Republic of Serbia

First National Report

Convention on Nuclear Safety

August 2019

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Contents

Section A. Introduction

Republic of Serbia is located in the central part of the Balkan Peninsula (Figure 1), on the most important route linking Europe and Asia, occupying the area of 88,499 square kilometres. The length of Serbia's border is 2,361.7 kilometres [1]. Serbia borders Bulgaria to the east, Romania to the north-east, Hungary to the north, Croatia and Bosnia-Herzegovina to the west, Montenegro to the south-west and Albania and North Macedonia to the south [2].

The population in the Republic of Serbia without the province of Kosovo-Metohija in January 2019 was 6,963,764 [3].

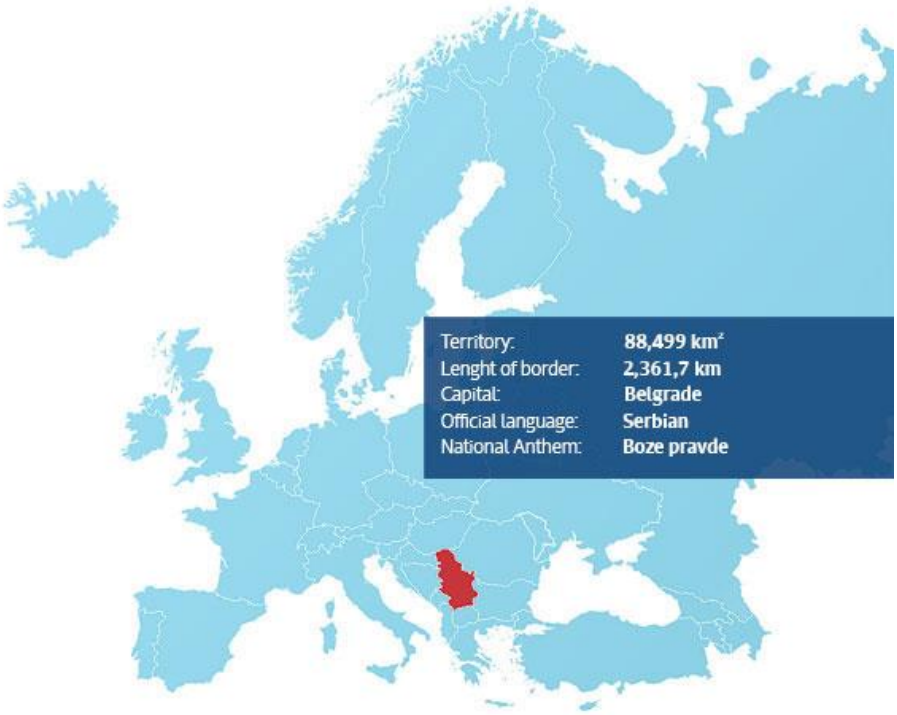

Figure 1. The Republic of Serbia on the map of Europe

SFR Yugoslavia became a member state of the International Atomic Energy Agency in September 1967. After the breakup of SFR Yugoslavia at the beginning of the 1990's, and its suspension from the UN, memebership to the IAEA was also suspended. The State Union of Serbia and Montenegro (former FR Yugoslavia established in 1992) became the memeber state of the IAEA in 2001. Republic of Serbia is a legal successor of the State Union of Serbia and Montenegro after its breakup in 2006.

Republic of Serbia has no nuclear installations on its territory and there are no plans for their construction in near future.

The document titled „Energy Sector Development Strategy of the Republic of Serbia for the period by 2025 with projections by 2030"[4] adopted by the Parliament in 2015 (published in *Official Gazette of RS*, No. 101/05) states:

> *„As for possibility to use nuclear energy, for which the Law that prohibits the construction of nuclear power plants is still valid, transferred based on the succession with SFRY, currently there is no regulatory or administrative framework which would regulate the construction and operation of nuclear power plants. Also, there are no scientific or expert human resources that would monitor the construction and operation of these plants, and educating human resources needed for nuclear energy was terminated. Similar situation is in administrative and regulatory and scientific and expert terms and with the treatment of*

highly radioactive waste and spent nuclear fuel. Also, it should also be noted, that this is the case of energy based on import fuels. However, the construction of nuclear power plants should not be excluded as an option, having in mind the environmental limitations for the existing generation and future needs. Estimation is that 10-15 years from the moment of abolishing the Law that prohibits the construction of nuclear power plants, would be the minimum period to overcome all listed problems and deficiencies, until the beginning of possible operation of such plant in the Republic of Serbia."

A.1 An overview of the national nuclear programme

There are no nuclear installations in the Republic of Serbia in terms of the definition of such installations in Nuclear Safety Convention.

The construction of nuclear power plants, nuclear fuel production plants and plants for spent nuclear fuel processing for nuclear power plants has been forbidden in the Republic of Serbia since 1989.

Research in the field of application of nuclear energy in the Republic of Serbia started in late 1940's shortly after Vinca Institute near Belgrade was established. Vinca Institute was established on 10 January 1948, with direct governmental management. During the first several years, the basic infrastructure for research in physics, chemistry and biology was built. Multidisciplinary research within the Institute for Nuclear Sciences was shaped by construction and the beginning of operation of research reactors RA and RB at the end of the 1950's, establishment of laboratories for high activity chemistry, reactor materials, radiation and medical protection and nuclear reactor technology. During its history, Vinča Institute was reorganized significantly several times. Finally, establishment of Public Company Nuclear Facilities of Serbia (PC NFS) in 2009, was the last organizational change, putting all nuclear facilities again under direct state control.

The breakup of former Yugoslavia in the early 1990's, accompanied by economic crisis, lead to a significant decrease in all research activities in nuclear field. Lack of human resources due to aging and brain drain also had a great impact on the loss of knowledge and experience.

