60}Co and ^{90}Sr.	44,7
Liquid in H0	^{137}Cs and ^{3}H	0,372

Table 2. Inventory of spent sealed sources in Secure Storage and Hangar H3

Category	Location	Radionuclides	Number
I	Secure Storage	^{60}Co	1
III and IV	Secure Storage	^{137}Cs, ^{226}Ra, ^{85}Kr, ^{232}Th, ^{241}Am, ^{60}Co, ^{152,154}Eu, ^{90}Sr and ^{241}Am/Be neutron sources	581
V	Secure Storage	^{3}H, ^{68}Ge, ^{63}Ni, ^{137}Cs and ^{90}Sr	483
V	Hangar H3	^{226}Ra	29443
V	Hangar H3	^{241}Am	10478

Table 3. Inventory of radioactive waste in Hangar H1

Radioactive waste type	Radionuclides	Quantity
Radioactive waste from different users	Unknown	330 m^3
Technological, irradiation and ventilation channels	Fission and activation products	40 m^3
Plastic bags and plastic containers with “yellow cake”	^{235}U, ^{238}U	10 m^3
Radioactive waste from the laboratory for reactor material sciences	^{235}U, ^{238}U	4 m^3
Transuranic liquid waste		4 m^3
Empty plastic containers	Unknown	5 m^3
Waste from HOT laboratory	Unknown	20 m^3
Glove boxes from laboratory 060	Unknown	6 m^3
^{60}Co and ^{137}Cs spent sealed radioactive sources	^{60}Co, ^{137}Cs	Aprox. 300 pcs
Cat. IV spent sealed radioactive sources from lightning rods	$^{152,154}Eu$, ^{60}Co	Aprox. 200 pcs
Other spent sealed radioactive sources	^{137}Cs, ^{60}Co, ^{226}Ra, etc.	Aprox. 200 pcs

Table 4. Inventory of radioactive waste in Hangar H2

Radioactive waste type	Radionuclides	Quantity
Radioactive waste from former open repository	Unknown	200 m^3
Air filters gathered after Chernobyl accident		60 m^3
Radioactive waste from various users	Unknown	90 m^3
Solidified sludge from the reactor pool	^{137}Cs	6 m^3
Spent sealed sources from radioactive lightning rods	$^{152,154}Eu$;	3 special collective containers with total of 625 sources
Depleted uranium bullets	^{235}U, ^{238}U	3 metal containers with 300 bullets
Depleted uranium bullet shells made of Aluminum	^{235}U, ^{238}U	2 metal containers
Soild contaminated with depleted uranium	^{235}U, ^{238}U	3 m^3
Contaminated metal pipes	^{226}Ra	0.2 m^3
Contaminated scrap metal	^{226}Ra	1.6 m^3
Radioacitve waste from spent fuel repackaging operation	^{60}Co, ^{137}Cs	25 stainless steel containers with volume of 77 liter
Compressible operational waste from spent fuel repackaging operation	^{60}Co, ^{137}Cs	80 m^3
Contamianted metal waste	^{137}Cs	22 m^3
Contaminated soil	^{137}Cs	24 m^3
Cat. V sources from smoke detectors	^{241}Am, ^{85}Kr, ^{226}Ra	100000 pcs
Industrial spent sealed radioactive sources		Approx. 800 pcs

Table 5. Inventory of radioactive waste in surroundings of hangars H1 and H2

Radioactive waste type	Radionuclides	Quantity
Contaminated metal waste	^{137}Cs; ^{226}Ra; ^{235}U, ^{238}U	5 Full ISO Containers 7 Half Length Half Height ISO Containers
Contaminated metal waste from spent fuel pool	^{60}Co, ^{137}Cs	
Contaminated metal waste from spent fuel repackaging operation	$^{152,154}Eu$	

Table 6. Inventory of liquid radioactive waste stored in underground tanks

Tank no.	Radiaoctive Waste Class	Quantity [m^3]
VR-1	ILW	123.6
VR-2	LLW	383.6
VR-3	LLW	223.3
VR-4	LLW	139.3

Table 7. Inventory of radioactive waste stored in Radium Bunker

Radioactive waste type	Radionuclides	Quantity
Radium sources	^{226}Ra	Approx. 7 g

Table 8. Inventory of legacy waste stored in Hangar H0

Radioactive waste type	Radionuclides	Quantity
Sealed sources	^{60}Co, $^{152,154}Eu$, ^{137}Cs	Unknown
Contaminated ventilation channels	Unknown	Unknown

L.2 References to national laws, regulations, requirements, guides, etc.

