7th NATIONAL REPORT

ON IMPLEMENTATION OF THE OBLIGATIONS UNDER

THE JOINT CONVENTION ON THE SAFETY OF SPENT FUEL MANAGEMENT

AND ON THE SAFETY OF RADIOACTIVE WASTE MANAGEMENT

EXECUTIVE SUMMARY

The 7th National Report of the Republic of Croatia in accordance with Article 32 of Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management [1] contains updated information on matters covered in the sixth report, the significant changes in applicable national laws, regulations, policies and practices. It also addresses safety issues, which were identified in the previous report, as well as the issues raised during the latest review meeting.

Major developments in Croatia in the period after issuing the previous national report were the following ones:

- Adoption of the National Programme for Radioactive Waste Management under the Council Directive 2011/70/Euratom[2] by Croatian Parliament.
- Amendment of the Act on Radiological and Nuclear Safety and harmonisation with the requiremnts of the Council Directive 2013/59/Euratom [3] and the Council Directive 2014/87/Euratom[4].
- By the adoption of the Act on Organization and Scope on the Ministries, the tasks and activities pertaining to radiological and nuclear safety fall under the competence of the Ministry of the Interior as of 1 January 2019.
- Third Revision of the Krško NPP Radioactive Waste and Spent Fuel Disposal Program and Third Revision of the NPP Krško Decommissioning Program, adopted on July 14, 2020 at the meeting of the Intergovernmental Commission for Monitoring the Implementation of the Agreement between the Government of the Republic of Croatia and Republic of Slovenia and in line with recent national policies in Republic of Slovenia and Republic of Croatia.

The National Programme covers the period up to 2025 with an overview of the developments till 2060. It advocates the application of the proven widely accepted solutions from international best practice. The National Programme foresees the establishment of a storage facility (temporary and return solution) for radioactive waste located on the territory of the Republic of Croatia and the construction of a storage facility (temporary and return solution) for low and intermediate level radioactive waste (LILW) located in Krško NPP, which waste the Republic of Croatia is obligated to manage and the remediation of sites that are contaminated with naturally occurring radionuclides. According to the National Programme spent nuclear fuel shall continue to be stored at Krško NPP by 2043 at the latest, after which a common permanent solution will be sought after with the Republic of Slovenia.

Also, according to the Bilateral Agreement between the Government of the Republic of Croatia and the Government of the Republic of Slovenia is of special importance for the issue of

[1] INFCIRC/546 of 24 December 1997.

[2] Official Journal of the European Union L 199, 2. 8. 2011

[3] Official Journal of the European Union L 13, 17. 1. 2014

[4] Official Journal of the European Union L 219, 25. 7. 2014

radioactive waste and spent nuclear fuel management from Krško NPP. Of particular interest are: Article 10, which deals with the decommissioning of the Krško NPP and management of radioactive waste and spent nuclear fuel from Krško NPP, Article 11 which deals with financing the decommissioning of the Krško NPP and disposal of radioactive waste and spent nuclear fuel, and Article 18 which deals with establishing an interstate commission.

Croatian Overview Matrix of Spent Fuel and Radioactive Waste Management

	Long-term management policy	Funding of Liabilities	Current Practices / Facilities	Planned Facilities
Spent Fuel	Dry storage at Krško NPP site (joint programme with Slovenia) followed by disposal	Krško NPP up to final shutdown. National Funds after shutdown	Wet storage at Krško NPP site	Dry storage at Krško NPP site
Nuclear Fuel Cycle Waste	Long-term storage (40 years) followed by near surface disposal	Croatian Fund	Storage at Krško NPP site	Long-term storage facility
Non-Power Radioactive Waste	Long-term storage followed by disposal	Users	Two temporary storage facilities (closed)	Central National Storage Facility
Decommissioning	Immediate dismantling of Krsko NPP (joint programme with Slovenia). Deferred dismantling for other facilities	National Funds, users	No facilities in decommissioning	No planned facilities
Disused Sealed Sources	Reuse, repatriation and long-term storage	Users	Reuse, repatriation and two temporary storage facilities (closed)	Central National Storage Facility

A. INTRODUCTION

The Republic of Croatia is a country without nuclear installations and without the intention to build such installations in the near future.
Croatia has been a member of the European Union since 2013 and an IAEA Member State since 1993.
The state continues its successful cooperation with the International Atomic Energy Agency (IAEA) and aims to apply widely recognized principles and tools for high-quality safety management of spent fuel and radioactive waste.
The Joint Convention on Safety of Spent Fuel Management and on Safety of Radioactive Waste Management was signed on 9 April 1998 and ratified on 5 February 1999.

According to Article 32, each contracting party has to submit national report periodically to illustrate how the objectives of the Convention have been met. Croatian first national report was prepared at the beginning of 2003 and participated in every following meeting of Contracting Parties and submitted a National Report. Tha last National Report submitted in 2017.

This National Report contains updated information on matters covered in the sixth report, the significant changes in applicable national laws, regulations, policies and practices. The report follows the most recent version of the Guidelines regarding the Form and Structure of National Reports issued in 2014 [5] .

During this period, the following significant changes occurred in the Republic of Croatia:

- Adoption of the National Programme for Radioactive Waste Management under the Council Directive 2011/70/Euratom[6] by Croatian Parliament accorindg to the obligation from the Council Directive 2011/70/Euratom of 19 July 2011 establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste.
- Amendment of the Act on Radiological and Nuclear Safety (OG 141/13, 39/15, 130/17. and 118/18.) and new regulations harmonized with the requirements from the Council Directive 2013/59/Euratom and and Council Directive 2014/87/Euratom.
- By the adoption of the Act on Organization and Scope on the Ministries the tasks and activities pertaining to radiological and nuclear safety fall under the competence of the Ministry of the Interior as of 1 January 2019.
- Amendment of the Regulation on measures for protection agains ionizing radiation and procedures in case of emergency.
- Developed Plan for preparedness and response of the Republic of Croatia in the case of radiological and nuclear emergency.
- New Ordinance on Management of Radioactive Waste and Disused Sources.
- New Ordinance on the Conditions and Measures of Ionising Radiation Protection for Performing Activities Involving Ionising Radiation Sources.
- New Ordinance on Environmental Monitoring of Radioactivity.

[5] INFCIRC/604/Rev.3 of 18 December 2014

[6] Official Journal of the European Union L 199, 2. 8. 2011

- New Ordinance on Nuclear Security.
- New Ordinance on Dose Limits, Recommended Dose Limits and Assessment of Personal Doses.

The National Program for the Implementation of the Strategy for Management of Radioactive Waste, Disused Soures and Spent Nuclear Fuel – Programme for the period up to 2025, with a view to 2060 (National Programme) was adopted by the Governmental Decision (OG 100/18 of 9 November 2018).

The National programme is adopted based on the Article 57 of the Act on Radiological and Nuclear Safety (OG 141/13, 39/15, 130/17 and 118/18), Articles 10 and 11 of the Agreement between the Government of the Republic of Croatia and the Government of the Republic of Slovenia on the Regulation of the Status and other legal Relationships, Connected with Investments in the NPP Krško, its Exploatation and Decommissioning (OG – IA, 9 of 23 July 2002), and in accordance with the requirements given under the Articles 5, 11 and 12 of the Council Directive 2011/70/Euratom of 19 July 2011 establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste.

The National programe forsees the establishment of the Radioactive Waste Management Centre (RWMC) which includes both the central storage facility for institutional radioactive waste and disused sources originating from the territory of the Republic of Croatia, and the construction of a storage facility for low and intermediate level waste located in Krško NPP, the waste which the Republic of Croatia is obligated to manage.

According to the Third Revision of Krško NPP Radioactive Waste and Spent Fuel Disposal Program and NPP Krško Decommissioning Program adopted on 14 July 2020 at the meeting of the Intergovernmental Commission for Monitoring the Implementation of the Agreement between the Government of the Republic of Croatia and Republic of Slovenia, and in line with recent national policies in Republic of Slovenia and Republic of Croatia, the construction of dry storage facility for spent fuel at Krško NPP site, for a minimal operational life of 60 years with the possibility of extending its operation was approved. The consequence of this agreement is that spent nuclear fuel will not be stored on the territory of the Republic of Croatia.

In order to systematically dispose radioactive waste, the Republic of Croatia carries out activities to estalish the above-mentioned RWMC. The Fund for financing the decommissioning of the Krško NPP will be the competent authority for the establishment and management of the RWMC.
Currently there is no facility available in Croatia for the storage of institutional radioactive waste. Therefore, the planed central national storage facility is of crucial importance for the safe management of radioactive waste in Croatia.

B. POLICIES AND PRACTICES

ARTICLE 32. (1) OF THE JOINT CONVENTION

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

B.1 Spent Fuel Management Policy and Practice

The Republic of Croatia shares ownership of the Krško NPP with the Republic of Slovenia. Therefore, Croatia owns half of spent fuel that was generated so far and that will be generated up to expiration of the Krško NPP lifetime. The Bilateral Agreement (Articles 10 and 11) favours development of a common solution for spent fuel management. In accordance with aforementioned, the Republic of Croatia and the Republic of Slovenia are planning long-term dry storage of spent fuel at Krško NPP location and then its disposal in deep geological formation at a suitable location in the Republic of Croatia or the Republic of Slovenia.

According to the Third Revision of the Krško NPP Radioactive Waste and Spent Fuel Disposal Program and NPP Krško Decommissioning Program adopted on 14 July 2020 at the meeting of the Intergovernmental Commission for Monitoring the Implementation of the Agreement between the Government of the Republic of Croatia and Republic of Slovenia and in line with recent national policies in Republic of Slovenia and Republic of Croatia, the construction of dry storage facility for spent fuel at Krško NPP site, for a minimal operational life of 60 years with the possibility of extending its operation was approved. The capacity of the dry storage facility for spent fuel is sufficient to allow storage of all planned spent fuel and high level waste inventory, from its start of operation in 2021 until the final unloading of the core in 2043. Additionally, the project of dry storage facility for spent fuel will provide a safe and cost-effective storage solution for radioactive waste generated from Krško NPP decommissioning. The consequence of this agreement is that spent nuclear fuel will not be stored on the territory of the Republic of Croatia.

Croatian Parliament has adopted the Strategy for the Management of Radioactive Waste, Disused Sources And Spent Nuclear Fuel (OG 125/14) which defines basic guidelines and goals for the management of institutional radioactive waste produced in the Republic of Croatia, radioactive waste and spent nuclear fuel from Krško NPP as well as for the remediation of locations with naturaly occurring radioactive material (NORM).