First regulatory body for nuclear safety in the former Yugoslavia was Federal Commision for Nuclear Energy (FCNE) established in 1955. The function of regulatory body was transferred to different ministries in 1970 by the decision of Federal Government on cessation of FCNE. Serbian Radiation Protection and Nuclear safety Agency (SRPNA) was established as regulatory body in 2009. Inspection control over implementing radiation protection and nuclear safety measures were performed by two ministries until 2018. Parlament of Republic of Serbia adopted the new Law on Radiation and Nuclear Safety and Security in November 2018. SRPNA was transferred to Serbian Radiation and Nuclear Safety and Security Directorate[1] by the provisions of the new Law with additional responsibilities included inspection supervision.

Nuclear facilities in the Republic of Serbia are research reactors RA and RB on Vinca site near Belgrade, radioactive waste management facilities on the same site, and former uranium mine and associated hydrometallurgical plant in Gabrovnica near Kalna. PC NFS is the operator of all nuclear facilities in Republic of Serbia.

Information on the research reactors and other non-nuclear power facilities is provided for completeness.

Research reactor RA

The nuclear research reactor RA (Figure 2) was constructed in the second half of the 1950's, based on the Soviet design [5]. Main components of the reactor were manufactured in the former Soviet Union. The reactor was designed as a multi-purpose research reactor providing a relatively high neutron flux in

[1] In the text below: Directorate

the core. RA research reactor is a tank type reactor using heavy water as a primary coolant and as a moderator. Its full power was 10 MW, and a nominal one 6.5 MW.

The facility went critical in December 1959. During the period of operation, the reactor was successfully used for scientific research and commercial purposes. Although temporarily shut down in August 1984 for modernization and preparation for further operation, RA research reactor has never been re-started. In 2002, the Government of the Republic of Serbia adopted the Decision on its final shutdown. Fresh HEU fuel elements were transferred to the Russian Federation as country of origin in 2002. In 2004, the Government of the Republic of Serbia adopted decision on repatriation of spent nuclear fuel from RA research reactor and its decommissioning. Spent nuclear fuel was repatriated to the Russian Federation in 2010.

Figure 2. Research reactor RA

Prepartion for decommissioning was partially done by conducting radiological characterization of components and materials. Radiation levels and contamination mapping inside the reactor facility was mostly completed before repackaging of spent nuclear fuel. Since the shipment of spent nuclear fuel, no decommissioning activities have been performed on the research reactor RA.

Research reactor RB

At the very beginning the reactor RB (Figure 3) was designed and constructed as an unreflected zero power heavy water - natural uranium critical assembly. The first criticality was reached in April 1958. Later, 2% enriched metal uranium fuel and 80% enriched UO_2 fuel were obtained and used in the reactor core [6].

Figure 3. Research reactor RB

Modifications of the reactor control, safety and dosimetry systems done in 1960, 1976 and 1988 converted the RB critical assembly to a flexible heavy water reflected experimental reactor with 1 W

nominal power, operable up to 50 W. Several coupled fast-thermal systems were designed and constructed at RB reactor in the early 1990's for the purpose of research in fast reactors physics.

The reactor is currently out of operation due to lack of scientific and research interest.

Radioactive waste management facilities

Solid radioactive waste, including spent sealed radioactive sources, is stored in four storage facilities namely hangars H0, H1, H2 and H3 and Secure Storage for sealed radioactive sources. Liquid waste is stored in four underground liquid waste tanks namely VR1, VR2, VR3 and VR4.

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 fulfil waste acceptance criteria for Hangar H3 can be temporarily kept in a separate licensed facility – Hangar H0 until the infrastructure for treatment becomes available. Other facilities are closed and do not accept radioactive waste.

Radioactive waste in the Republic of Serbia is currently being generated in medical, industrial and research activities.

Uranium mine and hydrometallurgical plant

The facility was constructed in 1963, in the village of Gabrovnica, in the vicinity of uranium mine Kalna in Eastern Serbia, and in the same year it was fully operational.

The ore from the mine was of poor quality with very low uranium content, which required more expensive methods of extraction and processing. Shortly after the completion of the research, and due to many circumstances, the facility was closed in 1965.

There are no decisions regarding any future activities at this site. Remediation activities have to be performed in order to improve the safety on the location.

A.2 Statement on the commitment of the Republic of Serbia to the Convention

Republic of Serbia is strongly committed to achieving the highest level of nuclear safety and security. The protection of the public and the environment, ensuring the benefits of nuclear energy exclusively for peaceful purposes, and achieving global peace, prosperity and well-being of future generations, remain the priorities of the country.

A.3 Preparation, structure and main features of the National Report

The First National Report was prepared by Serbian Radiation and Nuclear Safety and Security Directorate during spring and summer of 2019. The Report was prepared according to INFCIRC/572/Rev. 6 „Guidlines regarding National Reports under the Convention on Nuclear Safety“, Chapter E. Contracting Parties without Nuclear Installations.

Section B. Summary

The Parliament of the Republic of Serbia adopted the Law on Ratification of Nuclear Safety Convention (*Official Gazzete RS – International Agreements*, No. 10/17) in November 2017. The Convention entered into force in the Republic of Serbia on 18 March 2018.

This document is the first National Report on Nuclear Safety Convention.

Information article by article of Nuclear Safety Convention relevant to the Republic of Serbia is provided in Section C of this Report. Section C.1 includes information on legislation in force, system of licencing and regulatory inspection. Section C.2 provides information about the regulatory body. Responsibilities of licensees are described in Secton C.3. The arrangements giving due priority to nuclear safety are described in Section C.4. The arrangements and regulatory requirements concerning radiation protection are described in Section C.5. Section C.6 provides information on measures for the preparation and testing of emergency plans and international arrangements in the event of emergency.

Participation in previous review meetings

Republic of Serbia did not participate in the previous review meetings.

International peer review missions

Republic of Serbia did not host International peer review missions.

Openness and transparency

This national report is available on the website of the Serbian Radiation and Nuclear Safety and Security Directorate (www.srbatom.gov.rs).

