



REPUBLIC OF CROATIA

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**

5th report

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A. INTRODUCTION

The Republic of Croatia 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. Croatia signed the Joint Convention on Safety of Spent Fuel Management and on Safety of Radioactive Waste Management (further referred to as the Convention) on 9 April 1998 and ratified it 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 reviewed at the meeting organized later that year. The second, third and fourth national report was delivered in 2005, 2008 and 2011 and reviewed at the meetings held in 2006, 2009 and 2012 respectively.

This national report contains updated information on matters covered in the fourth report, noting 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. As for the form, structure and contents, the report aims to follow the most recent version of the Guidelines Regarding the Form and Structure of National Reports issued in 2012 (INFCIRC/604/Rev.2).

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

- Joining the European Union (EU),
- Advances in the policies related to the spent fuel and radioactive waste and
- Changes within the legislative and regulatory system.

Croatia applied for the EU membership already in 2003 and the European Commission recommended making it an official candidate in early 2004. Candidate country status was granted by the European Council in mid-2004. The entry negotiations began in October 2005 together with the screening procedure. After a decade-long process, accession negotiations were completed on 30 June 2011 and on 9 December 2011 the Treaty of Accession was signed. The referendum on accession was held on 22 January 2012, with 66% of participants voting in favour of joining the EU. The ratification process was concluded on 21 June 2013 and on 1 July 2013 Croatia officially became the 28th member of the EU.

At the moment of accession all EU regulations, directives and decisions became binding for Croatia. However, the change was not as significant as it may seem, because most of the binding legislative and regulatory acts, as well as most of the non-binding acts (recommendations, opinions, communications etc.), were incorporated into national legislative and regulatory system during the negotiation process, i.e. well before the accession.

Governmental Strategy on Radioactive Waste and Spent Fuel Management from 2009 is replaced with a new one nowadays (further referred to as the new Strategy). As a matter of fact this new Strategy is in the process of adoption within the Croatian Parliament presently. The Strategy is based on requirements given under the Articles 54, 55, 56 and 95 of the new Act on Radiological and Nuclear Safety (further referred to as the Act), Official Gazette No. 141 of 27 November 2013. Also, the Strategy is developed in accordance with requirements given in the Articles 10 and 11 of the Bilateral Agreement between the Government of the Republic of Croatia and the Government of the Republic of Slovenia on the settlement of status and other legal relations with respect to investments, utilization of and decommissioning of the Krško NPP (further referred to as the Bilateral Agreement), Official Gazette No. 9 of 23 July 2002 as well as in the Article 4 of the Directive 2011/70/Euratom of 19 July 2011 establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste (further referred to as the Directive 2011/70/Euratom), Official Journal L 199 of 2 August 2011.

Changes within the Croatian legislative and regulatory system in the period covered by this national report were significant. The Act on Radiological and Nuclear Safety, which is the basic legislative act in the area of the safety of spent fuel and radioactive waste management, has been replaced with the new Act having the same title. In addition, a number of relevant by-laws were issued. These by-laws are focused on the subjects such as physical protection of radioactive and nuclear materials, protection against ionising radiation, exposure limits, interventions in case of emergency and informing the public and competent bodies. Of highest relevance is the by-law regulating the supervision and control of transboundary shipments of spent fuel and radioactive waste.

B. POLICIES AND PRACTICES

The main purpose of the new Strategy is to set out goals and general guidelines for development of national framework on radioactive waste and disused sources management, naturally occurring radioactive materials management as well as development of national framework on radioactive waste and spent fuel and spent fuel management from Krško NPP. A detailed set of strategic objectives and guidelines are supposed to be elaborated within the National Programme which will be developed in accordance with requirements given in the Act (Articles 57, 58 and 59) i.e. in the Directive 2011/70/Euratom (Articles 11 and 12).

