



**SECOND
NATIONAL REPORT
OF BOSNIA AND HERZEGOVINA**

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

to the 6th Review Meeting
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Section A: Introduction

Bosnia and Herzegovina deposited an instrument of accession to the Joint Convention on 02 August 2012. There were no declarations or reservations attached to the instrument of accession. The Convention entered into force for Bosnia and Herzegovina on 31 October 2012.

Bosnia and Herzegovina submitted its first report to the Fifth Review meeting held in 2015, hence this is the second national report. For the sake of coherency and for presenting a readable overview, much of the text from the previous national report is repeated here. The progress achieved between October 2014 and October 2017 is reflected in this report. The aim of this national report is to demonstrate that Bosnia and Herzegovina seeks to meet its obligations under the Joint Convention.

Bosnia and Herzegovina is a non-nuclear country located in Southeastern Europe with a population of approximately 3.8 million people and an area of approximately 50.000 km². The country is politically decentralized and comprises two administrative entities and one district. Both entities and a district have their own government. The Council of Ministers acts as the state government.

The authorities of Bosnia and Herzegovina have not yet expressed their intention to build nuclear power plants on the country's territory, however, authorities have not expressed any opposition to the construction of these facilities, either. For now, the country has sufficient energy resources, and in our history, this issue has never been on the agenda for the consideration by the relevant authorities. The regulatory body, for the moment, does not have information about possible interest of any authority or legal person for the construction and putting into operation of nuclear facilities.

While Bosnia and Herzegovina does not have any nuclear facilities or isotope production in its territory, it does have radioactive materials (sealed and unsealed) that are used in medical, industry and research activities, and as a result has a number of issues to be solved since sealed radioactive sources (both in use and disused) of all five categories are present in the country.

The current system of regulatory control of ionizing radiation sources in Bosnia and Herzegovina has been completely reorganized and updated to ensure that radiation and nuclear safety, based on the 2007 Law on Radiation and Nuclear Safety in Bosnia and Herzegovina, is as much as possible in compliance with IAEA standards and European Union Directives. An inventory of radiation sources, including sealed radioactive sources of all five categories, exists in Bosnia and Herzegovina and is maintained routinely in the RAIS 3.3 web software tool by SRARNS.

State Regulatory Agency for Radiation and Nuclear Safety (SRARNS) is a regulatory authority at the state level and there is no overlapping in its responsibilities with other authorities on any level in Bosnia and Herzegovina, therefore SRARNS regulates radiation safety on the whole territory, as well as all radiation practices in the country.

Currently, in Bosnia and Herzegovina radioactive material (majority in form of disused sealed radioactive sources) is stored in 19 interim storage locations. Majority of these interim storages are located in companies that used radioactive material in their work. Only one location accepts new radioactive sources in case of emergency. As of October 2017, a new centralized radioactive waste management facility has not been identified.

Owing to the legacy of the past, the possibility of orphan sources existing in Bosnia and Herzegovina cannot be ignored. The legal and regulatory system provides a firm framework and the responsible organizations have appropriate procedures and equipment for the effective and efficient management of possible situations associated with orphan sources.

As a Contracting Party to the Joint Convention, Bosnia and Herzegovina is in the process of ensuring coherence between laws, policies, strategies and regulations. The national strategy of radioactive waste management and disused sealed radioactive sources (DSRS) was approved by the Council of Ministers of Bosnia and Herzegovina, however, majority of defined measures have not yet been implemented. The regulation on radioactive waste and DSRS management has been published in 2015, in accordance with the national strategy. Bosnia and Herzegovina is still in process of establishing a new centralized storage facility for all DSRS and radioactive waste in the country. Although the disposal of radioactive waste is not defined in the strategic documents, Bosnia and Herzegovina have in mind the interim nature of storage and will define possible disposal options in the revision of national strategy of DSRS and radioactive waste management.

It is important to emphasize that Bosnia and Herzegovina has ratified most major international instruments in the nuclear field and is deeply committed to the implementation of its international obligations.

The main developments since the previous national report are:

- Bosnia and Herzegovina adopted a national emergency preparedness and response plan (National action plan for emergency cases of protecting the population against ionizing radiation in case of an emergency event, a nuclear accident or occurrence of nuclear damage).
- SRARNS has published a new regulation on radioactive waste and DSRS management.
- SRARNS hosted the Advisory Mission of the International Atomic Energy Agency.

In addition, Bosnia and Herzegovina would like to emphasize the importance of the article 27 of the Convention, in relation to plans by the Republic of Croatia, presented at the Fifth Review meeting of the Joint Convention, to establish a storage facility for radioactive waste, nuclear waste, and spent fuel along the very border with Bosnia and Herzegovina.

Section B: Policies and Practices – Article 32 Paragraph 1

This section's paragraphs on spent fuel management are not applicable to Bosnia and Herzegovina.

Policy on the safety of ionizing radiation sources in Bosnia and Herzegovina document was adopted by the Council of Ministers in 2012. This document is compatible with IAEA standards, in particular the IAEA Safety Fundamentals and the Code of Conduct on the Safety and Security of Radioactive Sources, and is based on the main objectives and principles of the safety and security of ionizing radiation sources.

The objective of the Policy is establishment of an efficient and transparent radiation protection system, thus ensuring the basis for protection of the people and the environment against harmful effects of ionizing radiation in accordance with international standards.

In addition to general objectives and main principles, this document contains five specific policies, including radiation safety, nuclear safety, safe management of radioactive waste, safe transport of radioactive material, and security of radioactive and nuclear material.