L.2.1 National legal acts

L.2.1.1 National laws

- Law on Radiation and Nuclear Safety and Security (*Official Gazette RS* 95/18 and 10/19);
- Law on banning the construction of nuclear power plants (*Official Gazette FRY* 12/95 and Official Gazette RS 85/05 -other law)
- Law on Public Agencies (*Official Gazette RS* 18/05, 81/05-corr. and 47/18);
- Information Secrecy Law (*Official Gazette RS* 104/09);
- Law on Budget System (*Official Gazette RS* 54/09, 73/10, 101/10, 101/11, 93/12, 62/13, 63/13-corr., 108/13, 142/14, 68/15- other law, 103/15, 99/16,113/17, 95/18, 31/19 and 72/19);
- Law on Emergency Situations (*Official Gazette RS* 111/09, 92/11 and 93/12);
- Law on Environmental Impact Assessment (*Official Gazette RS* 135/04 and 36/09);
- Law on Free Access to Information of Public Importance (*Official Gazette RS* 120/04, 54/07, 104/09 and 36/10);
- Law on General Administrative Procedure (*Official Gazette RS* 18/16 and 95/18-authentic interpretation);
- Law on Government (*Official Gazette RS* 55/05, 71/05 (Corrigendum), 101/07, 65/08, 16/11, 68/12 (CC), 72/12, , 7/14 (CC), 44/14 and 30/2018 other law);
- Law on Occupational Health and Safety (*Official Gazette RS* 101/05, 91/15 and113/17-other law);
- Law on Public Procurement (*Official Gazette RS* 91/19);
- Law on State Administrative Fees (*Official Gazette RS* 43/03, 51/03 - corr., 61/05, 101/05 – other law, 5/09, 54/09, 50/11, 70/11 – adj. din. amounts, 55/12 - adj. din. amounts, 93/12, 47/13 - adj. din. amounts, 65/13 – other law, 57/14 - adj. din. amounts, 45/15 - adj. din. amounts, 83/15, 112/15, 50/16 - adj. din. amounts, 61/17 - adj. din. Amounts, 113/17, 3/18 - corr., 50/18 - adj. din. amounts, 95/18, 38/19 - adj. din. amounts, 86/19, 90/19 - corr. and 98/20 - adj. din. amounts);
- Law on Transport of Dangerous Goods (*Official Gazette RS* 104/16, 83/18, 95/18 - other law and 10/19 - other law);

L.2.1.2 Governmental regulations and decisions

- Regulation on the Security Measures of Nuclear Facilities and Nuclear Materials (*Official Gazette RS* 39/14)
- Decision on Determining Goods Subject to Issuance of Specific Documents on Importation, Exportation and Transit (*Official Gazette RS* 4/20);
- Decision on Determining the National Control List of Dual-Use Goods (*Official Gazette RS* 18/18);
- Decision on Establishment of Serbian Radiation Protection and Nuclear Safety Agency (*Official Gazette RS* 76/09, 113/13, and 62/18)
- Decision on Establishment of Public Company for Nuclear Facility Management (*Official Gazette RS* 50/09)
- Regulation on determining the programme of nuclear safety and security (*Official Gazette RS* 39/14)
- Regulation on National Radiation Emergency Plan (*Official Gazette RS* 30/2018)