The new Strategy is based on the current status in the field of radioactive waste and disused sources management (medicine, industry, science, education and the past public use), in the field of recovery of the sites that contain naturally occurring radioactive materials as well as in the field of radioactive waste and spent fuel management from the Krško NPP. The new Strategy underlines obligations that have been taken by the Republic of Croatia in the aforementioned fields prescribed under the respective conventions, bilateral agreements, directives, and laws. Among others the new Strategy stands out an important need for development, construction and operation of the Central National Storage Facility (CNSF) for radioactive waste and disused sources generated in the country.

The major strategic goals are distributed over three time periods. These are short-term (2 years), medium-term (10 years) and long term goals (more than 10 years). These goals are broadly defined and elaborated for the each particular field of application. In order to fulfil the goals mentioned above the new Strategy sets up general guidelines regarding the legislative framework, responsibilities, funding, human resources and public participation.

In contrast to the spent fuel management that has not been practiced so far in Croatia, the management of radioactive waste has been practicing over the last 60 years. The experience gained include collection, segregation, treatment, conditioning, packing and storing of radioactive waste and disused sources generated in medicine, industry, science, education and the past public use (lightning rods and smoke detectors). There are two National Research Institutes and one technical support organisation that have been certified by State Office for Radiological and Nuclear Safety (SORNS) for providing services in the field of radioactive waste management in Croatia. These are Institute for Medical Research and Occupational Health (IMROH), Institute Ruđer Bošković (IRB) and EKOTEH private company.

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. This common solution was developed by both parties on generic way in 2004 (Programme of Krško NPP decommissioning and SF&LILW disposal plan, Revision 1, 2004) assuming construction of a spent fuel dry storage facility on-site or near-by and construction of a spent fuel disposal facility afterwards at generic site in Croatia or at generic site in Slovenia. In the meantime there have not been significant improvements of such generic solution. Therefore Croatia has developed the new Strategy which outlines the following major goals in respect to spent fuel management:

- Preparation of the programme on research and development of a dry storage facility for spent fuel from Krško NPP (short-term goal),
- Establishment of a centre for informing and educating public (short-term goal),
- Implementing the programme mentioned above (medium-term goal) and
- Preparation of the programme on research and development of a disposal facility for spent fuel from Krško NPP (long-term goal).

Some of the general guidelines that support the goals mentioned above are as follows:

- Respective legislative framework must be improved and harmonized with internationally recognized criteria and standards in the field,
- Responsibilities of all participants involved must be clearly defined,
- High degree of co-operation between relevant governmental authorities must be achieved,
- Financing will be provided in accordance with Bilateral Agreement (Article 11),
- Financial means required for implementation of activities that are foreseen must be available at the time of implementation of proper activity,
- All participants must be open to receive education and training in relevant fields of interest,
- Appropriate general requirements for all participants involved must be set up,
- Availability of information to all participants and public must be ensured and
- Public education and its right to participate in decision-making must be ensured.

Meanwhile, the spent fuel generated in the Krško NPP has been managed safely on-site by the operator and it will remain there at least up to expiration of the plant lifetime. Therefore the spent fuel management has not been practiced in Croatia so far.

B.2 RADIOACTIVE WASTE MANAGEMENT POLICY AND PRACTICE

The origins of radioactive waste in Croatia are legacy waste and radioactive waste and disused sources from medicine, industry, science, education and the past public use. Apart to this there is half of radioactive waste generated in Krško NPP that may be stored and disposed afterwards at Croatian territory. Namely, the Bilateral Agreement (Articles 10 and 11) favours development of a common solution for disposal of radioactive waste from Krško NPP. This common solution was developed by both parties on generic way in 2004 (Programme of Krško NPP decommissioning and SF&LILW disposal plan, Revision 1, 2004) assuming construction of tunnel type disposal facility at generic site in Croatia or at generic site in Slovenia. In the meantime there have not been significant improvements of such generic solution. Therefore Croatia has developed the new Strategy which outlines the following major goals in respect to management of radioactive waste and disused sources generated in the country and management of radioactive waste from Krško NPP:

- Preparation and implementation of the project on development, construction and operation of the Central National Storage Facility (short-term goal),
- Preparation of the programme on research and development of a long-term storage facility for radioactive waste from Krško NPP (short-term goal),
- Establishment of a centre for informing and educating public (short-term goal),
- Implementation of the programme on research and development of a long-term storage facility for radioactive waste from Krško NPP (medium-term goal),
- Preparation of the programme on research and development of a disposal facility for radioactive waste from Krško NPP (medium-term goal) and
- Implementation of the programme on research and development of a disposal facility for radioactive waste from Krško NPP (long-term goal).