Section C. Reporting Article by Article

C.1 Article 7 Legislative and Regulatory Framework

1. Each Contracting Party shall establish and maintain a legislative and regulatory framework to govern the safety of nuclear installations. 2. The legislative and regulatory framework shall provide for: (i) the establishment of applicable national safety requirements and regulations; (ii) a system of licensing with regard to nuclear installations and the prohibition of the operation of a nuclear installation without a licence; (iii) a system of regulatory inspection and assessment of nuclear installations to ascertain compliance with applicable regulations and the terms of licences; (iv) the enforcement of applicable regulations and of the terms of licences, including suspension, modification or revocation.

C.1.1 Article 7 (1) Establishing and maintaining legislative and regulatory framework

C.1.1.1 Primary legislative framework for nuclear safety, including interfacing national legislation

Primary legislative framework for nuclear safety in the Republic of Serbia consists of two main laws stated below:

1. *Law on Radiation and Nuclear Safety and Security* (*Official Gazette of RS*, No. 95/16 and 10/19)[2] which 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 ionising 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.
2. Under the *Law banning the construction of nuclear power plants in the Federal Republic of Yugoslavia* (*Official Gazette of FRY*, No. 12/95 and *Official Gazette of RS*, No. 85/05) it is forbidden to build nuclear power plants, nuclear fuel production plants and plants for reprocessing spent nuclear fuel for nuclear power plants. It is also forbiden to make investment decisions, investment programs and technical documentation for the construction of nuclear power plants, nuclear fuel production plants and plants for reprocessing spent nuclear fuel for nuclear power plants.

C.1.1.2 Ratification of international conventions and legal instruments related to nuclear safety

Republic of Serbia has joined to all relevant international conventions and legal instruments listed below:

1. Convention on Early Notification of a Nuclear Accident;
2. Convention on Assistance in the Case of a Nuclear Accident or a Radiological Emergency;
3. Convention on Physical Protection of Nuclear Material and Amendments thereto;

[2] In the text below: Law

4. Vienna Convention on Civil Liability for Nuclear Damages;
5. The Treaty on Non-Proliferation of Nuclear Weapons;
6. Agreement between SFRY and the IAEA for the Application of Safeguards in connection with the Treaty on Non- Proliferation on Nuclear Weapons.
7. Additional Protocol to the Agreement for the Application of Safeguards in connection with the Treaty on Proliferation of Nuclear Weapons;
8. Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management;
9. Convention on Nuclear Safety.

C.1.2 Article 7 (2) (i) National safety requirements and regulations

C.1.2.1 Secondary legislation for nuclear safety

There are three regulations in the field of nuclear safety and security adopted by the Serbian Government:

1. Regulation on determining the programme of nuclear safety and security;
2. Regulation on the security measures of nuclear facilities and nuclear materials
3. Regulation on the establishment of the National Radiation Emergency Plan (NREP).

According to Art. 6 of the Law, the Government 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, all for the period of seven years.

C.1.2.2 Regulations and guides issued by the regulatory body

Since its establishment in 2009, the regulatory body has issued the following rulebooks:

1. Rulebook on Performance of Nuclear Activities
2. Rulebook on Conditions for Obtaining Licence to Perform Nuclear Activity
3. Rulebook on Radioactive Waste Management
4. Rulebook on Procedure for Keeping Records of Nuclear Materials
5. Rulebook on Conditions for Obtaining Decisions to Perform Activities in the Field of Radiation Protection
6. Rulebook on Records on Performed Activities in the Field of Radiation Protection
7. Rulebook for Establishing Programme of Additional Training and Specialized Education of Occupationally Exposed Persons and Persons Responsible for Implementation of Radiation Protection Measures
8. Rulebook on Notification and Registration of Radiation Sources
9. Rulebook on Conditions for Obtaining Licence to Perform Radiation Practices
10. Rulebook on Application of the Radiation Sources in Medicine
11. Rulebook on Limits of Exposure to Ionizing Radiation and Measurements for Assessment of the Exposure Levels
12. Rulebook on the Records of Radiation Sources, Professionally Exposed Persons, Patients Exposure to Ionizing Radiation and Radioactive Waste
13. Rulebook on Limits of Radionuclide Content in Drinking Water, Food Stuffs, Feeding Stuffs, Drugs, Items of General Use, Building Materials and Other Goods to be Placed into Market
14. Rulebook on Limits of Radioactive Contamination of People, Working and Living Environment and Ways of Performing Decontamination
15. Rulebook on Radioactivity Monitoring

16. Rulebook for Establishing Programme of Systematic Environmental Radioactivity Examination
17. Rulebook on Radioactivity Control of Goods During the Import, Export and Transit
18. Rulebook for Establishing Programme for Early Warning of Emergency

C.1.2.3 Process of establishing and revising regulatory requirements, including the involvement of interested parties.

Under Art. 22 point 3, the Directorate is responsible to pass rulebooks and other guides pursuant to the Law.

In the same article, point 28 states that the Directorate is responsible to establish the 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.

C.1.2.4 Article 7 (2) (ii) System of licensing

Licensing system and processes

By applying the graded approach principle, the Law has introduced categorization of practices based on the health risk of the exposed workers and members of the public, the public and the environment, as well as based on the type of the activity being performed.

Under Article 33 of the Law, all practices are classified into the four categories:

1. low-risk radiation practices;
2. moderate-risk radiation practices;
3. high-risk radiation practices;
4. nuclear activities.

Nuclear activities (Article 5, point 71) are "phases of a lifetime of nuclear facility namely: siting, design, construction, trial run or commissioning, operation, decommissioning (except for radioactive waste disposal facility) or closure of nuclear facilities (except for radioactive waste disposal facility) and remediation of their sites".

Under Article 5, point 73. of the Law, nuclear facility is defined as "a facility or several of facilities when they are functionally linked in the same geographically confined territory 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".

According to Article 31, a legal entity or an enterpreneur intending to start to perform practice, prior to the practice commencement, shall notify the Directorate on the intention to perform the practice on which the Directorate shall issue a notification.