The Strategy defines short-term (2 years), mid-term (10 years) and long-term goals (more than 10 years) related to the management of radioactive waste, disused sources, spent nuclear fuel and remediation of NORM locations in Croatia. The goals set out in the Strategy include establishment of a long-term storage and then repository for institutional radioactive waste, spent sources and low and intermediate level radioactive waste from Krško NPP; establishment of a dry storage for spent nuclear fuel at Krško NPP location, and then disposal

of high level waste (HLW) in deep geological formation at a location in the Republic of Croatia or the Republic of Slovenia (or in an eventual international repository in the EU); and a programme for informing and educating public on the management of radioactive waste, spent sources and spent nuclear fuel. These goals are broadly defined and elaborated for the each particular field of application. In order to fulfil the goals mentioned above the Strategy sets up general guidelines regarding the legislative framework, responsibilities, funding, human resources and public participation.

National Programme for Implementation of the Strategy for Management of Radioactive Waste, Disused Sources and Spent Nuclear Fuel was adopted on 9 November 2018, with the Decision of the Government of the Republic of Croatia, published in OG 100/18.

The National Programme sets out how the following Strategy goals will be implemented in the period up to year 2025:

- Establishment of the central storage facility for institutional radioactive waste and disused sources,
- Construction and commissioning of storage facility for low and intermediate level waste (LILW) from Krško NPP and
- Remediation of sites with NORM[7] .

B.2 Radioactive Waste Mangement Policy and Practice

In Croatia, the radioactive waste and disused sources originate from medicine, industry, science, education and the past public use, and part of the waste pertains to legacy waste.

Regarding the radioactive waste generated in Krško NPP the Bilateral Agreement (Articles 10 and 11) favours development of a common solution for disposal of radioactive waste from Krško NPP. The Republic of Croatia and the Republic of Slovenia have not achieved a mutually satisfactory common solution until the moment of the establishment of this National Programme. In line with the objectives of the Strategy, the Republic of Croatia plans with National Programme a number of activities to establish the storage facility for low and intermediate level waste from Krško NPP.

[7] As the Republic of Croatia has not declared any waste that contains only naturally occurring radioactive material as radioactive waste for the purposes of the Convention in further text the plans for remediation of NORM sites will not be discussed).

Table B-1: Implementation activities for long-term storage and disposal of LILW from Krško NPP

Time period	Main activities
2019 - 2023	Obtaining a location and construction permit and a permit for testing and regular operation of the long-term LILW storage facility. During this period, the following main activities will be carried out: 1. field research at the preferred location of Čerkezovac; 2. development of environmental impact assessment of the LILW long-term storage facility; 3. holding public discussions and public participation in the decision-making process; 4. obtaining required permits for construction and construction works on the LILW long-term storage facility and other infrastructure facilities; 5. development and implementation of public education and information programmes; 6. creating waste acceptance criteria and a specification of waste packaging for storage of institutional radioactive waste; 7. creating security analyses; 8. determination of road or rail - road transport route for the transport of LILW from Krško NPP to the Čerkezovac location.
2023 - 2025	Physical take-over, transport, reception, and storage of half of the generated operation LILW from Krško NPP at the Čerkezovac location.
2025 - 2043	Physical take-over, transport, acceptance and storage of half of the operating LILW that will be created during the prolonged operation of Krško NPP. The dynamics of take-over will be determined in the upcoming version of the Programme for Decommissioning of the Krško Nuclear Power Plant.
2043 - 2060	Physical take-over, transport, acceptance, and storage of half of the decommissioning LILW. The dynamics of take-over of the decommissioning LILW will be determined in the final version of the Programme for Decommissioning of the Krško Nuclear Power Plant that will be developed.
2060 - 2065	Moving LILW from a long-term storage facility to a LILW disposal site, followed by the decommissioning the long-term storage facility and closing the LILW disposal site.

For management of the radioactive waste and disused sources originate from medicine, industry, science, education and the past public use, the National Programme plans the establishment of the central storage facility. The preferred location for the central storage facility is the location of Čerkezovac, the military logistic complex without perspective for future use by military. The location Čerkezovac is located in Dvor Municipality on the southern slopes of the Trgovska gora[8].

[8] In Croatian National Spatial Plan Trgovska gora is designated as potential location for LILW repository as a result of site-selection process which included the whole territory of the Republic of Croatia.

In addition to the radioactive waste produced in the country, the Republic of Croatia has the obligation to take over half of the radioactive waste from Krško NPP. The location Čerkezovac was recognized also as a preferred location for the long-term storage facility for LILW from Krško NPP. In that way, the location of Radioactive Waste Management Centre (RWMC) would be established, which would encompass all facilities necessary for management of radioactive waste in Croatia and also a centre for informing and educating public. The operator of the RWMC will be the Fund for the Financing of the Decommissioning and Disposal of Radioactive Waste and Spent Nuclear Fuel from the Krško Nuclear Power Plant (Fund). The process of confirmation of location will include participation of public in decision-making, planning in spatial plans, the environmental impact assessment process including the assessment of transboundary impact.

According to the Bilateral Agreement if there is no agreement on a joint solution by the end of regular designed lifetime of the Krško NPP (year 2023), the parties have to take over the radioactive waste in two years from that time in equal proportions. In accordance, the long-term storage facility for LILW from Krško NPP has to be operational at the beginning of 2023. The National Programme, in accordance with the objectives of the Strategy, sets out a series of activities in terms of strengthening regulatory framework and necessary infrastructure for the timely and harmonized operation of the competent authorities, in order to fulfil its obligation under the Bilateral Agreement and to take over and safely manage half of LILW from Krško NPP.

Regarding the financing of the radioactive waste management, financing of management of newly generated radioactive waste and disused sources will be ensured by applying the polluter pay principle and financing of radioactive waste management from Krško NPP will be provided in accordance with the Bilateral Agreement (Article 11).

Radioactive waste and disused sources from medicine, industry, science, education and the past public use are stored in two storage facilities. These are Institute for Medical Research and Occupational Health (IMROH) and Institute Ruđer Bošković (IRB) storage facilities and both of them are closed, so the project on development, construction and operation of the central storage facility is a priority. Basic design of the facility has been developed and preliminary safety assessment was performed.

B.3 Radioactive Waste Categorization

Radioactive waste categorization is covered under the Article 4 of the Ordinance on Management of the Radioactive Waste and Disused Sources (OG 12/18). Given the physical and chemical properties, the radioactive waste is categorized into solid, liquid and gaseous.

According to its typical characteristics and intended method of disposal, radioactive waste is classified into the following classes:

Table B-2: Radioactive waste categorization and method of disposal

Class	Typical properties	Method of disposal
Exempt and cleared radioactive waste	Radioactive waste that fulfils the requirements for the release from regulatory control.	Release from regulatory control. Once released from regulatory control this material is no longer deemed as radioactive waste.
Very short lived radioactive waste	Contains radionuclides with half-time shorter than 100 days.	Storage in a building with appropriate characteristics followed by release from regulatory control. Storing of such radioactive waste for several years will reduce its activity concentration to a level at or below the value stipulated in Annex 1 to this Ordinance.
Very low level radioactive waste	Radioactive waste with activity concentrations exceeding the limits for very short lived radioactive waste. The concentrations of radionuclides in this waste category are negligible.	Storage in a building with appropriate characteristics followed by release from regulatory control. Storing of such radioactive waste for several decades will reduce its activity concentration to a level at or below the value stipulated in Annex 1 to this Ordinance.
Low level radioactive waste	Radioactive waste containing radionuclides within half-life less than 30 years with a restricted alpha long-lived radionuclide concentration (limitation of long-lived alpha emitting radionuclides to 4.000 Bq/g in individual waste packages and to an overall average of 400 Bq/g in the total waste volume).) The generation of thermal power in this waste is lower than 2 kW/m^3.	Storage in a building with appropriate characteristics followed by a disposal in a surface or underground disposal facility.
Intermediate level radioactive waste	Radioactive waste with activity concentrations exceeding the limits for low level radioactive waste.	Storage in a building with appropriate characteristics followed by a disposal in an underground disposal facility at a depth of several dozen to several hundred metres below the surface of the ground.

High level radioactive waste	Radioactive waste thermal power is above 2 kW/m^3.	Storage in a building with appropriate characteristics followed by a disposal in an underground disposal facility in a stable geological formation at a depth of several hundred metres below the surface of the ground.

The generator and/or owner is responsible for the classification of radioactive waste.

Radioactive waste categorization described above is based on the recommendations given in in accordance with “Classification of Radioactive Waste, IAEA General Safety Guide GSG-1, 2009.”

C. SCOPE OF APPLICATION

ARTICLE 3. SCOPE OF APPLICATION

1. This Convention shall apply to the safety of spent fuel management when the spent fuel results from the operation of civilian nuclear reactors. Spent fuel held at reprocessing facilities as part of a reprocessing activity is not covered in the scope of this Convention unless the Contracting Party declares reprocessing to be part of spent fuel management.

2. This Convention shall also apply to the safety of radioactive waste management when the radioactive waste results from civilian applications. However, this Convention shall not apply to waste that contains only naturally occurring radioactive materials and that does not originate from the nuclear fuel cycle, unless it constitutes a disused sealed source or it is declared as radioactive waste for the purposes of this Convention by the Contracting Party.

3. This Convention shall not apply to the safety of management of spent fuel or radioactive waste within military or defence programmes, unless declared as spent fuel or radioactive waste for the purposes of this Convention by the Contracting Party. However, this Convention shall apply to the safety of management of spent fuel and radioactive waste from military or defence programmes if and when such materials are transferred permanently to and managed within exclusively civilian programmes.

4. This Convention shall also apply to discharges as provided for in Articles 4, 7, 11, 14, 24 and 26.

Regarding the obligations under Article 3 of the Joint Convention:

(a) Republic of Croatia has not declared reprocessing to be a part of spent fuel management,
(b) Republic of Croatia has not declared any waste that contains only naturally occurring radioactive material and does not originate from the nuclear fuel cycle as radioactive waste for the purposes of the Convention and
(c) Republic of Croatia has not declared any spent fuel or radioactive waste within military or defence programmes as spent fuel or radioactive waste for the purposes of the Convention.