Some of the general guidelines that support the goals mentioned above are as follows:

- Respective legislative framework must be improved and harmonized with internationally recognized criteria and standards in the field,
- Responsibilities of all participants involved must be clearly defined,
- High degree of co-operation between relevant governmental authorities must be achieved,
- Financing of legacy waste management will be ensured by the Governmental budget,
- Financing of management of newly generated radioactive waste and disused sources will be ensured by applying the polluter pay principle,

- Financing of radioactive waste management from Krško NPP will be provided in accordance with the Bilateral Agreement (Article 11),
- Financial means required for implementation of activities that are foreseen must be available at the time of implementation of proper activity,
- All participants must be open to receive education and training in relevant fields of interest,
- Appropriate general requirements for all participants involved must be set up,
- Availability of information to all participants and public must be ensured,
- Public education and its right to participate in decision-making must be ensured,
- Site selection process for radioactive waste disposal facility must be conducted with transparency to the public and
- Croatian government will actively support the development of local community in which territory disposal facility will be sited.

Radioactive waste generated in Krško NPP that belongs to the Republic of Croatia has been managed safely on-site by the operator and it will remain there at least up to expiration of the Krško regular lifetime. Therefore management of this radioactive waste has not been practiced so far in the Republic of Croatia.

Radioactive waste and disused sources from medicine, industry, science, education and the past public use are stored in two storage facilities. These are IMROH and IRB storage facilities. Both of them are closed nowadays. This is way the project on development, construction and operation of the Central National Storage Facility has been launched recently. Basic design of the facility and preliminary safety assessment is under way presently.

It should be mentioned here that, even 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, sites that contain naturally occurring radioactive material is covered by the new Strategy. Within the new Strategy the main goals as well as the general guidelines regarding the legislative framework, responsibilities, funding, human resources and public participation have been declared for this field of application.

B.3 RADIOACTIVE WASTE CATEGORIZATION

Radioactive waste categorization is covered under the Articles 13 and 14 of the Regulation on conditions and method of disposal of radioactive waste, spent sealed radioactive sources and ionising radiation sources which are not intended for further use, Official Gazette No. 44 of 16 April 2008. Given the physical and chemical properties, the radioactive waste is categorized into solid, liquid and gaseous. Given the toxicity the

radioactive waste is divided into toxic and non-toxic categories. Further categorization of solid radioactive waste due the activity concentration or total activity and half-life of the contained radionuclides is described in Table B-1.

Table B-1 Radioactive waste categorization

Radioactive Waste Category	Typical Property
Exempt and cleared radioactive waste	Activity concentrations or total radioactive waste activity at or below prescribed exemption or clearance levels.
Low level short lived radioactive waste	Radioactive waste containing radionuclides with half-life less than 100 days which will decay below clearance levels within 3 years.
Low and intermediate level radioactive waste	Radioactive waste containing radionuclides with half-life less than 30 years and activity concentration or total activity which will remain above prescribed exemption or clearance levels 3 years after their creation, and having a heat generation rate below 2 kW/m ³ .
Short lived waste	Low and Intermediate level radioactive waste containing radionuclides with half-life less than 30 years (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).
Long lived waste	Low and Intermediate level radioactive waste activity concentrations exceeding the limits for short lived waste.
High level radioactive waste	Radioactive waste thermal power above 2 kW/m ³ and activity concentrations exceeding limits for short lived waste.

Radioactive waste categorization described above is based on the recommendations given in Classification of Radioactive Waste, IAEA Safety Guide No. 111-G-1.1, 1994 and Commission Recommendation of 15 September 1999 on a classification system for solid radioactive waste, Official Journal L 265/37 of 13 October 1999. It should be noted here that revision of the above mentioned Regulation is under development and a new radioactive waste categorization is supposed to be developed in accordance with Classification of Radioactive Waste, IAEA General Safety Guide No. GSG-1, 2009.