The requirement to obtain the authorization to perform the practice is prescribed for any legal entity performing the practices regulated by the Law. Obligation of obtaining authorization from the Directorate is prescribed in Article 34. A holder of notification for intention to perform practice, prior to the commencement of practice performance, shall obtain from the Directorate the authorization commensurate with the practice category. According to Article 30, notified practices may be exempted from authorization issuance in compliance with the requirements prescribed by the Directorate.

Authorization is granted through registration or through licence. According to Article 34, registration is issued to authorize low-risk radiation practices while licence is issued to authorize moderate-risk and high-risk radiation practices as well as nuclear activities.

By virtue of graded approach principle and by the Law, the Directorate has different periods to decide on applications for registration and licence issuance. Based on the same principle, the authorizations for different categories have different validity and dates of expirations accordingly, which is illustrated in Table 1.

According to articles 41, 47, 48 and 49, the Directorate shall issue a written decision on registration or licence issuance only upon verification that all statutory requirements prescribed by the Law and bylaws closely regulating the authorization issuance have been fulfilled.

Table 1. Issuance of authorizations for different practice categories

Practice category	Written document to authorize the practice	Issuance period*	Validity
Low-risk radiation practices	Decision on registration	30 days	Indefinite
Moderate-risk radiation practices	Decision on licence issuance	60 days	10 years
High-risk radiation practices	Decision on licence issuance	90 days	5 years
Nuclear activities	Decision on licence issuance	180 days	Up to 10 years**

* as of the day of duly submitted application

** except the licence for nuclear activity – trial-run of nuclear facility which is issued for the period of up to two years

Articles 51, 52 and 53 of the Law prescribes the possibility of suspension or revocation of registration or licence, based on the authorization holder request or based on the findings of the inspection.

The scheme of the authorization process is presented in Figure 4.

Licence may be extended after expiration, according to Article 54, upon the request of the licensee. Directorate shall determine whether all requirements, as well as all radiation and nuclear safety and security measures, have been fulfilled prior to the extension of license duration. Decision is based on the result of periodic safety review.

Involvement of the public and interested parties

According to Art. 206 para. 2, the Directorate shall establish procedures ensuring that the public, local authorities, population and other interested parties in close proximity of a nuclear facility have accurate and timely information about the safety of the nuclear facility, and also ensuring that the public including interested parties in the process of licensing and all stages of a nuclear facility life cycle are informed and consulted.

Legal provisions to prevent the operation of a nuclear facility without a valid licence

Under Art. 4 para. 2 of the Law it is prohibited to perform a practice without previously obtained authorization issued by the Directorate. In addition, under Art. 233 point 1 the fine amounting from RSD 1,500,000 to 3,000,000 shall be levied for an commercial offence on a legal entity if such legal entity performs practices without previously obtained authorization issued by the Directorate.

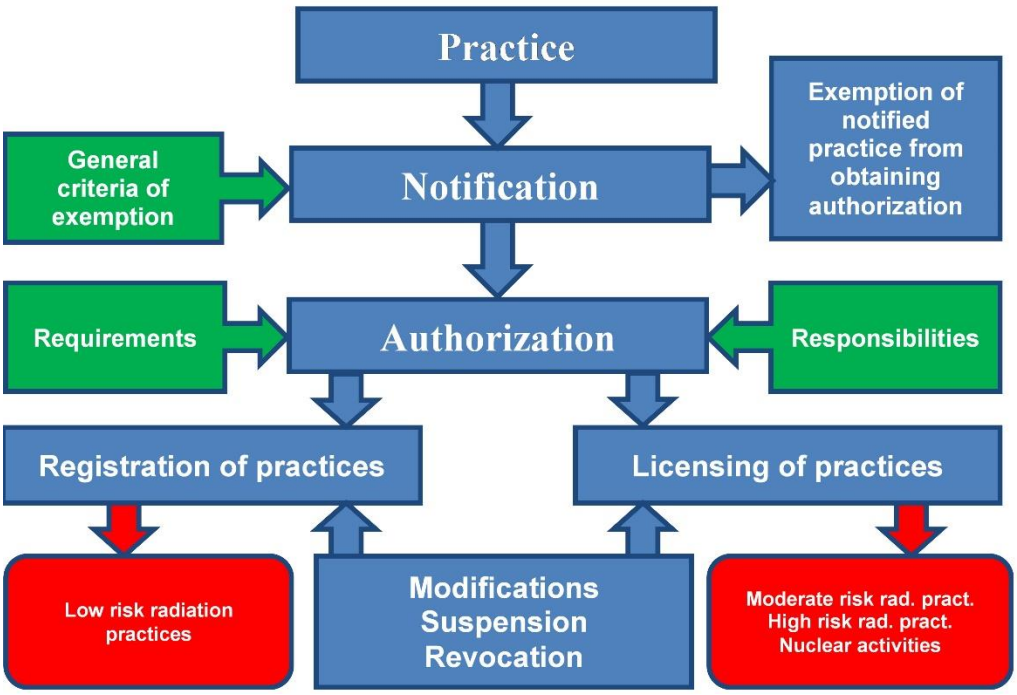

Figure 4. Procedures for authorization of practices

C.1.2.5 Article 7 (2) (iii) System of regulatory inspection and assessment

Regulatory inspection and assessment process with regard to the safety of nuclear facilities

Art. 214 of the Law prescribes the performance of inspectional supervision over the implementation of nuclear safety and security. According this article, the inspector has the right and duty to determine whether:

1. requirements for nuclear activity performance have been met;
2. prescribed measures of ionising radiation protection for the exposed workers, the public and the environment have been implemented;
3. prescribed measures of nuclear safety and security have been implemented;
4. records of nuclear material and other records as prescribed by the Law and the applicable international agreements have been duly kept;
5. other measures prescribed by this Law have been implemented.

Basic features of inspection programmes.