Main elements of the policy on the safe management of radioactive waste are:

- SRARNS shall establish a regulatory framework, in accordance with international standards, for the safe management of radioactive waste generated in the territory of Bosnia and Herzegovina.
- SRARNS authorizes technical services for safe management of radioactive waste. Such authorized services shall be responsible for the implementation of measures and activities regarding the radioactive waste management, including collection, transport, packaging, handling, conditioning, storage, and final disposal of radioactive waste.
- All activities related to the radioactive waste management shall be carried out openly and transparently, and the public shall have access to the information insofar as it does not violate national laws, security and defense.
- The responsibility for radioactive waste shall rest with the authorization holder until the radioactive waste is being taken over by the technical service authorized for radioactive waste management. The authorization holder generating radioactive waste shall be responsible for the implementation of measures with the aim of generating minimal amounts of radioactive waste.
- Sealed radioactive sources of category 1, 2 and 3 shall be imported provided that the importer can ensure they will be returned to the supplier after termination of their use by the authorization holder.
- Radioactive waste shall not be imported in Bosnia and Herzegovina.
- Final disposal of radioactive waste was not elaborated in details, but it is defined that a solution for final disposal shall be sought in future.

The policy on the safe management of radioactive waste foresees the development of a national strategy of radioactive waste management, as well. Strategy is foreseen as a plan

for implementation of the policy. National strategy of radioactive waste management was adopted by the Council of Ministers in the end of 2013. This document complements the policy of safe management of radioactive waste, and defines the following main strategic goals:

- Centralized radioactive waste management facility, owned and financed by the state, for all radioactive waste and disused sealed radioactive sources (DSRS);
- Operator of the centralized facility shall be authorized by SRARNS;
- Radioactive waste generated by previous practices, including DSRS in interim storages and lightning rods with sealed radioactive sources will be collected in the centralized facility for conditioning and long-term storage;
- Generators of radioactive waste will pay fees for radioactive waste storage.

Unfortunately, as of October 2017, a new centralized radioactive waste management facility has not been identified, neither the operator of the facility was authorized. Currently, radioactive material is stored on 19 locations around the country, as reported in the Section D and Annex 1.

Classification and categorization of radioactive waste is defined in the regulation on radioactive waste management. Radioactive waste classification system is based on the IAEA scheme (IAEA General Safety Guide GSG-1, 2009) and done according to the activity and half-life. Nuclide specific exemption and clearance levels are laid down in the Regulation on notification and authorization of radiation practices. The categorization of radioactive sources is given in the Regulation on Notification and Authorization of ionizing radiation sources, in addition, the categorization of sources according to A/D values is given in the Regulation on the security of nuclear material and radioactive sources. The categorization of disused sealed radiation sources is the same as for sealed sources in use.

Practices with regard to disused sealed sources are reported in Section J.

Section C: Scope of Application – Article 3

This report does not refer to the safety of spent fuel management because Bosnia and Herzegovina does not have any nuclear facilities nor have ever had any of these facilities, hence there is no spent fuel in the country.

This report applies to the safety of the management of radioactive waste resulting from civilian applications and some from military use in the past, which is now stored in the civilian facilities.

The present report does not apply to waste that contains naturally occurring radioactive material (NORM) exceeding the regulatory clearance levels. NORM material is out of the scope of the regulation on radioactive waste management and will be regulated separately. It is envisaged that the waste containing only naturally occurring radioactivity will be defined as radioactive waste if the exposure to the general public would exceed 1 mSv/a. A regulation that will regulate NORM material in the country should be published during 2018.

Section D: Inventories and Lists – Article 32 Paragraph 2

SRARNS is obliged to maintain a register of radioactive waste including disused sealed radioactive sources existing in the country.

A list of facilities that currently store radioactive material at its premises, as interim storage facility, is given in Annex 1.

An overview of the current inventory is listed in Annex 2.

Section E: Legislative and Regulatory System

Implementing Measures – Article 18

As described below, Bosnia and Herzegovina has taken legislative, regulatory and administrative measures and other necessary steps towards the implementation of obligations under the Joint Convention.

Legislative and Regulatory Framework – Article 19

A system of regulatory control for radiation sources in Bosnia and Herzegovina was originally established within the framework of the Former Yugoslavia more than 50 years ago. Since its declaration of independence in 1992, different organizational structures were in place for the control of radiation sources, but without good results in practice. The Law on Radiation and Nuclear Safety in Bosnia and Herzegovina, published in November of 2007, establishes a basis for the national infrastructure for safety and security of radioactive sources at the state level, and establishes the State Regulatory Agency for Radiation and Nuclear Safety (SRARNS) as the effectively independent regulatory body for radiation safety. This Law establishes the general framework of the system of control over the sources of ionizing radiation, the protection of people, present and future generations, and the environment from exposure or potential exposure to ionizing radiation. The law is compatible with IAEA requirements for safety and security of radiation sources. SRARNS has responsibility for, and is in the process of developing and issuing new regulations in the field of radiation and nuclear safety, which will regulate this field in details.

The biggest challenge, and the first task faced by SRARNS at its formation, was the development of legislation in the field of radiation and nuclear safety and its compliance with the international standards established by the IAEA, as well as with the directives of the European Union. Of particular significance are the legislative provisions that define radiation protection of the population and occupationally exposed persons, and which define radiation protection in medicine, control of radioactive sources of high activity and sources of unknown owners (out of regulatory control), the safe transport of radioactive material, etc. During this period SRARNS drafted regulations governing the process of

issuing licenses for the possession and use of sources of ionizing radiation and for the transport radioactive sources, establishing the grounds for the system that enables the development and use of sources of ionizing radiation in accordance with the requirements for protection of human health and the environment from harmful effects of ionizing radiation.

One of the other primary tasks of the SRARNS was defining policies and principles in the field of radiation and nuclear safety as the basis for its regulatory actions. In this regard, the SRARNS has prepared a draft document entitled "Policy on safety of ionizing radiation in Bosnia and Herzegovina", which the Council of Ministers adopted at the meeting held in June of 2012. This document is compatible with IAEA standards, in particular the IAEA Safety Fundamentals and the Code of Conduct on the Safety and Security of Radioactive Sources. In addition to 2007 Law, this Policy represents the most important document regarding regulatory activity in the country, and covers specific policies, as described in Section B. The policy on the safe management of radioactive waste foresees the development of a national strategy of radioactive waste management, which is foreseen as a plan for implementation of the policy. The strategy of radioactive waste (including disused sealed sources) was adopted and published by the Council of Ministers in 2013.