C. SCOPE OF APPLICATION

Regarding the obligations under Article 3 of the 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

In Croatia there are no spent fuel management facilities. Furthermore, there are no nuclear facilities in operation or in the process of being decommissioned. 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 Ruder 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 activities were performed under the supervision of the former State Office for Radiation Protection. At that occasion more than 900 sources were recovered and characterised along with approximately 0.5 m³ of contaminated materials. The sources containing the radionuclide Ra-226 were transferred to the storage facility at the IRB. Remaining waste packages are still kept at the IMROH storage facility pending the transfer to the future CNSF. Further segregation and volume reduction of this waste is planned before the transfer. The storage at the IMROH contains some 0.5 m³ of short lived waste having the total activity of 6x10¹¹ Bq and approximately 1 m³ of long lived waste with the activity of 9x10¹¹ Bq. The total volume of the waste is estimated to 1.5 m³, while the total activity amounts to 1.5x10¹² Bq (Table D-1). More details about the inventory can be found in Annex K.1.

Radioactive waste storage facility at the IRB was formed in 1967 to allow for safe storage of the waste produced within this scientific institution. In 1987 the facility was enlarged so that the waste produced elsewhere can be accepted as well. Until 2013 this facility was authorized for the collection, processing and storage of all types of solid and liquid radioactive waste generated in Croatia. In 2009 the Governmental Decision was issued according to which the storage at the IRB was supposed to be upgraded to become central national storage for the radioactive waste. However, Decision has never been implemented due to the technical issues raised by the IRB and because of the public concern. In September 2013 the facility was put out of operation by the inspectors of the SORNS, as the storage conditions were not in line with the regulatory requirements. A project on remediation of the facility, meaning segregation, characterization, treatment, conditioning and packing into lead containers are launched recently. Resulting waste packages will be transferred to the future CNSF as well.

Radioactive waste collected within the storage facility at IRB is only partially characterized and conditioned. In the facility there are some 1.000 sources with short lived

radionuclides with the total activity of 1.3×10^{13} Bq. The biggest contributions to the activity come from Co-60 (76%), Ir-192 (17%), Eu-152/154 (4%) and Cs-137 (2%). Furthermore, some 25.000 sources with long lived radionuclides are stored with the total activity of 4.9×10^{11} Bq. In this case the biggest contributions come from Am-241/Be (57%), Am-241 (16%), Ra-226/Be (15%) and Ra-226 (12%). The volume of short lived waste amounts to approximately 5 m^3 , while the volume of long lived waste is estimated to 1 m^3 . In total some 26.500 sources with the activity of 1.4×10^{13} Bq and with the volume of 6 m^3 are being stored at the IRB (Table D-1). More details about the inventory can be found in Annex K.1.

From the data provided in Table D-1 it is evident that presently there is no more than some 7.5 m^3 of radioactive waste stored in Croatia. The total activity of the waste is estimated to 1.6×10^{13} Bq, where the activity of the short lived waste amounts to 1.4×10^{13} Bq, while the activity of long lived waste is approximately 1.5×10^{12} Bq.

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}	5.0	1.3×10^{13}	5.5	1.4×10^{13}
Long lived	1.0	9.1×10^{11}	1.0	4.9×10^{11}	2.0	1.5×10^{12}
Total	1.5	1.5×10^{12}	6.0	1.4×10^{13}	7.5	1.6×10^{13}

The State Office for Radiological and Nuclear Safety operates a database where the changes in the inventories of both radioactive waste storage facilities are tracked. The operators (i.e. the IMROH and the IRB) are obliged to report about every change and also to submit a complete inventory list to the SORNS on a yearly basis. The summary of the data from the database is delivered annually to the IAEA Net Enabled Waste Management Database (NEWMDB).