Under Art. 10 of the Law on Inspection Oversight (*Official Gazette of RS*, No.36/15, 44/18 – other law, 95/18), which is of general nature and applicable in the field of radiation and nuclear safety and security, the inspection plans shall be based on the findings in each field of inspection oversight, as well as on risk assessment. Each inspection body shall be required to implement its inspection plan, except only in the event that justifiable extraordinary circumstances prevent it from doing so.

Additionally, each inspection body shall be required to draft a strategic (multi-annual) and an annual inspection plan. The annual inspection plan shall be implemented through operational (semi-annual, quarterly, and monthly) inspection plans.

In addition to common features shared by annual work plans of public administration bodies, the inspection plans must also define:

1. the frequency of inspection oversight by area and risk level;
2. overview of entities subject to inspection oversight covered by such inspection oversight;
3. where entities subject to oversight cannot be determined, or where their number is excessively high, such plans must contain information of importance for inspection oversight and determination of entities to be covered by such inspection oversight;
4. estimated risk for entities subject to oversight or sectors or activities to be covered by such inspection oversight or geographical area or other geographical or similar unit, building, or group of buildings;
5. period of inspection oversight;
6. information regarding types of inspection oversight to be performed;
7. information about the resources of the inspection body to be allocated to inspection oversight.

Inspection plan shall also contain:

1. preventive measures and activities planned to be undertaken by the inspection body;
2. planned measures and activities to prevent business operations or performance of activity by unregistered entities;
3. volume of extraordinary inspection oversight expected in the same period as scheduled oversight, with appropriate explanation;
4. other issues of importance for planning and performance of inspection oversight.

Depending on its organisational position in the public administration system, each inspection shall develop and/or formally adopt inspection plans in line with guidelines and instructions of the Co-ordinating Commission no later than 15 October of each year.

Inspection plan shall be published on the web-site.

C.1.2.6 Article 7 (2) (iv) Enforcement of applicable regulations and terms of licences

Power for legal actions

According to Art. 215 of the Law, in performing inspectional supervision, the inspector shall be empowered to:

1. inspect the work premises, facilities, plants and sites that are in connection with the radiation practice performance;
2. inspect the sites, buildings and facilities that are in connection with the nuclear practice performance;
3. gain insight into the technical specification of the equipment;
4. gain insight into the employment documentation of the exposed workers;
5. gain insight into the documentation on vocational qualifications and fulfillment of health requirements for the exposed workers;
6. gain insight into the documentation on education and training of the exposed workers;
7. gain insight into ledgers, records, official documents, electronic documents and other documentation in connection with the practice;
8. scan and copy ledgers, records, official documents and electronic documents subject to inspectional supervision;
9. identify the exposed workers, ionizing radiation protection officers and other individuals found at locations where the inspectional supervision is performed by inspecting their personal photographic identification documents or other public photographic identification instruments;
10. 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 inspectional supervision;

11. take photographs and make video recordings of locations where inspectional supervision is performed, as well as the ionizing radiation sources, radioactive and nuclear material or other items subject to inspectional supervision;
12. collect data and information that are of relevance for the inspectional supervision;
13. 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;
14. request the assistance and presence of the police, i.e. community police, if reasonably deemed as necessary by the circumstances of a particular case;
15. perform radioactivity measurements by means of radiation monitors;
16. attend reference sampling, measurements and decontamination of persons, work and living environment;
17. temporarily impound the goods subject to inspectional supervision, 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;
18. 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;
19. engage experts in the area of radiation and nuclear safety and security;
20. engage court expert witnesses in the area of radiation and nuclear safety and security;
21. take other measures in accordance with the Law

Overview of enforcement measures available to the regulatory body

Under Art. 216 para. 2 of the Law, the inspector shall be empowered to order nuclear safety and security measures to be taken as follows:

1. forbid a nuclear activity unless all requirements have been met;
2. forbid the trade in nuclear materials unless all requirements have been met;
3. forbid the work of exposed workers in the nuclear facility not meeting the prescribed professional or health conditions, or not having the required training and education;
4. order the exposed worker to have the appropriate health examination in accordance with the regulations governing occupational medicine;
5. order the exposed worker to have periodic retraining and acquire the required skills and knowledge to implement radiation protection measures;
6. order the establishment of radiation protection service, except in case of the license for a nuclear facility siting, design and construction;
7. order the establishment and implementation of the integrated management system;
8. 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;
9. order the removal of deficiencies in connection with the radioactive waste management;
10. order the removal of deficiencies in connection with spent nuclear fuel management;
11. order the removal of deficiencies in physical protection and a nuclear facility security;
12. order the prescribed measures in case of nuclear emergency to be implemented;
13. order environmental radioactivity monitoring in the vicinity of the facility;
14. 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;
15. order decommissioning of a nuclear facility;
16. order the site and soil remediation;
17. order record keeping and control of nuclear material;
18. order the prescribed nuclear security to be implemented;
19. order other measures of nuclear safety and security.

C.2 Article 8. 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 7, and provided with adequate authority, competence and financial and human resources to fulfil its assigned responsibilities.

2. Each Contracting Party shall take the appropriate steps to ensure an effective separation between the functions of the regulatory body and those of any other body or organization concerned with the promotion or utilization of nuclear energy.

C.2.1 Article 8 (1) Establishment of the regulatory body

Under Art. 13 of the Law, Serbian Radiation and Nuclear Safety and Security Directorate shall be established by law as an independent and separate regulatory body with regulatory, expert and associated executive functions in the area of radiation and nuclear safety and security for the purpose of providing the environment for professional and efficient regulatory control of practices regulated by the Law.