Related to international legal instruments, it is important to recognize that Bosnia and Herzegovina is a Contracting Party to the majority of international treaties and conventions in the nuclear field, as listed in Annex 3. In addition, Bosnia and Herzegovina has made a political commitment with regard to the Code of Conduct on the Safety and Security of Radioactive Sources and the Supplementary Guidance on the Import and Export of Radioactive Sources.

Pursuant to Article 8 of the Law, SRARNS implements the commitments assumed by Bosnia and Herzegovina under international conventions and bilateral agreements relating to radiation and nuclear safety and the application of safeguards for the purpose of non-proliferation of nuclear weapons.

In addition to the above international instruments relevant for nuclear safety, it should be noted that bilateral cooperation has been established, and it mostly pertains to the countries in the region (Croatia, Slovenia, Montenegro, Macedonia, and Albania).

This especially pertains to the border control and illicit trafficking of radiation sources, the exchange of experiences during the establishment of the regulatory system and in the education of employees of regulatory agencies, which are priority fields for all neighboring countries. The cooperation takes place through memorandums of understanding. Signing a similar document with Serbia is currently under negotiations.

SRARNS also cooperates with the United States administration, especially with the National Nuclear Security Administration, Office of Radiological Security, that has implemented several projects related to the security of radioactive sources.

As for cooperation with the IAEA, in accordance with the Law SRARNS is the state partner of the IAEA for all radiation and nuclear safety matters. In addition to the activities toward the implementation of technical cooperation projects, SRARNS intensively cooperates with the IAEA in other areas of radiation and nuclear safety and security, such as control

of sealed radiation sources, import and export control, transport safety, nuclear security, safety of radioactive waste management, and nuclear law. Bosnia and Herzegovina belongs to the group of priority countries that are recipients of IAEA assistance programs of technical cooperation, which is characterized through the support in establishing an adequate regulatory framework and improving the work of SRARNS and other relevant institutions in the country in the area of health care, industry, environmental protection, etc.

Cooperation of SRARNS with the EU institutions takes place mainly through the implementation of IPA projects in radiation protection and nuclear safety. There is an ongoing implementation of the project from IPA 2011 cycle, titled "Technical back-up to the IPA horizontal program on nuclear safety and radiation protection".

In order to exercise regulatory control, mainly through authorization and inspection of radiation practices, SRARNS has issued 23 regulations since its establishment.

These regulations are (official gazette number and year of publication is given in the brackets):

1. Regulation on the notification and authorization of practices involving sources of ionizing radiation (Official Gazette of BiH, No 66/10),
2. Regulation on inspection monitoring in the field of radiation and nuclear safety (Official Gazette of BiH, No 65/10),
3. Regulation on the requirements for trade and use of sources of ionizing radiation (Official Gazette of BiH, No 66/10),
4. Regulation on the ionizing radiation protection in medical exposure (Official Gazette of BiH, No 13/11),
5. Regulation on the categorization of radiation threats (Official Gazette of BiH, No 102/11),
6. Regulation on the radiation protection in occupational exposure and public exposure (Official Gazette of BiH, No 102/11),
7. Regulation on the control of high-activity sealed radioactive sources and orphan sources (Official Gazette of BiH, No 62/12),
8. Regulation on record keeping for legal persons carrying out practices involving sources of ionizing radiation (Official Gazette of BiH, No 67/12),
9. Regulation on the safety of transport of radioactive material (Official Gazette of BiH, No 96/12),
10. Regulation on the security of nuclear material and radioactive sources (Official Gazette of BiH, No 85/13),
11. Regulation on recognition of the qualified expert status (Official Gazette of BiH, No 84/14),
12. Regulation on the monitoring of radioactivity in the environment (Official Gazette of BiH, No 54/14),
13. Regulation on the concentration limits for radionuclides in food, feed, medicines, items of general use, building materials, and other goods placed on the market (Official Gazette of BiH, No 54/14),
14. Regulation on the training in ionizing radiation protection (Official Gazette of BiH, No 68/15),
15. Regulation on radioactive waste management (Official Gazette of BiH, No 68/15),

16. Regulation on the medical surveillance of occupationally exposed workers (Official Gazette of BiH, No 68/15),
17. Regulation on technical services for ionizing radiation protection (Official Gazette of BiH, No 68/15),
18. Regulation on the radiation protection officer (Official Gazette of BiH, No 86/15)
19. Regulation on the national register of individuals exposed to ionizing radiation (Official Gazette of BiH, No 86/15),
20. Regulation on the radiation protection of outside workers (Official Gazette of BiH, No 86/15),
21. Regulation on the radiation protection and medical physics service (Official Gazette of BiH, No 86/15),
22. Regulation on radiological emergency events in practices involving radioactive sources (Official Gazette BiH, No 30/16),
23. Regulation on conditions and method of sealing the premises and devices of end-users by inspectors (Official Gazette BiH, No 83/16).

With the promulgation of 2007 law and implementing regulations, Bosnia and Herzegovina has a legal and regulatory basis that, inter alia, addresses:

- categorization of sources and practices,
- establishment and maintenance of registers of radiation sources,
- requirement for prior authorization to take account of the potential risk,
- requirement for the regulatory body to investigate allegations as related to radiation safety and security of radioactive sources,
- involvement of the public in the regulatory process,
- import and export of radioactive material,
- the processes of exclusion and exemption,
- procedures of review and appeal against regulatory decisions,
- process for removal of a facility or activity from regulatory control,
- implementation of obligations under international treaties, conventions or agreements.