E. LEGISLATIVE AND REGULATORY SYSTEM

E.1 Legislative

E.1.1 Basic legislative act

In Croatia the issues related to the safety of spent fuel and radioactive waste management are almost entirely covered by the Act. The Act establishes measures for radiological safety, measures for physical protection and measures for non-proliferation of nuclear weapons in performing nuclear operations and operations involving sources of ionizing radiation. The goal is to ensure adequate protection of individuals, society and the environment against harmful effects of ionizing radiation, as well as to ensure safe performance of operations involving ionizing radiation sources, nuclear operations, radioactive waste management and physical protection of ionizing radiation sources and nuclear installations.

The Act provides solid basis for regulation, administrative processes and inspection and covers wide scope of activities. The provisions of the Act are harmonized with the following EU directives and regulations:

- Council Regulation (Euratom) No 1493/93 on shipments of radioactive substances between Member States,
- Commission Regulation (Euratom) No 302/2005 on the application of Euratom safeguards,
- Commission Regulation (Euratom) No 66/2006 exempting the transfer of small quantities of ores, source materials and special fissile materials from the rules of the chapter on supplies,
- Council Directive No 89/618/Euratom on informing the general public about health protection measures to be applied and steps to be taken in the event of a radiological emergency,
- Council Directive No 90/641/Euratom on the operational protection of outside workers exposed to the risk of ionizing radiation during their activities in controlled areas,
- Council Directive No 96/29/Euratom laying down basic safety standards for the protection of the health of workers and the general public against the dangers arising from ionizing radiation,
- Council Directive 97/43/Euratom on health protection of individuals against the dangers of ionizing radiation in relation to medical exposure, and repealing Directive 84/466/Euratom,
- Council Directive No 2003/122/Euratom on the control of high-activity sealed radioactive sources and orphan sources,

- Council Directive No 2006/117/Euratom on the supervision and control of shipments of radioactive waste and spent fuel,
- Council Directive No 2009/71/Euratom establishing a Community framework for the nuclear safety of nuclear installations and
- Council Directive No 2011/70/Euratom establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste.

The Act comprises of 102 articles structured in 15 chapters (more information on the structure and contents is provided in Section L.2). Of highest importance for this National Report is Chapter 5, i.e. Articles 49 to 59. This Chapter regulates the management of radioactive waste, disused sources and spent fuel. According to Article 49, radioactive waste and spent nuclear fuel generated in Croatia has to be disposed, in general, on Croatian territory (two exemptions related to specific situations are envisaged). The costs of the waste management have to be covered by the producers. The obligation of the producers is to make sure that the radioactive waste, disused sources and spent fuel is managed in the prescribed manner and that the transfer of the burden of waste disposal to the future generations is avoided to the greatest possible extent. The producers also have to ensure that the quantities of the radioactive waste, disused sources and spent fuel are minimized.

Article 50 deals with the approvals for the performance of operations involving the management of radioactive waste, disused sources and spent nuclear fuel. No such operation can commence before the approval is issued by the SORNS. The approvals are granted for a maximum period of 10 years.

Article 51 is related to the storage and disposal of the radioactive waste and spent fuel originating from Krsko NPP. According to this Article, the obligation of the Croatian Government is to designate legal person which will manage the waste from that origin. Within Article 52 it is prescribed that this legal person will be financed from the designated fund established by the Act on the Fund for Financing the Decommissioning of the Krsko Nuclear Power Plant and the Disposal of Radioactive Waste and Spent Nuclear Fuel (Official Gazette 107/07). On the other hand, setting up of the central national storage for radioactive waste and disused sources generated in Croatia is going to be financed by the state budget.

Article 53 prohibits any import of radioactive waste, disused sources and spent nuclear fuel to Croatia, unless otherwise regulated by international agreements. The exemption is primarily related to the radioactive waste and spent fuel originating from Krsko NPP.