D. INVENTORIES AND LISTS

ARTICLE 32. REPORTING

2. This report shall also include:
(i) a list of the spent fuel management facilities subject to this Convention, their location, main purpose and essential features;
(ii) an inventory of spent fuel that is subject to this Convention and that is being held in storage and of that which has been disposed of. This inventory shall contain a description of the material and, if available, give information on its mass and its total activity;
(iii) a list of the radioactive waste management facilities subject to this Convention, their location, main purpose and essential features;
(iv) an inventory of radioactive waste that is subject to this Convention that:
(a) is being held in storage at radioactive waste management and nuclear fuel cycle facilities;
(b) has been disposed of; or
(c) has resulted from past practices.
This inventory shall contain a description of the material and other appropriate information available, such as volume or mass, activity and specific radionuclides;
(v) a list of nuclear facilities in the process of being decommissioned and the status of decommissioning activities at those facilities.

In Croatia there are no spent fuel management facilities. Furthermore, there are no nuclear facilities in operation or in the process of decommissioning. The only two facilities for which Article 32 (paragraph 2) is applicable are:

- Radioactive waste storage facility at the Institute for Medical Research and Occupation Health (IMROH) and
- Radioactive waste storage facility within the premises of the Institute Ruđer Bošković (IRB).

Both storage facilities are located in Zagreb (the capital) and contain the waste from medicine, industry, science, education and the past public use. The storage at the IMROH was operational in the period from 1959 till 2000. In June 2006 partial waste segregation, characterization, conditioning and packing into lead containers has been carried out with the assistance of the IAEA. The project on remediation of IRB storage facility, meaning segregation, characterization, treatment, conditioning and packing into lead containers was carried out in July 2015.

The estimation of the radioactive waste volume and characteristics in both storages is provided in the Table D-1. More details about the inventory can be found in Annex L.

Table D-1: Estimation of the radioactive waste volume and characteristics

Radioactive waste type	IMROH storage		IRB storage		Total	
	Volume (m^3)	Activity (Bq)	Volume (m^3)	Activity (Bq)	Volume (m^3)	Activity (Bq)
Short lived	0.5	6.0×10^{11}	7,03	$6,84\times10^{11}$	7,53	$1,28\times10^{12}$
Long lived	1.0	9.1×10^{11}	2,81	$1,14\times10^{12}$	3,81	$2,05\times10^{12}$
Total	**1.5**	**1.5×10^{12}**	**9,84**	**$1,82\times10^{12}$**	**11,34**	**$3,33\times10^{12}$**

It is estimated that the total volume of institutional radiaoctive waste will increase in the next 40 years due to remediation of the IRB storage facility. Also, the activity of the long-lived radiaoctive waste will be doubled. This is mainly due to the relatively large number of smoke detectors (Am-241 and Ra-226), which need to be dismantled, conditioned and then stored.

E. LEGISLATIVE AND REGULATORY FRAMEWORK

ARTICLE 19. LEGISLATIVE AND REGULATORY FRAMEWORK

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

E.1 Legislative framework

Croatia is a member of the European Union, therefore its regulatory framework in respect of radioactive waste and the protection of workers and the public from the hazards associated with ionising radiation is based on the relevant EU Directives and Regulations.

The legal framework in the field of the radiological and nuclear safety is mainly contained in Act on Radiological and Nuclear Safety (OG 141/13, 39/15, 130/17, 118/18) and other legislative and regulatory acts issued on the basis of this Act.

E.1.1 Act

The Act sets measures for radiological and nuclear safety and security to ensure adequate current and future protection of individuals, society and environment. The measures also pertain to the safe performance of practices involving radiation sources, nuclear activities and management of radioactive waste and disused sources.

The provisions of the Act are harmonized with the following EU directives and regulations:

- Council Regulation (Euratom) 1493/93 of 8 June 1993 on shipments of radioactive substances between Member States (OJ L 148, 19. 6. 1993)
- Commission Regulation (Euratom) 302/2005 of 8 February 2005 on the application of Euratom safeguards (OJ L 54, 28. 2. 2005)
- Commission Regulation (Euratom) 66/2006 of 16 January 2006 exempting the transfer of small quantities of ores, source materials and special fissile materials from the rules of the chapter on supplies (OJ L 11, 17. 1. 2006)
- Council Directive 2006/117/Euratom of 20 November 2006 on the supervision and control of shipments of radioactive waste and spent fuel (OJ L 337, 5. 12. 2006)
- Council Directive 2009/71/Euratom of 25 June 2009 establishing a Community framework for the nuclear safety of nuclear installations (OJ L 172, 2. 7. 2009)

- Council Directive 2011/70/Euratom of 19 July 2011 establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste (OJ L 199, 2. 8. 2011)
- Council Directive 2013/59/Euratom of 5 December 2013 laying down basic safety standards for protection against the dangers arising from exposure to ionising radiation, and repealing Directives 89/618/Euratom, 90/641/Euratom, 96/29/Euratom, 97/43/Euratom and 2003/122/Euratom (OJ L 13, 17. 1. 2014)
- Council Directive 2014/87/Euratom of 8 July 2014 amending Directive 2009/71/Euratom establishing a Community framework for the nuclear safety of nuclear installations (OJ L 219, 25. 7. 2014).

One of the novelties entered in the Act, following the requirements of the Council Directive 2013/59/Euratom, was graded approach to regulatory control.

Chapter 5 of the Act (Articles 49-59) regulates management of radioactive waste, disused sources and spent nuclear fuel. Radioactive waste and spent nuclear fuel generated in the territory of the Republic of Croatia must be disposed in a long-term, sustainable manner in the territory of the Republic of Croatia (Article 49).

According to the Article 49 of the Act on Radiological and Nuclear Safety, generators of radioactive waste and disused sources shall ensure that waste radioactive substances are generated in the smallest possible quantities and transfer of the burden of disposal of radioactive waste and disused sources to future generations is avoided to the greatest possible extent. Generators of radioactive waste, disused sources or spent nuclear fuel shall ensure disposal thereof and bear the incurred costs.

According to the Article 50 of the Act on Radiological and Nuclear Safety, the operation involving management of radioactive waste, disused sources and spent nuclear fuel shall not commence prior to the issuance of the approval for such activity by the Civil Protection Directorate of the Ministry of the Interior (CPD of MoI).

According to the Article 51 of the Act for Radiological and Nuclear Safety, Fund for the Financing of the Decommissioning and Disposal of Radioactive Waste and Spent Nuclear Fuel from the Krško Nuclear Power Plant (Fund) will establish the Radioactive Waste Management Centre. The Fund in its operation reports to the Government of the Republic of Croatia.

The manner of financing of Radioactive Waste Management Centre shall be prescribed by a regulation of the Government of the Republic of Croatia.

E.1.2 New ordinances

New ordinances in the field of the management radioactive waste and disused sources issued in 2018 are:

- Ordinance on Management of Radioactive Waste and Disused Sources
- Ordinance on the Conditions and Measures of Ionising Radiation Protection for Performing Activities Involving Ionising Radiation Sources
- Ordinance on Environmental Monitoring of Radioactivity

- Ordinance on Dose Limits, Recommended Dose Limits and Assessment of Personal Doses
- Ordinance on Nuclear Security

The *Ordinance on radioactive waste and disused sources management* (OG 12/18) provides a new categorization of radioactive waste. It also provides the definition of a radioactive waste management center (RWMC) and facilities which it may include: requirements for design of radioactive waste and disused sources management facilities; procedure for licensing radioactive waste management facilities (design, commissioning, operation, closure and decommissioning); harmonisation with IAEA Safety case and supporting Safety assessment concept for licensing radioactive waste and disused sources management facilities and definition of requirements for waste acceptance criteria.

The *Ordinance on the conditions and ionising radiation protection measures for performing activities involving ionising radiation sources* (OG 53/18) stipulates the following:

- applicable requirements for objects, devices and installations in which radiation sources are used or located for ionising radiation sources, protective equipment and personal protective equipment,
- radiological workplace monitoring and radiation protection measures in supervised and controlled areas,
- requirements on design, construction, use and decommissioning of facilities in which ionising radiation sources are used or located,
- mandatory content an keeping period of records of the radioactive sources,
- methods, extent and deadlines for: performance testing of ionising radiation sources with required parameters and corresponding acceptance values and tolerance limits, personal protective devices and equipment testing, measuring instruments testing, radioactive contamination of people and environment testing, and content of the test reports as well as reporting frequency, deadlines and reporting procedure, and
- activity and activity concentration exemption limits.

The *Ordinance on environmental radioactivity monitoring* (OG 40/18) stipulates monitoring locations, periods and methods of environmental radioactivity monitoring, as well as the manner and the extent of the environment impact assessment of the facilities where nuclear activities or practices involving the sources of ionizing radiation are performed.

The *Ordinance on dose limits, dose constraints and individual dose assessment* (OG 38/18) prescribes the dose limits for members of the public, exposed workers, apprentices and students, dose constraints for professional exposure, members of the public, volunteers, comforters and careers, classification of exposed workers, reference levels for existing exposure situations, methods, extent and period for monitoring and surveillance of exposed workers, individual dose assessment methods, stipulates the requirements on the dosimetry systems, obligatory content of the dosimetry report, recording and reporting of results, access to the results of individual monitoring, dose record keeping and the content of the national dose registry.

The *Ordinance on nuclear security* (OG 38/18) prescribes the type and the scale of nuclear security measures, content of the Nuclear Security Plan and manner and scope of reporting on occurrences, which pose a threat to nuclear security.

E.1.3 Other legislative and regulatory acts

Regulation on Measures for Protection Against Ionising Radiation and Interventions in Case of Emergency is amended in 2020. The changes were made regarding the distribution of responsibilities within the organizational structure of new regulatory body CPD of MoI. The roles of CPD of MoI are now both manager and expert body, as well as a first responder.

Emergency preparedness and response Plan of the Republic of Croatia in the event of a radiological or nuclear emergency has been drafted based on Regulation Measures for Protection Against Ionising Radiation and Interventions in Case of Emergency (OG 24/18 and 70/20).

E.2 Regulatory Body

ARTICLE 18. IMPLEMENTING MEASURES

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

In line with the Decision of the Government of the Republic of Croatia of 2 August 2018, the tasks and activities pertaining to radiological and nuclear safety and security fall under the competence of Ministry of the Interior (MoI) as of 1st January 2019. The responsibilities of the MoI are defined in the Act on Radiological and Nuclear Safety. Civil Protection Directorate (CPD) within the MoI carries out the tasks of radiological and nuclear safety, security and inspection.

On the basis of the Act on Organization and Scope on the Ministries (OG 85/20), the Ministry of the Interior is functionaly separated from any other state body or organization dealing with management of radioactive waste and spent fuel. Regulatory body is functionally separate from any other body or organisation concerned with the promotion or utilisation of ionising radiation sources or nuclear energy, and does not seek or take instructions from any such body or organisation when carrying out its regulatory tasks (Article 7.a of the Act).