According to Art. 22 of the Law, the functions of the Directorate are:

1. to prepare draft strategies and action plans for their implementation under Article 6 and 8 hereof;
2. to prepare draft regulations adopted by the Government pursuant to this Law;
3. to pass rulebooks and other guides pursuant to this Law;
4. 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;
5. to prepare draft Response plan in case of nuclear and radiological emergency situation;
6. to lay down protective measures for a member of the public, the public and the environment from the harmful effect of ionizing radiation;
7. to establish requirements for protection against increased exposure of workers, members of the public and the public to naturally occurring radiation;
8. 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;
9. to issue, suspend or revoke certificates pursuant to the Law;
10. to issue certificate of entry into records and deletion from the records of radiation sources;
11. to lay down criteria for the exemption from the obligation of notification;
12. to lay down criteria for the release from regulatory control
13. to verify the competence of persons responsible for the implementation of radiation protection measures;
14. to define the obligations, including the financial ones, of authorization holders;
15. to ensure continuous professional cooperation in the performance of duties by engaging consultants, preparing projects or establishing permanent and ad hoc advisory bodies;
16. 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;
17. 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;

18. 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;
19. to establish categorization of radiation sources based on their possible impact and harmful effect on the health and lives of people and the environment;
20. 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;
21. 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;
22. to participate in defining design bases and design basis accidents for the purpose of implementing radiation and nuclear safety and security measures;
23. to cooperate with other state bodies and organizations within their competences;
24. 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;
25. 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;
26. 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;
27. 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;
28. 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;
29. to fulfil any other commitments deemed as necessary to establish protection of the public and the environment in the Republic of Serbia;
30. 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;
31. to carry out regulatory control and inspectional supervision of the implementation of radiation and nuclear safety and security measures;
32. to control the fulfilment of conditions serving as the basis for the issuance of authorizations pursuant to the Law;
33. to review, observe and assess the practices to verify their compliance with this Law, applicable regulations and the requirements for obtaining authorizations;
34. to take actions, require and monitor the implementation thereof in the event of noncompliance with the law, bylaws and other applicable regulations regarding the requirements for obtaining authorizations;
35. to establish and maintain the system of accountancy and control of nuclear material;
36. to perform other statutory duties.

Under Art. 20 para. 3, 4, 5 and 6 of the Law, the Directorate shall take into employment the appropriate number of employees with relevant qualifications, experience and expertise.

Directorate may also use external resources and expertise in support of its regulatory functions.

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

All rights, duties and responsibilities of the employees of the Directorate are subject to general regulations governing employment, general acts of the Directorate and employment contract.

According to the Decision of the Serbian Government adopted in May 2019, the maximum number of employees in the Directorate is 48 which is deemed as fairly sufficient. Organizational scheme of Directorate is presented in Figure 5. At the time of writing this Report, there are 29 employees in the Directorate.

Under Art. 20 para. 1 and 2 of the Law, the financial resources of the Directorate are provided from the budget of the Republic of Serbia, the income the Directorate acquires from the activities within its remit, donations, grants and other sources.

Directorate shall independently use the aforementioned resources. Over the past three years the financial resources have been constantly increasing and at the moment are at a satisfactory level.

According to Art. 25 of the Law, the Directorate may hire legal entities and persons with necessary scientific and technical qualifications, expertise, specialized knowledge and skills in the field of analyzing, improving and regulating radiation and nuclear safety and security measures as consultants.

Under Art. 28 of the Law, the Directorate shall establish, implement, continuously assess and improve an integrated system of management, which is aligned with safety goals and contributes to their achievement.

Directorate shall implement regulatory process based on the procedures incorporated in the integrated system of management and thus ensure stable and consistent regulatory control.

In order to fulfil the aforementioned, the management of the Directorate shall:

1. demonstrate leadership for and commitment to safety;
2. be responsible for the establishment, implementation, sustainability and continuous improvement of the integrated system of management;
3. establish goals, strategies and plans of the Directorate that are aligned with the safety policies of the Directorate;
4. ensure adequate interaction with the interested parties;
5. determine and ensure competences and resources necessary for safe activity performance within the Directorate.

The integrated system of management of the Directorate shall be documented, developed and applied in accordance with the principle of graded approach.