In order to strengthen regulatory control and facilitate the implementation of regulations and regulatory requirements by end users, SRARNS prepared and published on its web site several guidance documents:

1. Guide for the classification of controlled and supervised areas and the categorization of occupationally exposed workers, students, and persons in training,
2. Guide for the preparation of the radiation protection program in diagnostic radiology,
3. Guide for the radiation protection of occupationally exposed workers, pregnant and breastfeeding women,
4. Guide for radiation protection of pregnant and breastfeeding patients in medical exposure,
5. Guide for handling discovered orphan sources,
6. Guide for the recognition of the qualified expert status,
7. Guide on radiation safety procedure for technical services,
8. Guide on the contents of radiation protection training for radiation protection officers,
9. Guide for use of personal dosimeters

The process of notification and authorization is regulated by the regulation on notification and authorization of practices. As a result, SRARNS is able to issue licenses for the following activities:

- the possession and use of sources of ionizing radiation;
- transportation of radioactive sources;
- import and export of radioactive sources;
- technical services;
- procurement and distribution of sources of ionizing radiation;
- production of radiation sources.

In accordance with the 2007 law and regulations on internal organization and job classification, the SRARNS encompasses the inspectorate, which performs work under its jurisdiction, through the inspectors in the SRARNS headquarters and regional offices. State inspectors carry out control of radiation and nuclear safety. The field of work and special authorities of inspectors are defined by the 2007 law, administration law and the regulation on inspection in the field of radiation and nuclear safety. All persons who possess or use radiation sources, or are engaged with radiation sources, are subject to regulatory inspection. Authorized technical services are also subject to inspection by SRARNS, in order to guarantee the conditions under which they are authorized, as well as the accuracy of their work.

Establishing and maintaining a comprehensive inventory of radiation sources is one of the key factors for a successful regulatory system in every country. Therefore, pursuant to an article of the law which defines the functions and responsibilities of the SRARNS, among other things stipulated is to establish and maintain the state register of radiation sources and persons exposed to ionizing radiation, as well as a register of issued authorizations. This important activity is carried out through the collection and processing of information and data in the information management system tool RAIS (IAEA's Regulatory Authority Information System), which was established with the support of the IAEA. SRARNS is currently using the web version RAIS 3.3 web that is adapted for the SRARNS needs, and provides an acceptable database for all their regulatory activities, including the state register of radiation sources, both in use and spent/disused.

Through a combination of accurate and detailed records of radiation sources from the past, a process of notification and authorization, and extensive on-field work of SRARNS inspectorate, the state register is up-to-date for all five categories of sealed radioactive sources in use and also for radiation generators. The register maintained by SRARNS, contains data on issued authorizations and occupationally exposed workers, too. RAIS has proven to be a very useful tool for instance in the planning of inspections. All radioactive sources that are not in use have to be notified to SRARNS, but there is no authorization process for these sources, only regular inspections by SRARNS inspectorate are performed. Inventory of DSRS in the country exists and is maintained by SRARNS, although it is not always completely verified by SRARNS. DSRS inventory relies on declarations by end-users and verification by SRARNS inspectorate where it is possible.

Regulatory Body – Article 20

State regulatory agency for radiation and nuclear safety (SRARNS) - Regulatory body was formed by the 2007 Law on Radiation and Nuclear Safety. SRARNS, independently and in accordance with the law and other regulations, performs regulatory control of radiation and nuclear safety and security, including safety of radioactive waste and safety of the transport. SRARNS is also in charge of the implementation of safeguards agreements in Bosnia and Herzegovina.

SRARNS has the authority to (Article 8 of the 2007 law):

- define policy in the field of radiation and nuclear safety, security principles and relevant criteria as the basis for its regulatory actions;
- prepare and issues regulations and guidelines on which its regulatory actions are based;
- define the radiation exposures that are excluded from the framework of the regulations on the basis that they are not subject to regulatory control;
- establish and implement procedures for notification, authorization, inspection and enforcing regulatory requirements;
- require that each operator implements a safety assessment;
- enters, at any time, in the space or facility to perform state safety inspection of radiation sources;
- issue, supplement, suspend or take away and sets the terms of authorization for the import, export, manufacture, purchase, receipt, possession, storage, use, transit, transportation, maintenance, recycling and final disposal, as well as any other activity in connection with sources of ionizing radiation;
- issue, supplement, suspend or withdraw licenses from technical services for radiation protection;
- determine exclusions and exemptions relating to the possession and use of radiation sources and issues relevant document;
- take appropriate measures in case of radiological emergency events and nuclear accidents;
- establish and maintain the State Register of sources of ionizing radiation and persons exposed to ionizing radiation, as well as licenses issued;
- cooperate with other authorities and other institutions in relation to the content of work of SRARNS;
- establish appropriate methods of dissemination of public information on matters of ionizing radiation;
- determine the proposed amount of fees (taxes) for the issuance of authorization or approval, and to handle the collection of the fee;
- cooperate with other countries, the International Atomic Energy Agency (IAEA) and other relevant international organizations;
- to be a state partner of the International Atomic Energy Agency (IAEA);
- represent Bosnia and Herzegovina at the international level on issues in the field of radiation and nuclear safety;

- take the necessary measures for the safety of radioactive and nuclear materials, in collaboration with relevant government agencies, and to seek, from other relevant authorities to carry out the monitoring within the state and at the necessary control points in order to detect sources that are not under regulatory control;
- be prepared to assist in emergency situations and react in accordance with the national action plan for emergency situations;
- establish formal arrangements with other relevant agencies involved in the regulatory process;
- provide opinions and recommendations to join the international conventions, as well as recommendations for the adoption of other international documents in the field of radiation and nuclear safety;
- carry out obligations which Bosnia and Herzegovina has assumed under international conventions and bilateral agreements relating to the Radiation and Nuclear Safety and the application of safeguards to nuclear nonproliferation.