The jurisdiction of the CPD of MoI covers administrative and professional tasks in field of radiological and nuclear security: issuing approvals, permits, authorisations, drafts legal acts in the field of radiological and nuclear safety, etc. The CPD of MoI is also competent for keeping records, monitoring and analysing doses of exposed workers, exposure of patients and the population to ionising radiation. It carries out tasks of prescribing curriculum in the field of radiological and nuclear safety, approving relevant dose constraint values and dose assessment methods. The CPD of MoI organizes environmental radioactivity monitoring and monitors the presence of radioactive substances in human and animal food and consumer products in regular and emergency situations. It organizes the preparedness system, management and support in radiological and nuclear emergency events and cooperates with the International Atomic Energy Agency, relevant bodies of the European Union and national organisations and associations in the field of radiological and nuclear safety.

The Act on Radiological and Nuclear Safety provides that all activities including the use of ionizing radiation sources must not be performed before CPD of MoI issues an approval or registration permission. Every organization in the chain of successive activities must comply

with this requirement, which can be checked during inspections. The Act introduced a definition of graded approach, and through the provisions of the Ordinance on Notification, Registration, Approval and Placing on the Market of Sources of Ionizing Radiation (OG 54/18) the principle of the graded approach covers authorization and inspection activities. Through these provisions and different enforcement options the graded approach has been introduced into the legal and regulatory framework.

According to the Article 76 of the Act, inspection supervision of implementation of this Act and subordinate regulations adopted on the basis thereof shall be performed by inspectors for radiological and nuclear safety of the CPD of MoI.

F. OTHER GENERAL SAFETY PROVISIONS

ARTICLE 21. RESPONSIBILITY OF THE LICENCE HOLDER

1. Each Contracting Party shall ensure that prime responsibility for the safety of spent fuel or radioactive waste management rests with the holder of the relevant licence and shall take the appropriate steps to ensure that each such licence holder meets its responsibility.

2. If there is no such licence holder or other responsible party, the responsibility rests with the Contracting Party which has jurisdiction over the spent fuel or over the radioactive waste.

According to the Article 20 of the Act on Radiological and Nuclear Safety the holder of the approval shall be responsible for the implementation of radiological and nuclear safety and nuclear security measures and bear the costs of their implementation. The holder of the approval shall ensure that the measures for protection against ionizing radiation implement the principles of justification, optimisation and dose limitation (Article 23 of the Act).

The licence holder whose operations cause radioactive contamination of the environment, premises, areas, objects and persons or that causes damage due to loss of control over the source or for any other reason shall be liable for the damage incurred and without delay take care of remediation at its own expense (Article 63 of the Act). If the holder of the approval due to bankruptcy, liquidation or for another reason, cannot ensure implementation of remediation, or if the holder of the approval cannot be established or is not on the territory of the Republic of Croatia, the Republic of Croatia shall ensure the entire remediation process (Article 64 of the Act).

ARTICLE 22. HUMAN AND FINANCIAL RESOURCES

Each Contracting Party shall take the appropriate steps to ensure that:
(I) qualified staff are available as needed for safety-related activities during the operating lifetime of a spent fuel and a radioactive waste management facility;
(II) adequate financial resources are available to support the safety of facilities for spent fuel and radioactive waste management during their operating lifetime and for decommissioning;
(III) financial provision is made which will enable the appropriate institutional controls and monitoring arrangements to be continued for the period deemed necessary following the closure of a disposal facility.

According to the Radiological and Nuclear Safety Act (OG 147/13, 39/15, 130/17 and 118/18) holder of the approval (licence holder) is a legal or natural person, a state administration body, any other state body or a body of a local or regional self-administration unit that has been granted a licence and that is responsible for performing a certain operation involving ionizing radiation sources, or nuclear operation, or an operation involving management of radioactive waste, disused sources or spent nuclear fuel, or performing work activities.

Also, holder of the approval (licence holder) is a legal or natural person, a state administration body, any other state body, or a body of a local or regional self-administration unit that has been granted a decision on registration. Act gives framework conditions and requirements of

licence holders in the field of qualified staff, availability of financial provisions for facilities safe operation, monitoring and institutional control.

Financial provisions for establishment and operation of Radioactive Waste Management Centre are defined in the Radiological and Nuclear Safety Act and Act on the Fund for Financing the Decommissioning of the Krško Nuclear Power Plant and the Disposal of Krško NPP Radioactive Waste and Spent Nuclear Fuel (OG 107/07). Radioactive waste management activities are financed from:

- disposal compensation paid by radioactive waste and spent nuclear fuel generators/owners ("*polluter pays principle*");
- a dedicated fund established by the Act on the Fund for the Financing of Decommissioning and Disposal of Radioactive Waste and Spent Nuclear Fuel of the Krško Nuclear Power Plant in accordance with the obligations under the Agreement between the Government of the Republic of Croatia and the Government of the Republic of Slovenia on Regulation of Status and Other Legal Issues Regarding Investments in Krško NPP, and its Exploitation and Decommissioning (Official Gazette – International Agreements 9/02) (Bilateral Agreement). Annual amounts to be paid to the dedicated national fund, as well as deadlines and method of payments are defined in regulations of Croatian Government.

Ordinance on Management of Radioactive Waste and Disused Sources (OG 12/18) defines obligations of the licence-holders as well as Radioactive Waste Management Centre operator in the field of qualified personnel and appropriate education in order to ensure safe radioactive waste and disused source management.

The licence holder / facility operator (among others) is obligated to:

- have and provide list of experts for radioactive waste disposal operations, along with their qualifications and experience in performing of such or similar tasks,
- appoint person responsible for the disposal of radioactive waste and disused sources,
- documented evidence on financial resources, means of ensuring financial resources, amount of resources and types of guarantees as well as methods for applying guarantees in line the Act on Radiological and Nuclear Safety
- adopt and regularly update risk analysis including plan for optimizing protection against ionizing radiation and certification and expert opinion of an authorized technical service with proposed measures for risk reduction.

Licence holder/ radioactive waste management facility operator is responsible for ensuring that all needed measures are taken for the safe management of radioactive waste.

Concerning the education for persons managing radioactive waste, in accordance to the Ordinance on Management of Radioactive Waste and Disused Sources (OG 12/18), the person responsible for radioactive waste and disused sources management shall have completed undergraduate or graduate university studies in technical or natural field and a special professional training for operating ionising radiation sources as well as on the application of radiological safety measures acquired either through regular education, specialised education or further education, that must be substantiated by a written evidence and for whom there are no safety related obstacles for the performance of the undertaken duty.

Monitoring previous the establishment and licencing, during operation as well as for closure and decommissioning of radioactive waste management facilities and/or activities are defined in the Ordinance on Environmental Monitoring of Radioactivity (OG 40/18) and exactly by the Radioactivity monitoring program for the specific radioactive waste management facility and/or activity. Radiological monitoring can be performed only by the institutions authorized for testing and monitoring of radioactive substances in air, soil, sea, rivers, lakes, groundwater, precipitation, drinking water, food and consumer products, according to the Ordinance on Granting Authorisation to Professional Technical Services for Performing Tasks Pertaining to Radiological Safety (OG 40/18).

Monitoring at the state level is carried out in accordance with the Annual Environmental radioactivity monitoring program of the Republic of Croatia and is financed from the state budget. The monitoring of the radioactive waste management facility and the environment of the radioactive waste management facility is obligation of the licence holder (facility operator). All discharges from radioactive waste management facilities must be monitored according to the authorized Monitoring program. Post-closure institutional control and monitoring have to be defined case-by-case in the Environmental radioactivity monitoring program after closure and decommissioning for the specific radioactive waste management facility.

Fund for financing the decommissioning of the Krško NPP and the disposal of Krško NPP radioactive waste and spent nuclear fuel (Fund) has six employees in the Department for Activities related to coordination of preparation and drafting of the Krško NPP decommissioning and radioactive waste and spent nuclear fuel Disposal Program. Employees of the RWMC are of various professions and are regularly further educated to upgrade specific knowledge in the field of decommissioning, safe radioactive waste management and radiation protection. The education is mostly carried out through IAEA technical cooperation projects, as well as IAEA and other trainings, meetings, workshops, and fellowships, but also in direct cooperation with universities, institutes, expert radioactive waste management organizations, institutions, and groups in other countries.

Collection of funds for the decommissioning and disposal of radioactive waste and spent nuclear fuel from the Krško NPP is defined in the Regulation on the Amount, Deadline and Manner of Payment of Funds for Financing the Decommissioning and Management of Radioactive Waste and Spent Nuclear Fuel of the Krško NPP (OG 155/08). The Regulation prescribes that Hrvatska Elektroprivreda d.d. (Croatian electricity company) shall contribute resources to the Fund’s account in the amount of EUR 14.25 million per year, and that the amount may be changed in accordance with a revision of the Krško NPP Decommissioning and radioactive waste and spent nuclear fuel Disposal Program confirmed by the Intergovernmental Commission. Assessment of necessary funds are performed during revisions of the Krško NPP Decommissioning and radioactive waste and spent nuclear fuel Disposal Program according to the obligations from the Bilateral Agreement. Programs revisions include proposed decommissioning, predisposal and disposal technologies, with costs assessments, including compensations to the local communities, monitoring and control during its operation, decommissioning and after closure and contingencies.

Fund's primary objective is the acquisition, maintenance and increase of value of assets for the implementation of the Krško NPP Decommissioning and radioactive waste and spent nuclear fuel Disposal Program including necessary facilities, its safe operation, closure and decommissioning including institutional control and monitoring.

ARTICLE 23. QUALLITY ASSURANCE

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

The holder of the approval for radioactive waste and disused sources management, who also operates the RWMC, shall establish, implement and regularly update the quality assurance programme (Article 11 of the Ordinance on Management of Radioactive Waste and Disused Sources).

Radioactive waste and disused sources management shall be in line with the radioactive waste and disused sources management programme which is made by the holder of the approval for radioactive waste and disused sources management who operates the RWMC. The management programme shall be in line with quality assurance programme of the licence holder (Article 8 of the Ordinance on Management of Radioactive Waste and Disused Sources).

Ordinance on Management of Radioactive Waste and Disused Sources (OG 12/18) defines obligations of the licence-holders as well as Radioactive Waste Management Centre operator to prepare, adopt, and regularly revise Quality Assurance Program and written radioactive waste management procedures in the frame of this Program. Ordinance stipulates content and scope of written procedures for radioactive waste management. Licence holders have to document and demonstrate quality of installed equipment and materials in line with quality assurance programmes, standards, technical norms and quality standards for products and services in order to ensure safe radioactive waste management.