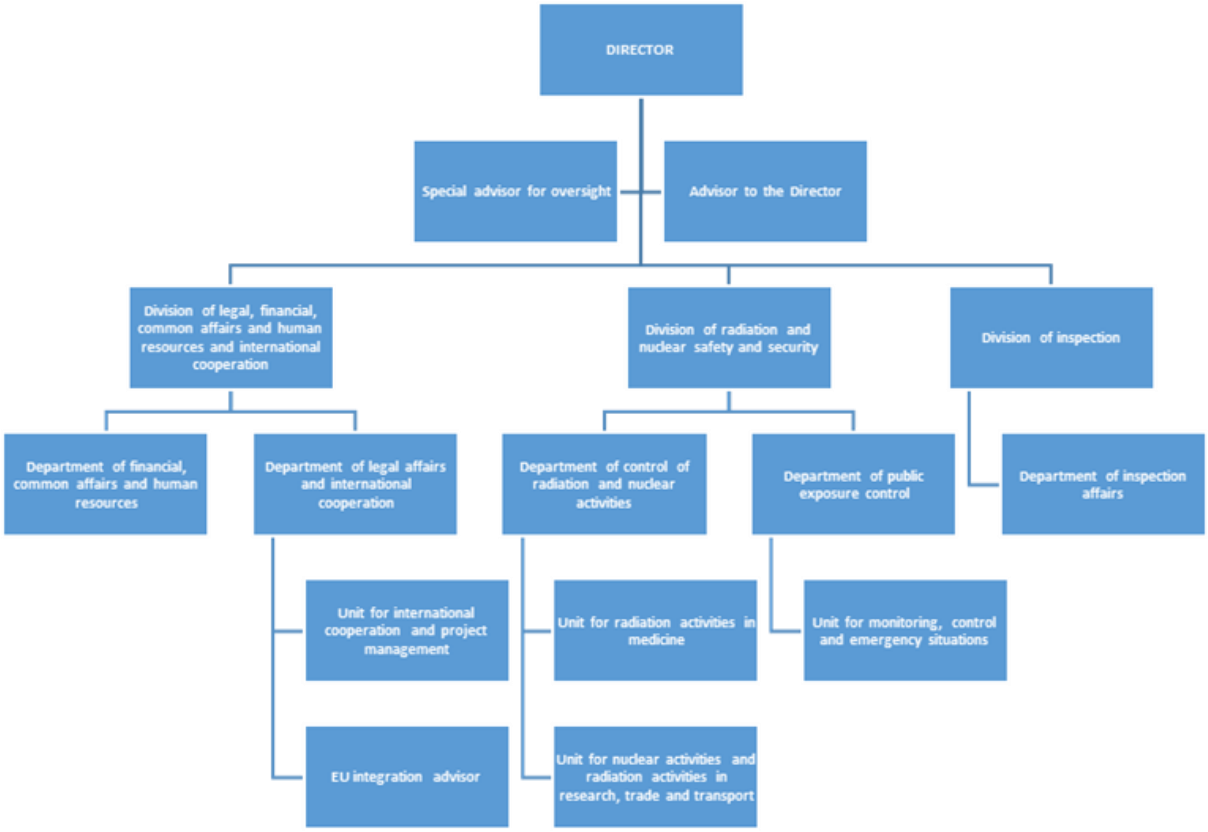

Figure 5. Organizational sheme of Directorate

Under Art. 206 of the Law, the Directorate shall establish procedures ensuring that:

1. the public, local authorities, population and other interested parties in close proximity of a nuclear facility have accurate and timely information about the safety of the nuclear facility;
2. the public including interested parties in the process of licensing and all stages of a nuclear facility life cycle are informed and consulted;
3. every issued authorization and all requirements for the issuance thereof, apart from security sensitive and classified data, are made public.

Directorate shall cooperate with the competent regulatory bodies in other countries in the area of radiation and nuclear safety and security by exchanging and/or sharing information.

Directorate, within its remit and pursuant to the Law, shall inform the public on any unauthorized use of radiation sources or any breech of prescribed procedures in facilities that can result in an emergency event.

According to Art. 26 of the Law, the Directorate shall engage consultants without compromising its own independence by ensuring that there is no conflict of interest for the consultants that provide scientific and technical support to the Directorate.

The consultants shall provide the Directorate with scientific and technical support without commercial, financial or any other kind of leverage from other interested parties, and without the influence from any other organization regarding the results of their work.

The consultants shall provide the Directorate with scientific and technical support based on solely technical knowledge, analysis results and regulatory requirements.

C.2.2 Article 8 (2) Status of the regulatory body

Under Article 14 of the Law, the Directorate shall be responsible only to the Government of the Republic of Serbia. The Directorate is a legal entity. The head office of the Directorate is in Belgrade. Internal organization, remit and manner of work, manner of planning, performing activities and other issues of relevance for the Directorate shall be regulated by the Statute of the Directorate and other general legal enactments pursuant to law.

According to Art. 15 of the Law, the bodies of the Directorate are the Board and the Director, appointed by the Government.

C.3 Article 9 Responsibility of the Licence Holder

Each Contracting Party shall ensure that prime responsibility for the safety of a nuclear installation rests with the holder of the relevant licence and shall take the appropriate steps to ensure that each such licence holder meets its responsibility.

According to Art. 66 of the Law, one of the fundamental principles of radiation and nuclear safety is:

> *"Prime responsibility for radiation and nuclear safety must rest with the legal entity or enterpreneur responsible for practices and facilities that give rise to elevated radiation risk".*

According to Article 36, the 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 Directorate 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 Directorate 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 Directorate, and;

13. provide, upon the request of the Directorate or in line with the requirements, all information regarding the practice performance that the Directorate deems necessary or relevant for radiation and nuclear safety and security.

Article 38 stipulates that the Directorate shall issue the authorization for practices to legal entities or enterpreneurs provided they fulfil general and special requirements pursuant to the Law.

C.4 Article 10 Priority to Safety

Each Contracting Party shall take the appropriate steps to ensure that all organizations engaged in activities directly related to nuclear installations shall establish policies that give due priority to nuclear safety.

Article 35 prescribes that the authorization holder shall bear prime responsibility for radiation and nuclear safety and security and shall be responsible for all activities conducted by legal entities, persons and enterpreneurs they engage and whose practices can affect radiation and nuclear safety and security. The 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, until the facility, the site, and the parts thereof are released form the regulatory control.

According to the Article 42, the implementation of radiation and nuclear safety and security measures shall be confirmed based on the Safety Analysis Report, Radiation Protection Programme and other documentation specified by the Directorate.

The Safety Analysis Report shall particularly include (Article 43):

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.

According to the Article 115, the licensee for a nuclear activity shall take measures to improve and develop nuclear safety and security culture by implementing an integrated management system.

According to the Article 28, the Directorate shall establish, implement, continuously assess and improve an integrated system of management, which is in accordance to safety goals and contributes to their achievement. Among other things, the management of the Directorate shall demonstrate leadership for and commitment to safety and establish goals, strategies and plans of the Directorate that are in accordance with the safety policies of the Directorate.

C.5 Article 15 Radiation Protection

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

The fundamental principles of radiation protection as listed in Article 29 are:

1. justification,
2. optimization and
3. dose limitation.

General requirements concerning radiation protection as listed in Article 39 are:

1. that the facilities, the venues and the sites where the practice is performed meet technical, safety, security and other requirements ensuring the protection of exposed workers, members of the public, the public and the environment from the harmful effect of ionising radiation;
2. that the exposed workers handling radiation sources are provided with the adequate radiation protection tools and ionising radiation measuring devices;
3. to designate a radiation protection officer or a radiation protection service;
4. depending on the type of practice, to have staff with adequate education and training in the area of radiation protection that fulfil necessary health requirements to work with radiation sources;
5. to implement the measures necessary to prevent contamination of work and living environment by the practice performance, excluding the practices using ionising radiation generators;
6. to use and trade in radiation sources in a safe and secure manner and in accordance with the relevant regulations;
7. to implement other radiation protection measures stipulated by the Law.