Articles 54 to 56 cover the Strategy for the Management of Radioactive Waste, Spent Nuclear Fuel, Disused Sealed Radioactive Sources and Ionizing Radiation Sources Which are not Intended for Further Use (further referred to as the Strategy). The Strategy has to be proposed to the Croatian Government by the SORNS and adopted by the Parliament. As a minimum, the Strategy has to provide for the following:

- Generation of the radioactive waste, disused sources and spent nuclear fuel must be limited to the minimum reasonably achievable amount in the sense of the volume, organisation of technology and manner of management and decommissioning, including reuse of materials,
- Dependence between the phases of generation of radioactive waste, disused sources and spent nuclear fuel and their management must be taken into account in the sense of rationalising procedures and increasing efficiency and radiological and nuclear safety,
- Radioactive waste, disused sources and spent nuclear fuel must be managed in a safe manner, including long-term passive measures of radiological and nuclear safety,
- Application of measures of radiological and nuclear safety must be proportionate to the risk,
- Costs of management of radioactive waste, disused sources and spent nuclear fuel must be borne by the generators of the radioactive waste, disused sources and spent nuclear fuel,
- Process of management of radioactive waste, disused sources and spent nuclear fuel must be documented in all its phases,
- Legal or natural persons performing waste management operations have to be liable for the application of radiological and nuclear safety measures,
- An efficient legal framework with institutional infrastructure for the management of radioactive waste, disused sources and spent nuclear fuel must be secured in a long term,
- Management of radiological and nuclear safety must be established in the facilities and for the installations included in the performance of waste management operations,
- Performance of waste management operations must be secured in a manner that undoubtedly demonstrates long-term justification of the selected manner of performing the operation, on the basis of its contribution to the general good,
- In the course of performance of waste management operations radiological and nuclear safety must be optimised in a manner that ensures the highest reasonably achievable level of radiological and nuclear safety,
- Risk limitation must ensure that the burden on an individual or the environment due to performance of waste management operations be below the permitted limits
- Protection of the present and future generations against risks arising from performance of waste management operations must be provided,
- All possible efforts must be taken in order to prevent an emergency which could arise due to performance of the waste management operations,
- Arrangements necessary for a response in the case of an emergency must be established and maintained and

- Activities for the protection from and/or mitigation of consequences of an emergency must be justified and optimised in a manner that ensures contribution to the general good.

In order to facilitate the implementation of the Strategy, dedicated National Programme has to be prepared with the coordination of the SORNS and adopted by the Government. The Programme and its contents are covered by the Articles 57 to 59. The implementation of the National programme will be monitored by the SORNS. Also, the SORNS will initiate periodical revisions of the Programme based on gathered experience and the best technical and scientific practice.

E.1.2 Most important by-laws

The most important by-laws related to the safety of spent fuel management and radioactive waste management are the following ones:

- 1) Ordinance on Performing Nuclear Activities (Official Gazette 74/06),
- 2) Regulation on Conditions and Method of Disposal of Radioactive Waste, Spent Sealed Radioactive Sources and Ionising Radiation Sources Which are not Intended for Further Use (Official Gazette 44/08),
- 3) Ordinance on Conditions for Nuclear Safety and Protection With Regard to the Siting, Design, Construction, Use and Decommissioning of a Facility in Which a Nuclear Activity is Performed (Official Gazette 71 /08),
- 4) Ordinance on the Requirements for the Design, Construction and Removal of Structures Accommodating Sources of Ionising Radiation or in Which Practices Involving Sources of Ionising Radiation Take Place (Official Gazette 99/08),
- 5) Ordinance on Physical Protection of Radioactive Materials, Nuclear Materials and Nuclear Objects (Official Gazette 38/12),
- 6) Regulation on Measures for Protection Against Ionising Radiation and Interventions in Case of Emergency (Official Gazette 102/12),
- 7) Ordinance on the Scope and Content of the Plan and Programme of Measures in the Event of an Emergency and of Informing the Public and Competent Bodies (Official Gazette 123/12),
- 8) Ordinance on the Supervision and Control of Transboundary Shipments of Radioactive Waste and Spent Fuel (Official Gazette 11/13),
- 9) Ordinance on Conditions and Measures for the Protection Against the Ionizing Radiation in Performing the Activities with Radioactive Sources (Official Gazette 41/13) and
- 10) Ordinance on Exposure Limits (Official Gazette 59/13).