Fund for financing the decommissioning of the Krško NPP and the disposal of Krško NPP radioactive waste and spent nuclear fuel (Fund) is obligated to establish and operate the Radioactive Waste Management Centre (RWMC) in Croatia for safe storage of institutional radioactive waste and disused sources generated on the territory of the Republic of Croatia as well as low and intermediate level waste form the Krško NPP.

The Fund has introduced and certified integrated quality assurance and information security management system with recognised operational processes for:

- Revisions of the Krško NPP Decommissioning and radioactive waste and spent nuclear fuel Disposal Program,
- Establishment of the radioactive waste management centre and
- Management of radioactive waste and disused sources at the RWMC.

With the aim of continuous improvement of quality and information security, Fund's integrated management system is regularly and periodically audited according to the established audit programme and annual auditing planes and revised. In parallel with the establishment of the RWMC, it is planned to upgrade Fund's integrated management system with the environmental management system and develop detailed work instructions and routines for acceptance, verification and safe storage of radioactive waste packages and disused sealed sources in the planned storage facilities at the RWMC.

ARTICLE 24. OPERATIONAL RADIATION PROTECTION

1. Each Contracting Party shall take the appropriate steps to ensure that during the operating lifetime of a spent fuel or radioactive waste management facility:

(I) the radiation exposure of the workers and the public caused by the facility shall be kept as low as reasonably achievable, economic and social factors being taken into account;

(II) no individual shall be exposed, in normal situations, to radiation doses which exceed national prescriptions for dose limitation which have due regard to internationally endorsed standards on radiation protection; and

(III) measures are taken to prevent unplanned and uncontrolled releases of radioactive materials into the environment.

2. Each Contracting Party shall take appropriate steps to ensure that discharges shall be limited:

(I) to keep exposure to radiation as low as reasonably achievable, economic and social factors being taken into account; and

(II) so that no individual shall be exposed, in normal situations, to radiation doses which exceed national prescriptions for dose limitation which have due regard to internationally endorsed standards on radiation protection.

Each Contracting Party shall take appropriate steps to ensure that during the operating lifetime of a regulated nuclear facility, in the event that an unplanned or uncontrolled release of radioactive materials into the environment occurs, appropriate corrective measures are implemented to control the release and mitigate its effects.

There is no nuclear facility at Croatian territory. However, the operational radiation protection of workers, public and environment due to operation of future radioactive waste management facility is stipulated by the Act on Radiological and Nuclear Safety and ordinances issued based on the Act.

The ordinances based on the Act which, inter alia, regulate operational radiation protection are:

- Ordinance on Management of Radioactive Waste and Disused Sources (OG 12/18)
- Ordinance on the the Conditions and Measures of Ionising Radiation Protection for Performing Activities Involving Ionising Radiation Sources (OG 53/18)
- Ordinance on Environmental Monitoring of Radioactivity (OG 40/18)
- Ordinance on Dose Limits, Recommended Dose Limits and Assessment of Personal Doses (OG 38/18)
- Regulation on Measures for Protection Against Ionising Radiation and Interventions in Case of Emergency (OG 24/18, 70/20).

Operational radiation protection measures are required to keep the radiation exposure of workers and public as low as reasonably achievable as well as the set of measures that have to be undertaken in order to prevent unplanned and uncontrolled releases of radioactive materials into the environment. All of mentioned before, are set in Ordinance on the Conditions and Measures of Ionising Radiation Protection for Performing Activities Involving Ionising Radiation Sources (OG 53/18). The dose constraints and the dose limits for workers and members of the public are stipulated in the Ordinance on Dose Limits, Recommended Dose Limits and Assessment of Personal Doses (OG 38/18).

All stipulated measures are in line with requirements set forth in the Council Directive 2013/59/Euratom.

ARTICLE 25. EMERGENCY PREPAREDNESS

1. Each Contracting Party shall ensure that before and during the operation of a spent fuel or radioactive waste management facility there are appropriate on-site and, if necessary, off-site emergency plans. Such emergency plans should be tested at appropriate times.

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

The Republic of Croatia has no nuclear installations on its territory.

The closest to the Croatian territory are Krško NPP in Slovenia (PWR, 707 MWe) and Pakš NPP in Hungary (VVER, 4x440 MWe).

Krško NPP is situated some 10 km from the border and less than 30 km from the Croatian capital of Zagreb, while Pakš NPP is located some 75 km from the border. Severe accidents with large releases in those NPPs, particularly in Krško NPP, could cause serious consequences on Croatian territory.

NPP Krško and NPP Pakš are declared as Emergency preparedness category IV (EPC V according to the IAEA categorization – Preparedness and Response for a Nuclear or Radiological Emergency, IAEA Safety Standards Series, GSR Part 7, IAEA, 2015).

In accordance with the provisions of regulations, informing the population on protection measures in a case of an emergency is an obligation for all participants in the emergency preparedness and response system in accordance with their competences. Information to population shall be focused:

- on basic facts about radioactivity and its effects on human beings and on the environment
- on various types of radiological hazards and their consequences for the general public and the environment
- on extraordinary measures envisaged to alert, protect and assist the general public in the event of a radiological hazard, and
- on appropriate information on actions the population should take in the event of such radiological hazard.

The population that could be affected by the consequences of an emergency, without submitting a special request, shall be provided with information on the protective measures intended for them and on the actions to be taken in the case of emergency. The information will be constantly available to the public and regularly updated when significant changes occur.

The MoI is responsible for the communication with the public in the event of an emergency at the national or regional level through the Civil Protection Headquarters of the Republic of Croatia. At the local and regional level, the civil protection headquarters of the affected areas are responsible for the communication with the public.

All approval holders are obliged to prepare a Plan and programme of measures in the event of an emergency, which is approved by the MoI.

The approval holder who is managing and coordinating the emergency response is in charge of the communication with the public and media representatives during the emergency with expert support provided by the MoI.

To ensure that no individual is exposed to the radiation doses which exceed prescribed national dose limits, dedicated radiological monitoring program is developed by NPP Krško and continuously implemented by the accredited laboratory from the Ruđer Bošković Institute in the Republic of Croatia and Institute Jožef Stefan in the Republic Slovenia. The test results are presented in a bulletin prepared by the Ruđer Bošković Institute in cooperation with the CPD of MoI. The newsletter is available on the CPD of MoI website: https://civilna-zastita.gov.hr/podrucja-djelovanja/radioloska-i-nuklearna-sigurnost/sluzba-za-nuklearnu-sigurnost/odjel-za-okolis-i-radioaktivni-otpad/bilteni-ne-krsko/175

ARTICLE 26. DECOMMISSIONING

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

(I) qualified staff and adequate financial resources are available;

(II) the provisions of Article 24 with respect to operational radiation protection, discharges and unplanned and uncontrolled releases are applied;

(III) the provisions of Article 25 with respect to emergency preparedness are applied; and

(IV) records of information important to decommissioning are kept.

According to the Article 44 of the Ordinance on Management of Radioactive Waste and Disused Sources, the holder of the approval for the operation of radioactive waste and disused sources management facility shall develop the closure and decommissioning plan for the management facility. This plan shall contain facility description, description of emergencies in the facility until the day of completing the plan, including description of contaminations, description of facility decommissioning procedures, evaluation of types and quantity of waste and radioactive waste that will be generated through decommissioning and evaluation where that radioactive waste will be stored or disposed, evaluation of risks for workers engaged in decommissioning during decommissioning procedure and proposed final end state and method by means of which the approval holder shall prove that the final state has been achieved.

According to the Article 75 of the Act on Radiological and Nuclear Safety, the holder of the use permit for a nuclear installation shall have secured financial resources for implementation of the prescribed nuclear safety measures throughout the operating lifetime of the installation. This financial resources shall also cover payment of all the costs of decommissioning of the nuclear installation.

G. SAFETY OF SPENT FUEL MANAGEMENT

Spent fuel management has not been practiced in the Republic of Croatia. As the Republic of Croatia and the Republic of Slovenia are planning long-term dry storage of spent fuel at Krško NPP location and the site selection process for the repository will not begin before 2050, therefore, the safety of spent fuel management in the Republic of Croatia is not an issue.

H. SAFETY OF RADIOACTIVE WASTE MANAGEMENT

ARTICLE 11. GENERAL SAFETY REQUIREMENTS

Each Contracting Party shall take the appropriate steps to ensure that at all stages of radioactive waste management individuals, society and the environment are adequately protected against radiological and other hazards.

In so doing, each Contracting Party shall take the appropriate steps to:

(I) ensure that criticality and removal of residual heat generated during radioactive waste management are adequately addressed;

(II) ensure that the generation of radioactive waste is kept to the minimum practicable;

(III) take into account interdependencies among the different steps in radioactive waste

management;

(IV) provide for effective protection of individuals, society and the environment, by applying at the national level suitable protective methods as approved by the regulatory body, in the framework of its national legislation which has due regard to internationally endorsed criteria and standards;

(V) take into account the biological, chemical and other hazards that may be associated with radioactive waste management;

(VI) strive to avoid actions that impose reasonably predictable impacts on future generations greater than those permitted for the current generation;

(VII) aim to avoid imposing undue burdens on future generations.

According to the Article 49 of the Act on Radiological and Nuclear Safety, generators of radioactive waste and disused sources shall ensure that waste radioactive substances are generated in the smallest possible quantities and transfer of the burden of disposal of radioactive waste and disused sources to future generations is avoided to the greatest possible extent.

Since both storage facilities are closed, the newly generated radioactive waste and disused sources are kept at the owners facilities until the central storage facility is in function.

Furthermore, the start of operation of the long-term storage for LILW from Krško NPP is planned for year 2023. The projects of the central storage facility and long-term storage facility for LILW from Krško NPP are being developed in accordance with the safety requirements given in IAEA safety standards. Also, it should be noted here that obligations prescribed under this Convention are transposed into the Act as well as into the Strategy and the National Programme.

The new Ordinance on Management of Radioactive Waste and Disused Sources, adopted in 2018, takes in the consideration all safety requirements set forth in the Convention and in the IAEA safety requirements and guidelines.

This Ordinance establishes the conditions and manner of management of radioactive waste and disused sources, the obligation to keep records thereof, the content, manner of keeping and time periods for the storing of such records, the scope and method of reporting as well as the list and requirements for the performance of operations involving management of

radioactive waste and disused sources and the list of documents that are used in the procedure for issuing an approval to demonstrate compliance with the requirements prescribed.