The SRARNS' headquarters is in Sarajevo, the capital of Bosnia and Herzegovina. SRARNS, according to 2007 law, established two regional offices in Banja Luka and Mostar. The headquarters has four organizational units as follows:

- Office of the Director;
- Department for general, legal, personnel and financial affairs;
- Department for authorization;
- Inspectorate.

Rulebook on internal organization and job classification defines that SRARNS employs a total of 34 employees. Today it operates with 18 employees, which amounts to cca. 50% of the estimated number of employees by classification. In addition to employees, a significant support to the SRARNS work gave engaged outside experts, who participated in the drafting of regulations and other documents adopted or proposed by SRARNS.

SRARNS is an independent administrative organization that executes its powers under the direct supervision of the Council of Ministers of Bosnia and Herzegovina. It is independent of other governmental and non-governmental organizations involved in the promotion of radiation technology. SRARNS is completely funded by the budget of the institutions of Bosnia and Herzegovina, and from independent sources. Funding is not dependent on collected taxes for authorization or inspection penalties.

SRARNS annually reports on its activities to the Council of Ministers of Bosnia and Herzegovina. It carries out the activities provided for in the annual plan of the Council of Ministers, too.

In addition, the Report on radiation and nuclear safety in Bosnia and Herzegovina has to be delivered to the Parliamentary Assembly of Bosnia and Herzegovina at least once a year.

Section F: Other General Safety Provisions

Responsibility of the license holder – Article 21

Under the Law on Radiation and Nuclear Safety in Bosnia and Herzegovina, primary responsibility for the safety of radiation sources shall be borne by the authorization holder, i.e. licensee and registrant (Article 15 of the 2007 law).

Authorization holders are fully responsible in respect of all regulatory provisions concerning the safe management of their radioactive material. They have to ensure the safe management after use of radioactive material, as well as the implementation of radiation protection measures.

Human and financial resources – Article 22

Human and financial resources of the regulatory body – SRARNS are described in Section E – Regulatory body.

Users of radioactive material are constrained by legislation to provide adequate human resources to guarantee the safety of their radioactive sources and waste. All the licensees have to nominate a qualified radiation protection officer who is responsible to implement the obligations of the license and the radiation protection measures in its facility. The radiation protection officer has to be recognized by the SRARNS in line with the Regulation on radiation protection officer.

In the area of radioactive waste management, some trained personnel exist, but only several persons are trained in conditioning of radioactive sources of category 4 and 5. Currently, this number is insufficient for any conditioning campaign on a higher scale.

Quality assurance – Article 23

Regulatory authority has various internal procedures, but its management system is not fully documented. SRARNS is currently in the process of development of its management system with support of IAEA (national TC project BOH9008 titled Implementing an Integrated Management System and Strengthening Capabilities in the Regulatory Body) and EU (implementation of the IPA2011 project). QA manual of SRARNS is being drafted and should be published by the end of 2017.

Quality assurance programs are requested from end-users on a regulatory base in the field of operational radiation protection and quality control of equipment and procedures, and are subject to the regulatory inspection of a facility by SRARNS.

Operational radiation protection – Article 24

Regulation on the radiation protection in occupational exposure and public exposure lays down the operational radiation protection requirements for authorization holders. The objective of this regulation is to establish standards and criteria for the radiation

protection of exposed workers and the population. It prescribes, inter alia, the principles of radiation protection of exposed workers and the population in ordinary situations, radiological and nuclear emergencies; principles of the radiation protection system; dose limits for exposed workers, apprentices, high-school and university students in training, and the population; responsibilities of the radiation protection experts.

Radiation protection principles include:

- The principles of operational protection: justification, optimization and dose limit;
- Values of dose constraints and dose limits;
- Specific requirements: protection during pregnancy and breastfeeding;
- Radiation safety assessment;
- Protection of exposed workers: prevention of exposure (classification of workplaces), classification of exposed workers into categories, implementation of control measures and assessment of exposure, including workplace monitoring, individual monitoring and medical surveillance.

Implementation of the radiation protection measures by an authorization holder is described in its radiation protection program, which is assessed during the authorization process, and inspected as part of regular regulatory inspection by SRARNS.

Emergency preparedness – Article 25

Bosnia and Herzegovina's legislation requires local (on-site) emergency plans for all facilities dealing with radiation sources. The radioactive waste generator and the operator must prepare an emergency plan for the management of radioactive waste under their responsibility. Local emergency plan is prepared by the facility, according to its practice and risk, and presented to SRARNS during the authorization process.

The Parliamentary Assembly of Bosnia and Herzegovina adopted the National Emergency Preparedness and Response Plan in 2015. The aim of the plan is establishment of an efficient and successful system of preparedness and response of the institutions in Bosnia and Herzegovina at all levels in case of a nuclear or radiological emergency on the country territory.

The plan consists of four chapters:

- Introduction,
- Response planning,
- Response to a radiation emergency,
- Preparedness for a radiation emergency.

The plan particularly emphasizes an adequate involvement of the institutional capacities and identifies deficiencies in order to work towards their future elimination, which would allow for the establishment of an effective system of public and environmental protection in the event of a radiation emergency.

The plan has defined the powers and responsibilities of institutions in Bosnia and Herzegovina, which will be an opportunity for their active participation in the exercises

related to the provision of information, engaging and seeking assistance, regularly organized by the IAEA in cooperation with the Member States.

It is important to emphasize that Bosnia and Herzegovina has an automated on-line system for monitoring environmental radiation and for early warning of a radiation emergency by measuring the ambient dose rate of gamma radiation. The system was donated by the IAEA through a technical cooperation project in 2004. It consists of 11 measuring stations distributed across the country, as well as two interconnected servers for data storage. As the system has been outdated, SRARNS launched a system upgrade with the IAEA's support through a national TC project BOH9007 titled Enhancing Radiation Emergency Preparedness and Response Capabilities.