L.2.1.3 Rulebooks

- Rulebook on Conditions for Obtaining Licence to Perform Nuclear Activity (*Official Gazette RS* 37/11)
- Rulebook on Radioactive Waste Management (*Official Gazette RS* 60/11)
- Rulebook on Procedure for Keeping Records of Nuclear Materials (*Official Gazette RS* 27/11)
- Rulebook on Limits of Exposure to Ionizing Radiation and Measurements for Assessment of Exposure Levels (*Official Gazette RS* 86/11 and 50/18)
- Rulebook on Radioactivity Monitoring (*Official Gazette RS* 97/11)
- Rulebook for Establishing Programme of Systematic Environmental Radioactivity Monitoring (*Official Gazette RS* 100/10)
- Rulebook for Establishing Programme of Early Warning of Emergency (*Official Gazette RS* 70/11)
- Rulebook on Records on Performed Activities in the Field of Ionizing Radiation Protection (*Official Gazette RS* 17/11)
- Rulebook on Registration and Notification of Sources of Ionising Radiation (*Official Gazette RS* 25/11 and 50/18)
- Rulebook for Establishing Programme of Additional Training and Specialized Education of Occupationally Exposed Persons and Persons Responsible for Implementation of Radiation Protection Measures (*Official Gazette RS* 31/11)
- Rulebook on Limits of Radioactive Contamination of People, Working and Living Environment and Ways of Performing Decontamination (*Official Gazette RS* 38/11)
- Rulebook on Radioactivity Control of Goods during Import, Export and Transit (*Official Gazette RS* 44/11)
- Rulebook on Conditions for Obtaining Decision to Perform Activities in the Field of Radiation Protection (*Official Gazette RS* 61/11 and 101/16)
- Rulebook on Conditions for Obtaining Licence to Perform Radiation Practice (*Official Gazette RS* 61/11, 101/16 and 50/18)
- Rulebook on Limits of Radionuclides Content in Drinking Water, Foodstuffs, Feeding Stuffs, Medicines, General Use Products, Construction Materials and Other Goods that are Put on Market (*Official Gazette RS* 36/18)
- Rulebook on the Records of Ionizing Radiation Sources, Professionally Exposed Persons, Patients Exposure to Ionizing Radiation and Radioactive Waste (*Official Gazette RS* 97/11)
- Rulebook on application of the ionising radiation sources in medicine (Official Gazette RS 1/12)
- Rulebook on Radioactivity Control of Goods during Import, Export and Transit (*Official Gazette RS* 86/19 from 6.12.2019 and 90/19- corrigendum of 20 December 2019)
- Rulebook on Condition for Categorization of Radiation Practicies (*Official Gazette RS* 94/19)

L.2.2 International instruments

L.2.2.1 Multilateral treaties

- Convention on Early Notification of a Nuclear Accident
- Convention on Assistance in the Case of a Nuclear Accident or a Radiological Emergency
- Convention on Physical Protection of Nuclear Material
- Amendment to the Convention on the Physical Protection of Nuclear Material
- Vienna Convention on Civil Liability for Nuclear Damages
- The Treaty on Non-Proliferation of Nuclear Weapons
- Agreement between SFRY and the IAEA for the Application of Safeguards in connection with the Treaty on Non- Proliferation on Nuclear Weapons
- Nuclear Safety Convention

- Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management
- International Convention for the Suppression of Acts of Nuclear Terrorism
- The IAEA Incident Reporting System (IAEA-IRS)
- Comprehensive Nuclear-Test-Ban Treaty
- Treaty on the Prohibition of the Emplacement of Nuclear Weapons and other Weapons of Mass Destruction in the Sea-Bed and the Ocean Floor
- Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water
- Convention on the Prevention of Marina Pollution by Dumping of Wastes and Other Matter
- The Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and their Disposal

L.2.2.2 Bilateral trities

- The Agreement between the Government of Hungary and the Government of the Republic of Serbia for the Early Exchange of Information in the Event of Radiological Emergency (*Official Gazette of RS – International agreements* 19/15)
- Intergovernmental agreement between the Republic of Serbia and the Russian Federation on cooperation in the field of nuclear energy use for peaceful purposes based on proven and innovative technologies (*Official Gazette of RS – International agreements* 2/19)