Management facilities must be designed and constructed in such a way that they have sufficient capacity for all operations for the management of radioactive waste and disused sources for which approval is required to operate under normal circumstances as well as in the event of an emergency, that the barrier system ensures adequate protection of the environment during the foreseen operating hours and that access to radioactive waste and disused sources is provided at all times for the purpose of inspection, verification, exemption from regulatory control or transport. Before the commencement of the operation of the management facility, it is necessary to carry out a trial operation, during the operation of the facility, periodic inspections are carried out and after closure and decommissioning of the facility it is necessary to determine the state of the environment.

According to the Article 17 of the Ordinance on Management of Radioactive Waste and Disused Sources, the holder of an approval for the performance of an operation involving radioactive sources, that imports a radioactive sealed source containing radionuclide, shall by means of contractual arrangements oblige the manufacturer to agree to the return of the sealed radioactive source which is no longer in use.

I. TRANSBOUNDARY MOVEMENT

ARTICLE 27. TRANSBOUNDARY MOVEMENT

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

(i) a Contracting Party which is a State of origin shall take the appropriate steps to ensure that transboundary movement is authorized and takes place only with the prior notification and consent of the State of destination;

(ii) transboundary movement through States of transit shall be subject to those international obligations which are relevant to the particular modes of transport utilized;

(iii) a Contracting Party which is a State of destination shall consent to a transboundary movement only if it has the administrative and technical capacity, as well as the regulatory structure, needed to manage the spent fuel or the radioactive waste in a manner consistent with this Convention;

(iv) a Contracting Party which is a State of origin shall authorize a transboundary movement only if it can satisfy itself in accordance with the consent of the State of destination that the requirements of subparagraph (iii) are met prior to transboundary movement;

(v) a Contracting Party which is a State of origin shall take the appropriate steps to permit re-entry into its territory, if a transboundary movement is not or cannot be completed in conformity with this Article, unless an alternative safe arrangement can be made.

2. A Contracting Party shall not licence the shipment of its spent fuel or radioactive waste to a destination south of latitude 60 degrees South for storage or disposal.

3. Nothing in this Convention prejudices or affects:

(i) the exercise, by ships and aircraft of all States, of maritime, river and air navigation rights and freedoms, as provided for in international law;

(ii) rights of a Contracting Party to which radioactive waste is exported for processing to return, or provide for the return of, the radioactive waste and other products after treatment to the State of origin;

(iii) the right of a Contracting Party to export its spent fuel for reprocessing;

(iv) rights of a Contracting Party to which spent fuel is exported for reprocessing to return, or provide for the return of, radioactive waste and other products resulting from reprocessing operations to the State of origin.

The Act on Radiological and Nuclear Safety explicitly bans any import of radioactive waste, disused sources or spent fuel to the country, unless differently prescribed by international agreements (Article 53). The Ordinance on the Supervision and Control of Transboundary Shipments of Radioactive Waste and Spent Fuel (OG 11/13) ensures that transboundary movement is undertaken in a manner consistent with the provisions of Article 27 of the Convention. The Ordinance is also in line with the provisions of the Council Directive 2006/117/Euratom of 20 November 2006 on the supervision and control of shipments of radioactive waste and spent fuel.

J. DISUSED SEALED SOURCES

ARTICLE 28. DISUSED SEALED SOURCES

1. Each Contracting Party shall, in the framework of its national law, take the appropriate steps to ensure that the possession, remanufacturing or disposal of disused sealed sources takes place in a safe manner.

2. A Contracting Party shall allow for re-entry into its territory of disused sealed sources if, in the framework of its national law, it has accepted that they be returned to a manufacturer qualified to receive and possess the disused sealed sources.

The obligation of the owner of radioactive waste and disused sources is to ensure that in all procedures of management of radioactive waste and disused sources special attention is paid to:

1. the protection of individuals and the society against adverse effects of ionising radiation
2. undertaking all necessary steps to avoid unnecessary generation of radioactive waste during waste management operations as well as to minimise the existing quantity and activity
3. undertaking all necessary steps to avoid any risk for plant and animal life through contamination of the environment, i.e. waters, seas, soils and the air above the prescribed clearance values
4. undertaking all necessary steps to avoid, to the extent possible, imposing the burden of radioactive waste and disused sources management on future generations
5. undertaking all necessary steps to avoid uncontrolled handling of radioactive waste and disused sources
6. undertaking all necessary steps to ensure appropriate training of all workers within the waste management system
7. availability of all necessary information on the management of radioactive waste and disused sources for workers in the waste management system and the general public, if that does not compromise security and
8. covering all associated costs.

Each disused sealed source firstly has to be offered to those who would use it for other purposes or shall be returned to its manufacturer. If such users do not exist, the source has to be transported to central storage facility. The dismantling of sources and transport to storage facility can be performed only by authorized technical service and in the prescribed manner.

Owners/users are allowed to keep disused sources at their own storages for a maximum of 6 months. Short lived disused sealed sources of low activity can be kept in the local storages belonging to the owners/users until the criteria for the clearance are met, but only if this will be achieved within the period of up to 6 months. In order to minimize waste generation, the Ordinance obliges users to contractually bind the manufacturers to take back each disused sealed source within 12 months after requesting its return.

The CPD of MOI is keeping records of radioactive waste and disused sources that contains data on:

1. radioactive waste and disused sources kept by the Radioactive Waste Management Centre
2. radioactive waste and disused sources kept by other holders
3. radioactive waste released into the environment;
4. radioactive waste and disused sources released from regulatory control
5. radioactive waste and disused sources that are abroad due to treatment or storage or have been returned to the manufacturer
6. radioactive waste and disused sources that were found without a legal holder and were handed over to the RWMC for further management.

K. GENERAL EFFORTS TO IMPROVE SAFETY

The representatives of the Republic of Croatia participated at the Review Meeting of Parties of Joint Convention organized in 2017.

At that Review Meeting, future challenges in the field of radioactive waste management for Croatia were recognized:

- adoption of National Programme for radioactive waste management
- acceptance of preferred location for radioactive waste management as the location for establishment of a future Radioactive Waste Management Centre
- establishment of RWMC and consultations with all stakeholders
- capacity building in the field of radioactive waste management.

The National Programme was adopted at the end of 2018. Consequently, the implementation of the Strategy was assured, and in the period until 2025 all activities are directed to the establishment of the Radioactive Waste Management Centre which will include an establishment of the storage facility for radioactive waste located at the territory of the Republic of Croatia and construction of the storage facility for LILW form Krško NPP, for which the Republic of Croatia is responsible to manage.

The National Programme has undergone the process of strategic environmental impact assessment, including consultations with the interested public in accordance with the provisions of the Environmental Protection Act (OG 80/13, 153/13 and 78/15) and the Regulation on Strategic Assessment the impact of the plan and program on the environment (OG 64/08), Regulation on informing the public and interested public on and their participation in environmental issues (OG 64/08) and the Act on the Ratification of the Protocol on Strategic Environmental Assessment to the Convention on Environmental Impact Assessment in a Transboundary State (OG 7/09) and Act on the Right of Access to Information (OG 25/13, 85/15).

In accordance to the above-mentioned regulatory framework, public and interested public had access to the subject matter documentation and participated in organized public discussion on the strategic environmental study and the draft proposal of the National Programme. The report on the public discussion including a list of participants suggestions and comments related to the subject matter which had been or had not been accepted or had been partially accepted with the explanations of the reasons for their rejection or partial acceptance is available on the website of the regulatory body. As well, the Ministry of Environmental Protection (now Ministry of Economy and Sustainable Development) organised interstate consultations with the Republic of Slovenia and Bosnia and Hercegovina.

With the adoption of the National Programme, a long-term solution for radioactive waste management was established in line with best international practices, standards and EU directives. Thereby, the National Programme takes into account the synergy in resolving development, economy and special planning potentials such as putting state and private real estate in economic purposes and development of local community at which territory RWMC is planned.

For management of the radioactive waste and disused sources originate from medicine, industry, science, education and the past public use, the National Programme plans the

establishment of the central storage facility. The preferred location for the central storage facility is the location of Čerkezovac, located in Dvor Municipality on the southern slopes of the Trgovska gora, a military logistic complex without perspective for future use by military.

In addition to the radioactive waste produced in the country, the Republic of Croatia has the obligation to take over half of the radioactive waste from Krško NPP. The location Čerkezovac was recognized also as a preferred location for the long-term storage facility for LILW from Krško NPP.

All activities related to the establishment of the Center will be carried out in accordance with the activities envisaged by the National programme as listed in Chapter B2, Table B-1. During the implementation of the planned activities, continuous availability of information and participation of all stakeholders in all processes is envisaged by international conventions and standards regarding environmental impact, and transboundary impact is ensured in accordance to the Convention on Environmental Impact Assessment in a Transboundary Context (OG-IA 6/96) (Espoo 91) and Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters (OG -IA 1/07) (Aarhus).

According to the activities planned in the National Programme, a number of activities in the field of information, education and participation of public is foreseen: consultation with interested public, educational and informational lectures in primary and secondary schools, establishment of virtual information centre, organization of workshops with the topic of LILW management, and the establishment of the centre for information and education of public at the location of the RWMC.

In order to systematically dispose radioactive waste, the Republic of Croatia carries out activities to estalish a Radioactive Waste Management Centre which will be a storage facility for radioactive waste and disused sources from the Republic of Croatia and for radioactive waste from the Krško NPP.

In the process of solving of recognized challenges, at the requirement of the Government of the Republic of Croatia, the team of experts from the International Atomic Energy Agency carried out IRRS Follow-up mission in the period 21-29 October 2019. According to the IRRS Follow-up report, Croatia has taken the following positive steps:

- adopted a Radiological and Nuclear Safety Strategy;
- updated the legal and regulatory framework for safety in line with International Standards by issuing a number of new amendments of the Act and Ordinances;
- drafted the Croatian Emergency Preparedness and Response Plan which will be implemented through the revision of the Ordinance on Emergency;
- identified existing exposure situations which are deemed to give rise to occupational exposures and public exposures. Moreover, Radon Action Plan has been developed. and Remediation Plans for sites containing naturally occurring radioactive materials are under development.