The by-laws listed under 1) to 4) were described within the previous National Report. Other by-laws, i.e. the ones not covered by the previous National Report, are briefly described hereafter.

The **Ordinance on Physical Protection of Radioactive Materials, Nuclear Materials and Nuclear Objects** prescribes the scope and contents of safety plans, safety requirements and physical protection measures related to the utilization and transport of radioactive and nuclear materials and to the nuclear objects. It also covers the categorization of radioactive sources according to so-called A/D ratios, as well as the categorization of nuclear materials.

The **Regulation on Measures for Protection Against Ionising Radiation and Interventions in Case of Emergency** prescribes the response to emergencies which may occur in practices involving sources of ionizing radiation and nuclear activities as well as the measures for the protection against ionizing radiation and interventions to be taken in case of emergency. Within the Regulation threat categories are defined and the principles of justification, optimization and dose limitation are introduced. Moreover, the roles and responsibilities within the emergency preparedness and response system are specified. Finally, the number and contents of so-called SOPs (Standard Operational Procedures) is determined. Those SOPs, together with the Regulation itself, should form the national emergency preparedness and response plan for the case of nuclear and radiological accident. The Regulation conforms to the Council Directive No 89/618/Euratom.

The **Ordinance on the Scope and Content of the Plan and Programme of Measures in the Event of an Emergency and of Informing the Public and Competent Bodies** prescribes the scope and contents of the emergency plans which have to be prepared by the users of radioactive sources, by the performers of nuclear activities and by the operators of nuclear facilities. It provides the guidelines on how the effectiveness of such plans should be evaluated. In addition, the Ordinance defines which data should be provided to the public and to the authorities, as well as how and when the data should be made available.

The **Ordinance on the Supervision and Control of Transboundary Shipments of Radioactive Waste and Spent Fuel** applies when the radioactive waste or spent fuel is being exported, imported or transferred through the Croatian territory and when the quantities and concentrations exceed the exemption levels. The Ordinance is not applicable when used sealed sources are being sent back to the supplier or producer, for the shipments of radioactive materials processed for further use or for the shipments containing only naturally occurring radioactive material. Shipments within the boundaries of the EU and shipments to or from the countries which are not the members of the EU are regulated separately. The Ordinance prohibits the shipments to the destinations south of 60 degrees south latitude, to the contracting parties of the Contonou Agreement which are not EU member states and to any country which, according to the opinion of the SORNS, does not have adequate administrative, technical and regulatory capacities to safely manage radioactive waste or spent fuel. The Ordinance is in line with the Council Directive No 2006/117/Euratom.

The **Ordinance on Conditions and Measures for the Protection Against the Ionizing Radiation in Performing the Activities with Radioactive Sources** conforms with the Council Directive No 96/29/Euratom, Council Directive 97/43/Euratom and Council Directive 2003/122/Euratom. The Ordinance prescribes the conditions and measures for the protection against the ionizing radiation in performing the operations with radioactive sources. It covers the exemption levels for the radionuclides, the requirements for the premises in which radioactive sources are used or stored, working conditions, exposure conditions and other technical and organizational measures. It also regulates quality assurance programmes which have to be implemented by all those who are authorized to perform operations involving ionizing radiation.

The **Ordinance on Exposure Limits** defines relevant parameters such as the absorbed dose, effective dose, equivalent dose, collective dose, weighting coefficients etc. and sets the exposure limits applicable to the professionals, persons being educated for working with radiation sources and members of the public. It prescribes the exposure limits to be applied for professionals in case of an emergency, as well as action and intervention levels for protecting the population. It also regulates exposure to radon at the workplace and at home. The Ordinance is in line with the Council Directive No 96/29/Euratom and Council Directive 97/43/Euratom.

It should be emphasized that the Regulation listed above under 2) is still the most important by-law in the area of interest. As this Regulation is issued in 2008 and does not conform to the latest guidelines on clearance and exemption levels.