Bosnia and Herzegovina has appointed contact persons for the IAEA USIE (Unified System for Information Exchange in Incidents and Emergencies) platform, and regularly participates in exercises organized by the IAEA in relation to the platform.

Decommissioning – Article 26

Decommissioning of radioactive waste management facilities is stipulated in the regulation on radioactive waste management. Operator of a storage facility has to prepare a decommissioning plan according to the provisions of the regulation, where the minimum elements of a decommissioning plan are listed. The existing interim storage facilities will have to be decommissioned according to this regulation.

Section G: Safety of Spent fuel Management

This section containing articles 4 - 10 is not applicable to Bosnia and Herzegovina.

Section H: Safety of Radioactive Waste Management

General safety requirements – Article 11

The legal regime currently in place (see Section E) and particularly the system of notification, licensing and inspection by the regulatory body is a guarantee for the safe management of a small quantities of waste produced in the country, especially for minimization of the production of radioactive waste. All practices where radioactive materials are used have to be authorized under the radiation safety legislation. Small amounts of short-lived radioactive waste, produced in nuclear medicine departments or research activities, are kept until their activity is low enough to be disposed of as normal waste. The end users are responsible for that all those who handle waste must do it

according to accepted written procedures, based on relevant radiation protection regulations and international standards.

The Regulation on radioactive waste management defines general safety requirements for radioactive waste management in the country. It provides for the mandatory measures in radioactive waste management; the responsibility for the waste management; the way of classification, processing, storage, and keeping records of radioactive waste; the way of discharging radioactive waste substances into the environment, and also other important matters related to the waste management.

The regulation applies to the management of radioactive waste:

- a) generated through an authorized practice;
- b) generated when the authorization has expired, when there is no authorization or when the authorized practice has been terminated;
- c) in the form of disused sealed radiation sources declared as waste;
- d) generated during an emergency;
- e) in other cases in which radioactive waste is generated, including the residues generated in work activities.

According to the regulation, the following mandatory measures should be taken in radioactive waste management:

- a) Ensuring the prescribed level of health protection of exposed workers and the public, and the environmental protection;
- b) Planning an equal level of health protection of the future generations to avoid imposing any undue burden on them in respect of the waste;
- c) Taking into account the possible effects on human health and the environment beyond national borders;
- d) The application of graded approach in the safe management of waste in accordance with a waste classification;
- e) Using passive means in the safe management of waste;
- f) Generating reasonably practicable minimal amounts of waste both in terms of activity and volume;
- g) Ensuring appropriate safety and security in waste management;
- h) Complying with the principle of interdependency between individual steps in waste management;
- i) Keeping accurate records on the activities associated with all stages of waste management;
- j) Providing information to the public and adequate participation of the interested public in individual stages of waste management.

Existing facilities and past practices – Article 12

The existing facilities for storage of disused sealed radioactive sources were not separately licensed for the activity of interim storage. A brief safety assessment of those facilities have been conducted in the past, but new regulation stipulated a comprehensive safety assessment and development of the safety case for all the existing facilities that will continue to serve as a radioactive waste management facility. Safety case has been developed for the Rakovica facility and a need for improvements in the area of safety and security was recognized (for more details see Section J).

Siting of proposed facilities – Article 13; Design and construction of facilities – Article 14; Assessment of safety of facilities – Article 15

Strategy of radioactive waste management foresees a possibility of construction of a completely new predisposal radioactive waste management facility in Bosnia and Herzegovina. There is an ongoing process for selection of a possible new site for this facility. Use of an existing facility (that was not used as a radiation facility) with adequate infrastructure, most probably former military facility/area, that can be easily modified to suit the country's needs, will be preferred. Suitability of a site will be evaluated from all relevant aspects and documented in the safety case, which will be approved by the regulatory body. Detailed requirements for the safety case content are given in the regulation on radioactive waste management.

As of October 2017, the new site for radioactive waste management facility has not been identified.

At present, there is no plan for development of a disposal facility in Bosnia and Herzegovina. If such a plan emerges, all relevant international obligations and standards will be taken into account.

Operation of facilities – Article 16

Operation of a facility is governed by its authorization (i.e. license). During the authorization process, inter alia, safety assessment and operational procedures are reviewed and approved. In addition, regulatory authority inspects the facilities in order to check and reassure their safe operation.

Institutional measures after closure – Article 17

There is no disposal facility in Bosnia and Herzegovina, hence the legislation does not cover measures after its closure.

Section I: Transboundary Movement – Article 27

In Bosnia and Herzegovina, import and export of radioactive material need prior approval by SRARNS if its activity is above the exemption limit set in the legislation. Each transport operation of radioactive material needs to be approved by SRARNS, as well. An approval for transport can be issued only to the authorized carriers of radioactive material. Authorization of carriers and import, export and transport operations is governed by the regulation on notification and authorization of radiation practices. Transport operations have to be performed in line with the regulation on the safety of transport of radioactive materials.

According to the policy on the safe management of radioactive waste, import of radioactive waste in Bosnia and Herzegovina is prohibited. Nevertheless, the re-entry of disused sealed sources into its territory is allowed, if the shipment originated from Bosnia and Herzegovina. The returned shipments of radioactive sources have to be approved before entering Bosnia and Herzegovina, as described in the paragraph above.

All previous cases of returned shipments were scrap metal shipments in which a radioactive material was detected abroad. Radioactive material (mainly sealed sources) from those shipments was returned to Bosnia and Herzegovina without major issues, and safely stored. Some more details is given in Section J.

The regulation on radioactive waste management defines that SRARNS will approve export of radioactive waste only if the following requirements are met:

- a) The country of destination is a party to the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management;
- b) The country of destination has a radioactive waste management and disposal program with objectives representing a high level of safety, in line with international recommendations.
- c) The recipient of radioactive waste is authorized for radioactive waste management by the competent authority of the country of destination.