The conclusions of the IRRS Follow-up Mision were:

- provide the CPD of MoI with human and financial resources enabling the CPD to completely fulfil its statutory obligations for regulatory control;

- strengthen the capacity and competence to carry out regulatory functions, especially inspections and licensing complex facilities and activities;
- develop an integrated management system for CPD of MoI that clearly specifies the interfaces among different internal sections and units performing tasks related to radiological and nuclear safety in an integrated manner;
- continue its efforts to coordinate and harmonize emergency planning zones with their Slovenian counterparts in relation to Krško NPP;
- continue its efforts to establish the criteria for qualification and recognition of medical physicists;
- continue its efforts to establish a national waste management centre.

The IRRS Follow-up report can be found on the link: https://civilna-zastita.gov.hr/podrucja-djelovanja/radioloska-i-nuklearna-sigurnost/medjunarodna-agencija-za-atomsku-energiju-iaea/237 .

L. ANNEXES

L.1 Inventory of Radioactive Waste

Table L-1: Radioactive Waste at the Storage Facility Operated by the Institute for Medical Research and Occupation Health

Radioactive waste package	Radionuclide	Number of sources	Activity (Bq)	Total activity (Bq)
Cylindrical container (80 l)	Co-60	52	3.72×10^{9}	2.51×10^{11}
	Eu-152/154	102	2.47×10^{11}	
Cylindrical container (50 l)	Co-60	17	1.19×10^{10}	1.35×10^{11}
	Cs-137	10	6.99×10^{10}	
	Eu-152/154	15	5.34×10^{10}	
Lead container (80 l)	Co-60	111	2.06×10^{10}	1.36×10^{11}
	Cs-137	9	9.91×10^{10}	
	Eu-152/154	5	1.60×10^{10}	
Lead container (50 l)	Co-60	55	3.11×10^{9}	3.11×10^{9}
Standard drum (200 l)	Fe-55	16	2.37×10^{10}	9.85×10^{11}
	Co-60	46	4.33×10^{9}	
	Kr-85	6	1.13×10^{10}	
	Sr-90	339	2.23×10^{10}	
	Cd-109	1	1.85×10^{8}	
	Cs-137	17	4.86×10^{9}	
	Pm-147	8	-	
	Eu-152/154	41	8.00×10^{9}	
	Ra-226	39	9.06×10^{11}	
	Ra-226/Be	2	3.92×10^{9}	
	Am-241/Be	1	3.70×10^{8}	
	n/k	n/k	n/k	
Standard drum (200 l)	Am-241	n/k	n/k	n/k
	n/k	n/k	n/k	
Plastic containers (7x50 l)	Am-241	n/k	n/k	n/k
	Ra-226	n/k	n/k	
Wooden box (50 l)	Am-241	n/k	n/k	n/k
Plastic containers (4x50 l)	n/k	n/k	n/k	n/k
Plastic containers (4x25 l)	Co-60	n/k	n/k	n/k
	Ra-226	n/k	n/k	n/k
	Am-241/Be	1	1.11×10^{9}	1.11×10^{9}

n/k - not known

Table L-2: Radioactive Waste at the Storage Facility Operated by the Institute Ruđer Bošković packed in EKO-KON 1 and EKO-NEUT 1 Containers

Packaging ID	Radionuclide	Activity (Bq)	Number of sources
EKO-KON 1 ser.no. 001	Eu-152/154	$5,4\times10^{10}$	36
	Eu-152/154	$4,13\times10^{10}$	25
	Eu-152/154	$2,38\times10^{10}$	16
	Cs-137	$1,24\times10^{11}$	59
	Co-60	$6,68\times10^{9}$	118
	Eu-152/154	$1,31\times10^{11}$	79
	Co-60	$1,80\times10^{8}$	8
	Eu-152/154	$4,74\times10^{10}$	36
	Eu-152/154	$4,59\times10^{10}$	32
TOTAL ACTIVITY		**$4,74\times10^{11}$**	**409**
EKO-KON 1 ser.no. 002	Ir-192	$6,55\times10^{9}$	294
	Ir-192	$<1,00\times10^{9}$	146
	Cd-109		5
	Ba-133	$3,30\times10^{8}$	1
	Fe-55	$2,59\times10^{10}$	11
	Gd-153	$2,95\times10^{10}$	2
	K3-82	$7,38\times10^{10}$	7
	Pm-147	$2,00\times10^{7}$	6
	Tl-204	$9,30\times10^{8}$	9
	Sr-90	$1,00\times10^{10}$	71
	Ra-226	$7,70\times10^{11}$	50
	Ra-226/BE+		4
	Am-241	$6,66\times10^{10}$	11
	Cm-247		1
	All sorts		3
	Cs-137	$1,18\times10^{10}$	1
	Cs-137	$6,88\times10^{10}$	1
TOTAL ACTIVITY		**$1,06\times10^{12}$**	**623**
EKO-KON 1 ser.no. 003	Ni-63	$2,30\times10^{9}$	5
	Co-60	$7,58\times10^{9}$	23
TOTAL ACTIVITY		**$9,88\times10^{9}$**	**28**
EKO-NEUT 1 ser.no. 001	Am-241/Be	$1,16\times10^{11}$	20
TOTAL ACTIVITY		**$1,16\times10^{11}$**	**20**

Table L-3: Radioactive Waste at the Storage Facility Operated by the Institute Ruđer Bošković packed in Standard 200l Steel Drums

Packaging ID	Radionuclide	Activity (Bq)	RW Class (IAEA 2009)	Content description
RWP1	Ra-226	$3{,}80\times10^{10}$	DSRS	Conditioned 226Ra
RWP2	Ra-226	$1{,}10\times10^{11}$	DSRS	Conditioned 226Ra
RWP3	Ra-226		LLW	Metal plates, housing of devices, 4 instruments painted with radium, 3 plastic boxes with radium ore, bottle with radium, 2 metal boxes contaminated with radium, Phillips device
RWP4	Ra-226		LLW	Metal plates, big parts of some motor contaminated with radium
RWP5	Cs-137 and others		LLW	3 plastic bags
RWP6	Bi-207, Pb-210 and others		LLW	plastic bag Bi-207), plastic bag (Pb-210), 2 plastic bags with “hot” lab’s waste
RWP7	Eu-152		LLW	plastic bags containing various material used for testing contaminated with 152Eu
RWP8	Non specified		LLW	2 pieces of semicircular metallic plates, large plastic bag with clothes, papers, tissues etc., cardboard boxes, plastic ampoules
RWP9	Eu-152, Cs-137		LLW	large plastic bags with various contaminated objects, clothes, papers, tissues, cardboard boxes,
RWP10	U-238, Th-234		LLW	large plastic bags with various contaminated objects, clothes, papers, tissues, cardboard boxes
RWP11	Eu-152		LLW	soil
RWP12	Eu-152		LLW	Small metallic pellets
RWP13	Cs-137		LLW	Large bags with mainly paper and tissue, gloves etc contaminated with 137Cs
RWP14	Cs-137		LLW	Large bags with mainly paper and tissue, gloves etc contaminated with 137Cs

Packaging ID	Radionuclide	Activity (Bq)	RW Class (IAEA 2009)	Content description
RWP15	Eu-152		LLW	Small metallic pellets
RWP16	Mixed		LLW	Various plastic, glass, cardboard materials, vials, empty bottles, gloves etc.
RWP17	Mixed		LLW	Metallic bars, various metal pieces, boxes, plastic bag with, paper, glass, cotton wool etc.
RWP18	Mixed		LLW	Cardboard boxes, plastic bags, paper, glass, cotton wool, tissue, gloves, etc.
RWP19	U-238		LLW	Various materials contaminated with U238
RWP20	Mixed		LLW	Various objects: paper, clothes, wood, cardboard, tissue, gloves, shoes, etc
RWP21	Co-60		LLW	Plates-calibration of gamma cameras
RWP22	Co-60, Cs-137 and others		LLW	Plastic bags and bottles, dust, metal boxes, bags, paper, gloves, plastic tubes, paper pieces, some metal parts etc.
RWP23	C-14, Cs-137 and others		LLW	Mixed waste: plastic bags and bottles, dust, bags, paper, gloves, vials, plastic tubes, paper pieces, etc.
RWP24	Mixed		LLW	Mixed waste: plastic bags and bottles, dust, bags, paper, gloves, vials, plastic tubes, paper pieces, etc.
RWP25	Mixed		LLW	Mixed waste: 2 large plastic bags and bottles, metal parts, paper, gloves, vials, plastic tubes, paper pieces, etc.
RWP26	Mixed		LLW	Mixed waste: 2 large plastic bags and bottles, metal parts, paper, gloves, vials, plastic tubes, paper pieces, etc.
RWP27	U-238		LLW	U (“black” granular sand) in original steel drum
RWP28	U-238		LLW	U (“black” granular sand) in original steel drum
RWP29	U-238		LLW	UO2 yellow cake-powder
RWP30	Mixed		LLW	Plastic pieces (canisters), contaminated wood, plastic ample in plastic box
RWP31	Mixed		LLW	Plastic pieces (canister), plastic ample, plastic boxes, glass, bottles etc

Packaging ID	Radionuclide	Activity (Bq)	RW Class (IAEA 2009)	Content description
RWP32	Mixed		LLW	Plastic pieces (canister), plastic ample, plastic boxes, glass, bottles etc
RWP33	Mixed		LLW	Various empty cans, plastic canisters, plastic and glass bottles, small pieces of metal
RWP34	Mixed		LLW	Powder samples in plastic boxes and cans, ores, soil, rock etc.
RWP35	Mixed		LLW	Cyclotron targets, contaminated lead containers
RWP36	Co-60, Cs-137, Eu-152		LLW	Canisters and bottles with solutions containing 60Co, 137Cs, 152Eu
RWP37	Co-60, Cs-137, Eu-152		LLW	Canisters and bottles with solutions containing 60Co, 137Cs, 152Eu
RWP38	Co-60		LLW	Big plastic canister placed into the drum
RWP39	Mixed		LLW	Various plastic objects: bottles, cans, canisters, broken pieces
RWP40	Mixed		LLW	Metal pieces of drums and containers
RWP41	Mixed		LLW	Paper, glass, clothes, gloves, plastic bags, cardboard, rubber gloves, shoes, etc.
RWP42	U-238		LLW	Various uranium and thorium compounds and objects NUCLEAR MATERIAL
RWP43	Mixed		LLW	Various contaminated materials: plastic sheets
RWP44	Am-241	$5{,}50\times10^{9}$	LLW	Smoke detectors. No. of sources: 24032
RWP45	Am-241	$5{,}61\times10^{9}$	LLW	Smoke detectors. No. of sources: 6491

Table L- 4: Nuclear Material at the Storage Facility Operated by the Institute Ruđer Bošković packed in Standard 200l Steel Drums

Packaging ID	Radionuclide / Material	Mass (g)	Content description
NM1	Th-232	12 405	Lab samples, ceramic samples, optical devices
NM2	U, UO2, U3O8, UO2SO4	20 903	Lab samples, U rod, solutions, powder, metalic parts
NM3	UF6, U, U/Th, UO4	42 492	Yellow cake, U powder, ADU,
NM4	U-238	787000	Defectoscopes, Uranium parts, TH-232/U-232 rods,

L.2 Relevant legislation in force and relevant reports

In this annex, all relevant legislation in force (as of October 2020), mentioned in the chapter E, are listed bellow, as well as national and international reports, relevant for the management of radioactive waste and spent fuel.