The implementation of radiation protection measures shall be confirmed based on the Radiation Protection Programme. This programme shall particularly include (Article 46):

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 enterpreneurs 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.

All practices performed by an authorization holder are subject to regulatory control during the process of issuing authorization and inspection control according to the Law.

C.6 Article 16 Emergency Preparedness

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

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

2. Each Contracting Party shall take the appropriate steps to ensure that, insofar as they are likely to be affected by a radiological emergency, its own population and the competent authorities of the States in the vicinity of the nuclear installation arc provided with appropriate information for emergency planning and response.

3. Contracting Parties which do not have a nuclear installation on their territory, insofar as they are likely to be affected in the event of a radiological emergency at a nuclear installation in the vicinity, shall take the appropriate steps for the preparation and testing of emergency plans for their territory that cover the activities to be carried out in the event of such an emergency.

C.6.1 Article 16 (3) Emergency preparedness for Contracting Parties without nuclear installations

Serbian Radiation and Nuclear Safety and Security Directorate is the national coordinating authority in the field of preparedness to radiological and nuclear emergencies in the Republic of Serbia.

The basic document for preparedness and response to a nuclear or radiological emergency is the Law on Radiation and Nuclear Safety and Security.

Responsibilities of the Directorate according to Article 22 of the Law, among others, are implementation of the Programme for Early Warning of an Emergency and preparation of the draft National Radiation Emergency Plan (NREP) which has to be adopted by Government, as well as setting up the Environmental Radioactivity Monitoring Programme and coordination of its implementation. The Directorate is responsible for the analysis of the monitoring results and evaluation of radioactivity impact on the public and the environment.

Law on Disaster Risk Reduction and Emergency Management (*Official Gazette of RS* No. 87/2018), as a fundamental document for all emergency situations, defines activities, declaration and management in emergency situations; system of protection and rescue of citizens, material and cultural goods from natural and manmade disasters; rights and obligations of citizens, state agencies, autonomous provinces, local governments, companies and other legal persons and enterpreneurs; inspection and supervision of international cooperation and other issues relevant to organization and functioning of the protection and rescue system.

Republic of Serbia adopted the National Radiation Emergency Plan (NREP) in 2018 (*Official Gazette of RS* No. 30/18), prepared in accordance with national laws and regulations, and relevant documents of the IAEA and the European Commission. Updating is intended to be done every three years.

According to NREP, and as proposed by the Directorate or based on the available information, Republic Disaster Response Headquarters convenes to bring decisions on the response to an emergency on the territory of the Republic of Serbia. The Directorate, together with an expert operational team, is responsible for assessment of the situation in cases of transboundary release of radioactive material.

The Directorate is a part of the Republic Disaster Response Headquarters**.**

Cooperation with international community and neighbouring States

Republic of Serbia has been a Party to the Convention on Early Notification of a Nuclear Accident and the Convention on Assistance in Case of a Nuclear Accident or Radiological Emergency since 2002.

Directorate is a National Competent Authority for these Conventions and, with the Ministry of Interior's Sector for Emergency Management as a Warning point, a registered user for Serbia in the IAEA Unified System for Information Exchange (USIE).

Republic of Serbia has signed the following bilateral agreements:

1. 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 (2015)
2. Agreement between the Government of Bulgaria and the Government of the Republic of Serbia for the Early Exchange of Information in the Event of Radiological Emergency (2019)

Republic of Serbia submits environmental monitoring data from the national network of automatic monitoring stations to the European Radiological Data Exchange Platform (EURDEP) since January 2011. All environmental monitoring data are available on the Directorate website *http://www.srbatom.gov.rs*.

Republic of Serbia, as an official candidate for EU accession, requested ECURIE membership by regular diplomatic means in March 2019.

Protection strategy

The protection strategy is in compliance with the *Preparedness and Response for a Nuclear or Radiological Emergency, General Safety Requirements No GSR Part 7, IAEA, Vienna (2015)*. Protective actions for population and emergency workers, as well as criteria for their implementation have been set in NREP, and types of hazards have been recognized. No reference level has been established. The transition from an emergency to existing exposure situation is not clearly defined.

Decision making

According to the Law on Disaster Risk Reduction and Emergency Management, the coordinating bodies for all emergencies, including the nuclear and radiological emergencies, are national, regional and local Disaster Response Headquarters (DRH), depending on the scale of an emergency.

Members of DRH are representatives of state administration, local communities and professional experts from special organizations, scientific and other institutions, companies and other legal entities, whose competencies and duties relate to protection and rescue.

Criteria for the implementation of radiation protection measures

Republic of Serbia has no assessment and prognosis tools and the only way to set some criteria was to apply the criteria of the international community. Therefore, the criteria for the implementation of protective measures have been taken from the international standards.

Criteria for protective and other response actions that are expected to be undertaken to minimize severe deterministic effects or to reduce the risk of stochastic effects predicted by NREP are those from: *Criteria for Use in Preparedness and Response for a Nuclear or Radiological Emergency, General Standards Guide No. GSG-2, IAEA, Vienna (2011)* and *Council Regulation (Euratom) 2016/52 of 15 January 2016 laying down maximum permitted levels of radioactive contamination of food and feed following a nuclear accident or any other case of radiological emergency***.**

There are eight NPPs on a distance shorter than 500 km from the Serbian border. In line with the requirements of IAEA Safety Standards publication GSR Part 7, Serbian territory is within emergency planning distances (extended planning distance and ingestion and commodities planning distance) of two NPPs in neighbouring countries, NPP „Paks" in Hungary which is 70 km from Serbian border and NPP „Kozloduy" in Bulgaria which is 90 km from Serbian border (Figure 6).

The use of Iodine Thyroid Blocking (ITB) as an urgent protective measure is not assumed on the territorry of the Republic of Serbia.

Figure 6. NPP in vicinity of Serbian border[3]

[3] https://www.google.com/maps/

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