Although not directly connected with Bosnia and Herzegovina's implementation of the obligations of this article, Bosnia and Herzegovina would like to emphasize once more the importance of this article in relation to plans by the Republic of Croatia, presented at the Fifth Review meeting of the Joint Convention, to establish a storage facility for radioactive waste, nuclear waste, and spent fuel along the very border with Bosnia and Herzegovina. The material originates from the nuclear power plant Krsko in Slovenia, jointly owned by Slovenia and Croatia. Upon closing of the nuclear power plant, which is scheduled for the year 2043, Croatia intends to deposit its amounts of nuclear waste in the storage facility at the site Trgovska Gora, which is only 3 km away from the town of Novi Grad in Bosnia and Herzegovina with population of about 30,000. The Parliamentary assembly of Bosnia and Herzegovina and the entity parliaments adopted a resolution in which they strongly oppose to the construction of storage and disposal for radioactive waste in Trgovska Gora. The population living in municipalities in Bosnia and Herzegovina close to the border with Croatia, and near the river Una also expressed its discontent with planned constructions

of the storage and disposal for radioactive waste in its surrounding area. The local community from the Bosnia and Herzegovina territory near the planned site is unanimously against this project due to, among other things, lack of detailed information about the project.

In addition, these activities in Croatia have created additional obligations to the Bosnia and Herzegovina's regulatory agency, and it is necessary to strengthen the SRARNS capacities in this sense provided that Croatia continues to implement the project.

Section J: Disused Sealed Sources – Article 28

Bosnia and Herzegovina does not produce/manufacture radioactive sources and all radioactive material or sources used in the country are imported, mostly from European countries. A condition imposed to the licensees during the authorization procedure is to return any disused source to the supplier/manufacturer. Details of the regulatory framework are reported in Sections B and E.

Disused sealed radioactive source (DSRS) is recognized as such in the legislation and defined as: A radioactive source that is no longer used, and is not intended to be used, for the practice for which an authorization has been granted.

The authorization holder in possession of a high-activity source have an obligation to return the high-activity disused source to the contracted manufacturer or transfer the source to another authorized holder or to a storage facility without any delay and within six months at the latest from the day of terminating the use of source. The authorization holder in possession of a high-activity source must promptly notify SRARNS of the date of terminating the use of such source.

DSRS are not „formally“ called radioactive waste but will be considered as radioactive waste if they are to be disposed of in the country, i.e. if they are not going to be returned or exported for recycling. This is defined in the regulation on radioactive waste management.

DSRS in Bosnia and Herzegovina are stored in eight interim storage locations (with more than 5 sources) around the country listed in Annex 1, in various storage conditions – from poor to acceptable. The specific inventories of DSRS in these locations are very different, but are well documented. Six of the eight locations are end-user locations where only end-user DSRS are stored. For each storage location, a different storage principle was followed, from abandoning sources in their working positions after factory bankruptcy, up to partially performed conditioning and sources packed in transport containers ready for shipment. Further ten locations listed in Annex 1 are storing less than 5 sources each, sources are from dismantled lighting rods ready for transport or nuclear gauges and industrial radiography cameras in original working containers.

Two locations were serving as temporary central storage facilities, Rakovica and Cajavec factory, operated by technical services. The Cajavec temporary central storage has been

closed since 2009, whilst the other storage is still in use as the only active storage location in Bosnia and Herzegovina for emergency situations. The Rakovica facility is going to be licensed according to the new regulation on radioactive waste management, after the submission of the Safety Case to SRARNS and its review and approval. This facility is located near Sarajevo and operated by the Radiation protection center of Institute of public health FBiH.

A long term central storage facility has not yet been established in Bosnia and Herzegovina. The reason for exploring a possibility to build a new predisposal facility for long term storage of DSRS and radioactive waste was due conditions in the existing facilities. The existing conditioning and storage facility near Sarajevo is being deemed to be unsuitable for prolonged use due to several safety issues (e.g., located in forested surroundings, lack of a stable water supply, surfaces which could not be easily decontaminated), unless significantly upgraded.

Although the detailed inventory of sealed radioactive sources (both in use and disused) exists in the country, there is an increased probability of orphan sources detection due to 270 old lightning rods with sealed radioactive sources installed on various buildings, some of which are abandoned or destroyed. If a sealed radioactive source from a lightning rod is detected, sometimes it is not possible to track it back to the owner since the state register does not contain serial numbers of all sealed sources.

The area of orphan sources is further regulated by the regulation on control of high activity sealed radioactive sources and sources out of regulatory control, and the supplementary guidance for responding in the case of finding of an orphan source. The regulatory framework in Bosnia and Herzegovina establishes the preventative and reactive measures to be implemented in the event of loss or theft of a radioactive source and, more generally, establishes rules aimed at reducing the risk of radioactive sources being abandoned and which could lead to accidental exposures of individuals.

Each user of a radioactive source is required to establish a system that allows the inventory of the sources to be updated at any time. Additionally, each user of the sources must immediately notify SRARNS in the case of loss, theft or unauthorized use or damage of a source. If necessary, actions are conducted (intervention, investigation) in order to recover the lost or stolen source. Despite the processes and features in place to prevent them, incidents or accidents involving radioactive sources may occur. On average, the number of orphan sources (all were sources from lightning rods) detected in the last few years was three cases per year, mainly at border points or at scrap metal yards. While the activity of these detected sources was small, the operator organization was deployed by the order of SRARNS inspector to recover those sources.

The costs of detection, remediation, storage, transportation and all other actions required to place the orphan source under regulatory control, are the responsibility of the most recent authorized owner of that source. In the event that an orphan source is detected at the border during import or export of goods, the exporting/importing company is required to pay the costs; however, if it is not possible to determine the owner of the source, the costs shall be paid from the budget of SRARNS.