L.2.1 Acts

- Act on Radiological and Nuclear Safety (OG 141/13, amended 39/15, 130/17 and 118/18)
- Act on Fund for Krško NPP Decommissioning, Radioactive Waste and Spent Nuclear Fuel Management (OG 107/07)
- Dangerous Goods Transport Act (OG 79/07)
- Act on Liability for Nuclear Damage (OG 143/98)
- Environmental Protection Act (OG 80/13, 153/13 and 78/15, 12/18 and 118/18)
- Act on Spatial Planning (OG 153/13, 65/17, 114/18 and 39/19)
- Construction Act (OG 153/13, 20/17 and 39/19)

L.2.2 Regulations

- Regulation on the Amount, Deadline and Manner of Payment of Funds for Financing the Decommissioning and Management of Radioactive Waste and Spent Nuclear Fuel of the Krško NPP (OG 155/08)
- Regulation on Measures for Protection Against Ionising Radiation and Interventions in Case of Emergency (OG 24/18, 70/20)
- Regulation on the Internal Organization of the Ministry of the Interior (OG 24/19)

L.2.3 Ordinances

- Ordinance on Management of Radioactive Waste and Disused Sources (OG 12/18)
- Ordinance on the Supervision and Control of Transboundary Shipments of Ordinance on Nuclear Safety Requirements for Nuclear Installation Construction (OG 36/16, amended 79/16)
- Ordinance on the Establishment of a Quality Assurance Programme for The Management of Nuclear Facilities (OG 29/17)
- Ordinance on the List and Content of Documents Required for Nuclear Activity Licensing (OG 29/17)
- Ordinance on the Content of the Application for the Nuclear Facility Commissioning Licence (OG 29/17)
- Ordinance on the Safety Analysis Report for Nuclear Installations (OG 29/17)

- Ordinance on Authorised of Nuclear Safety Experts (OG 29/17)
- Ordinance on Site Evaluation for Nuclear Installations (OG 38/17)
- Ordinance on the Content of the Application for Approval for Commencement or Termination of Operation or Decommissioning of a Nuclear Installation (OG 47/17)
- Ordinance on the Frequency, Content, Scope and Method for Carrying Out Periodic Safety Reviews of Nuclear Installations (OG 94/17)
- Ordinance on the Content, Scope, Method and Frequency of Reporting on the Operation of Nuclear Installations (OG 94/17)
- Ordinance on the Training Required for Handling Ionising Radiation Sources, Application of Measures for Radiological Safety and Managing Technological Processes in Nuclear Installations (OG 42/18)
- Ordinance on the Health Requirements of Exposed Workers and Persons Undergoing Training for Work With Ionising Radiation Sources (OG 66/18)
- Ordinance on the Conditions and Measures of Ionising Radiation Protection for Performing Activities Involving Ionising Radiation Sources (OG 53/18)
- Ordinance on Notification, Registration, Approval and Placing on the Market of Sources of Ionising Radiation (OG 54/18)
- Ordinance on the Manner and Procedure for Supervision During Import or Export of Material for Which there is Justified Suspicion of Contamination by Radionuclides or of Containing Radioactive Sources (OG 114/07)
- Ordinance on the Official Identity Card and Badge of the Radiological and Nuclear Safety Inspector (OG 125/15)
- Ordinance on the Scope and Content of the Plan and Programme of Measures in the Event of an Emergency and Informing the Public and Competent Bodies (OG 123/12)
- Ordinance on Radiation Protection Experts (OG 36/18)
- Ordinance on Dose Limits, Recommended Dose Limits and Assessment of Personal Doses (OG 38/18)
- Ordinance on Nuclear Security (OG 38/18)
- Ordinance on the Content, Requirements, Criteria and Authorisation Procedure for the Remediation Plan (OG 38/18)
- Ordinance on Granting Authorisation to Professional Technical Services for Performing Tasks Pertaining to Radiological Safety (OG 40/18)
- Ordinance on Environmental Monitoring of Radioactivity (OG 40/18)
- Ordinance on Conditions for Use of Ionising Radiation Sources for Medical and Non-Medical Imaging Puposes (OG 42/18)

L.2.4 Strategies and Plans

- Strategy for the Management of Radioactive Waste, Disused Sources and Spent Nuclear Fuel (OG 125/14)
- Radiological And Nuclear Safety Strategy for the Period 2017-2025 (OG 65/17)
- National Programme for Implementation of the Strategy for Management of Radioactive Waste, Disused Sources and Spent Nuclear Fuel (Programfor the period up to 2025. With a view to 2060), Decision on adoption of the National Programme for Implementation of the Strategy for Mana me gement of Radioactive Waste, Disused Sources and Spent Nuclear Fuel (OG 100/18)
- Radon Action Plan 2019 – 2024 (OG 118/18)

L.2.5 Multilateral agreements

- Vienna Convention on Civil Liability for Nuclear Damage (OG - IA 1/06)
- Joint Protocol Relating to the Application of the Vienna Convention and the Paris Convention (OG - IA 12/93)
- Convention on the Physical Protection of Nuclear Material (OG - IA 5/01, amended 5/06)
- Convention on Early Notification of a Nuclear Accident (OG - IA 1/06, amended 5/06)
- Convention on Assistance in the Case of a Nuclear Accident of Radiological Emergency (OG - IA 1/06)
- Convention on Nuclear Safety (OG - IA 13/95)
- Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (OG - IA 3/99)
- Agreement between the Kingdom of Belgium, the Kingdom of Denmark, the Federal Republic of Germany, Ireland, the Italian Republic, the Grand Duchy of Luxembourg, the Kingdom of the Netherlands, the European Atomic Energy Community and the International Atomic Energy Agency in Implementation of Article III (1) and (4) of the Treaty on the Non-Proliferation of Nuclear Weapons and Protocol Additional to the Agreement between the Kingdom of Belgium, the Kingdom of Denmark, the Federal Republic of Germany, Ireland, the Italian Republic, the Grand Duchy of Luxembourg, the Kingdom of the Netherlands, the European Atomic Energy Community and the International Atomic Energy Agency in Implementation of Article III (1) and (4) of the Treaty on the Non-Proliferation of Nuclear Weapons (OG – IA 3/16).
- Revised Supplementary Agreement Concerning the Provision of Technical Assistance by the International Atomic Energy Agency to the Government of the Republic of Croatia (OG – IA 9/97)
- Comprehensive Nuclear Test Ban Treaty (OG – IA 1/01)

L.2.6 Bilateral agreements

- Agreement Between the Republic of Croatia and the Republic of Slovenia on the Early Exchange of Information in the Event of a Radiological Emergency (OG – IA 6/98, amended 3/00)
- Agreement Between the Government of the Republic of Croatia and the Government of the Republic of Hungary on the Early Exchange of Information in the Event of a Radiological Emergency (OG – IA 11/99)
- Agreement Between the Government of the Republic of Croatia and the Government of the Republic of Slovenia on Regulating the Status and Other Legal Relations Pertaining to Investments, Use and Decommissioning of the Krško Nuclear Power Plant (OG – IA 9/02)

L.2.7 National and international reports

- 8th National report on the Implementation of the Obligations under the Convention on Nuclear Safety, Zagreb, August 2019
- 2nd National Report of Croatia on the implementation of the Directive 2009/71/Euratom establishing a Community framework for the nuclear safety of nuclear installations, as amended by Council Directive 2014/87/Euratom of 8 July 2014, July 2020
- Report of the Integrated Regulatory Review Service (IRRS) Follow-up Mission to the Republic of Croatia, IAEA-NS-IRRS-08, 21-29 October 2019[9]

[9] https://civilna-zastita.gov.hr/UserDocsImages//dokumenti/Radioloska%20i%20nuklearna%20sigurnost/Procjene,%20istrazivanja%20i%20analize/IRRS//IRRS%20Follow-up%20Croatia%20final%20report%202019-11-25.pdf

L.3 List of Abbreviations and Acronyms

Act	Act on Radiological and Nuclear Safety, Official Gazette 141/13, 39/15, 130/17, 118/18
Bilateral Agreement	Agreement between the Government of the Republic of Croatia and the Government of the Republic of Slovenia on the Regulation of the Status and other legal Relationships, Connected with Investments in the NPP Krško, its Exploatation and Decommissioning, Official Gazette – International Agreements 9/02
CPD of MoI	Civil Protection Directorate of the Ministry of the Interior
Council Directive 2013/59/Euratom	Council Directive 2013/59/Euratom of 5 December 2013 laying down basic safety standards for protection against the dangers arising from exposure to ionising radiation, and repealing Directives 89/618/Euratom, 90/641/Euratom, 96/29/Euratom, 97/43/Euratom and 2003/122/Euratom
Council Directive 2014/87/Euratom	Council Directive 2014/87/Euratom of 8 July 2014 amending Directive 2009/71/Euratom establishing a Community framework for the nuclear safety of nuclear installations
Joint Convention	Joint Convention on Safety of Spent Fuel Management and on Safety of Radioactive Waste Management
Fund	Fund for the Financing of the Decommissioning and Disposal of Radioactive Waste and Spent Nuclear Fuel from the Krško Nuclear Power Plant
HLW	High Level Waste
IAEA	International Atomic Energy Agency
IRRS	Integrated Regulatory Review Service
IMROH	Institute for Medical Research and Occupational Health
IRB	Institute Ruđer Bošković

LILW	Low and Intermediate Level Waste
National Programme	National Programme for Implementation of the Strategy for Management of Radioactive Waste, Disused Sources and Spent Nuclear Fuel
NORM	Naturally Occurring Radioactive Materials
NPP Krško	Nuclear Power Plant Krško
OG	Official Gazette
OG - IA	Official Gazette – International Agreements
RWMC	Radioactive Waste Management Centre
Strategy	Strategy for Management of Radioactive Waste, Disused Sources and Spent Nuclear Fuel, Official Gazette 125/14