Section K: General Efforts to Improve Safety

The first step towards the improvement of safety is publication of the regulation on radioactive waste management in 2015 and its full implementation. Details of this new regulation are given in the Section H. The regulation introduced the safety case development for radioactive waste management facilities and safety assessments for smaller interim storage facilities. These documents should identify the safety shortfalls and actions to overcome them for each existing site. All future conditioning activities will have to be justified by the safety assessment and safety case, as well. Furthermore, Bosnia and Herzegovina considers conditioning of the sealed sources to be an important step towards the final goal – all sources in the country conditioned, characterized and stored in a single storage location, ready for disposal.

The efforts to improve situation in the area of DSRS interim storage facilities in the country during the previous period were not very successful. The implementation of the measures described in the following paragraph will be a priority for Bosnia and Herzegovina.

Bosnia and Herzegovina plans to reduce the number of interim storage facilities in near future. Due to the limited storage space of these facilities, consolidating the DSRS in the country to a single location is not realistic at the moment. This is partly due to an additional significant number of sources anticipated to be stored in the near future at these locations (sealed sources from smoke detectors which have recently been dismantled and 270 sources from lightning rods that are still on their old working positions).

In support of this activity, a conditioning plan for some of those locations has been prepared in close cooperation with all stakeholders, considering site characteristics, safe practice and taking into account specific financial and political circumstances. This includes volume reduction by disassembling sources from the original working containers, separation of non-radioactive material from sealed sources, source characterization, and packaging for transport to the central storage facility. In addition, some locations contain a certain number of Am/Be and Pu/Be neutron sources. These sources can be disassembled from their working containers, packaged in specialized neutron containers and transported.

Bosnia and Herzegovina is exploring possibilities to return to the supplier or export for recycling its sole category 2 disused sealed source of Co-60 with initial activity of 22.2 TBq in year 1990. The source is currently stored in its original working container.

While the national strategy alludes to the disposal of all radioactive waste according to the policy, it does not define the details of a disposal facility or programme. This shortcoming in the Strategy will be addressed during the next revision, after implementation of predisposal management in the country.

Section L: Annexes

Annex 1: List interim storage facilities in Bosnia and Herzegovina

1. Rakovica temporary storage facility, Sarajevo
2. Cajavec factory, Banja Luka
3. Iron ore mine Omarska, Prijedor
4. Mittal steel factory, Zenica
5. Alumina factory Birac, Zvornik
6. Institute for mining, Tuzla
7. Energoinvest industrial radiography, Sarajevo
8. Cement factory, Kakanj

Locations with less than 5 sources stored (lightning rods, nuclear gauges, old industrial radiography cameras)

9. Elektrobosna factory, Jajce
10. Ilios, Istocno Sarajevo
11. Veterinary faculty, Sarajevo
12. Swisslion, Trebinje
13. Binela, Zenica
14. Metaling, Jajce
15. Bigeste, Ljubuski
16. Garo, Visoko
17. Tehnicki remont, Bratunac
18. Bosnaplod, Brcko

Location with a disused LDR brachytherapy device (36 sources in 1 device)

19. University clinical center Sarajevo, Sarajevo

Annex 2: Overview of the inventory

Overview of DSRS in interim storages

IAEA category	Type of application	Radionuclide	Interim storages
1	Total		0
2	Teletherapy used for calibration	Co-60	1
	Total		1
3	Calibration	Co-60	4
	Industrial gauge	Co-60	1
	Total		5
4	Industrial gauge	Am-241, Co-60, Cs-137, Am-241/Be, Pu-239/Be	173
	Brachytherapy (LDR)	Cs-137, Co-60, Ra-226	7
	Calibration	Co-60, Sr-90	7
	Total		187
5	Source from lightning rod	Eu-152/154, Co-60	174
	Industrial gauge	Kr-85, Sr-90, Tl-204, Co-60, Cs-137, Am-241, Cs-135	27
	Calibration	Sr-90, Co-60, Pm-147	10
	Calibration	Sr-90 (222 MBq)	1022
	Smoke detector	Am-241	5000
	Total		6233

In addition, **270** installed lightning rods with sealed radioactive source (Eu-152/154, Co-60).

Overview of other radioactive waste

- Two standard 200 L barrels with conditioned radium waste (62 mg of Ra-226);
- Additional small amount (estimated less than 1 mg) of non-conditioned Ra-226;
- 50 kg of metallic solid waste with thorium;
- 40 kg of depleted uranium in form of radiographer cameras (defectoscopes) for industrial radiography;
- Remnants of ammunition with depleted uranium, approx. 50 pieces;
- 200 kg of depleted uranium in form of uranium oxide, used as shielding material.

Annex 3: List of international treaties and conventions ratified by Bosnia and Herzegovina

1. Statute of the IAEA and the Amendments to Articles 6 and 14 of the Statute;
2. Treaty on the Non-Proliferation of Nuclear Weapons;
3. Agreement with the International Atomic Energy Agency on the application of safeguards in connection with the Treaty on Non-Proliferation of Nuclear Weapons;
4. Additional Protocol to the Agreement with the International Atomic Energy Agency on the application of safeguards in connection with the Treaty on Non-Proliferation of Nuclear Weapons;
5. Revised Supplementary Agreement concerning the provision of technical assistance by the International Atomic Energy Agency to Bosnia and Herzegovina;
6. Convention on Early Notification of a Nuclear Accident;
7. Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency;
8. Convention on the Physical Protection of Nuclear Material;
9. Amendments to the Convention on the Physical Protection of Nuclear Material;
10. International Convention for the Suppression of Terrorist Bombings;
11. International Convention for the Suppression of Acts of Nuclear Terrorism;
12. Vienna Convention on Civil Liability for Nuclear Damage;
13. Protocol on Amendments to the Vienna Convention on Civil Liability for Nuclear Damage;
14. Convention on Nuclear Safety;
15. Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management;
16. Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters (Aarhus Convention);
17. Convention on Environmental Impact Assessment in a Transboundary Context (Espoo Convention).

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