E.1.3 Other legislative and regulatory acts

In addition to the basic law and the most important by-laws outlined above, a number of other legal acts have some bearing in the area of the safety of radioactive waste and spent fuel management. Such legal acts are listed in Section L.3. The list includes acts, regulations, ordinances, strategies, plans, multilateral agreements and bilateral agreements.

It is believed that the Act on Radiological and Nuclear Safety together with its by-laws, the Strategy and other legislative and regulatory acts forms the framework which is capable of fulfilling all the requirements set within the Article 19 of the Convention.

E.2 REGULATORY BODY

The regulatory body entrusted with the implementation of the legislative and regulatory framework referred to in Article 19 of the Convention is the SORNS. According to the Act on Radiological and Nuclear Safety (Article 7) the SORNS, as the state administration body, is the competent authority for all activities pertaining to radiological and nuclear safety, as well as for the activities pertaining to storage of radioactive waste and disused sources of domestic origin in the central national storage. So far the SORNS has not been involved in

any activity which would jeopardise the independence of its regulatory function. Although at the moment the SORNS is considerably understaffed, once this problem is solved it should have adequate authority, competence and human resources to fulfil its assigned responsibilities.

F. OTHER GENERAL SAFETY PROVISIONS

The provisions set in Articles 21 to 26 of the Convention are generally delineated in new Act on Radiological and Nuclear Safety (Official Gazette 141/13) and further specified by the regulations described in Section E.1.2 and listed in Section L.3. Considering Article 21, the Act prescribes that the holders of the licence for performing the activities involving ionizing radiation sources or nuclear activities are responsible for the implementation of radiological and nuclear safety measures and have to bear all associated costs. The measures have to be implemented in line with the principles of justification, optimization and dose limitation. Moreover, the licence holders whose operations result in radioactive contamination of the environment or the ones who incur damage because of the loss of control over the source or for some other reason have to cover the costs of the remediation. If the licence holder is not in a position to carry out the remediation, cannot be defined or is out of reach, the costs of the remediation have to be covered from the state budget. Related to Article 22 of the Convention, the Act requires for all personnel who handle ionizing radiation sources and/or is exposed to ionizing radiation to be adequately educated. The knowledge has to be refreshed and checked periodically. Similar is expected from the personnel employed in nuclear facilities. Considering Article 23, all licence holders have to establish and implement quality assurance programmes which have to be audited and re-certified periodically. Licence holders for nuclear facilities have to plan and systematically carry out quality assurance measures focused on the facility components, process control systems and maintenance. In relation to Article 24, the Act addresses a number of issues such as the dose limits, age limits, protection during pregnancy and breastfeeding, education, personal dosimetry, self-protection measures, requirements concerning the premises and devices etc. Considering Article 25, it is prescribed that each licence holder has to prepare the plan and programme of the measures to be implemented in case of emergency. Plans and programmes have to be verified by the SORNS. Related to Article 26, for radioactive waste and nuclear facilities appropriate decommissioning arrangements have to be established (where applicable) before the operational license is granted.

The regulations which were issued after previous National Report and which are relevant for Articles 21 to 26 of the Convention are the following ones:

- 1) Ordinance on Physical Protection of Radioactive Materials, Nuclear Materials and Nuclear Objects (Official Gazette 38/12),
- 2) Ordinance on Conditions and Measures for the Protection Against the Ionizing Radiation in Performing the Activities with Radioactive Sources (Official Gazette 41/13),
- 3) Ordinance on Exposure Limits (Official Gazette 59/13),
- 4) Ordinance on Health Conditions of the Exposed Workers and Persons Being Educated to Work with the Ionizing Radiation Sources (Official Gazette 80/13),

- 5) Ordinance on the Personal Dosimetry, on the Examination of Ionizing Radiation Sources and Working Conditions and on the Reports and Inquest Registers (Official Gazette 41/12, amended 89/13),
- 6) Regulation on Measures for Protection Against Ionising Radiation and Interventions in Case of Emergency (Official Gazette 102/12),
- 7) Ordinance on the Scope and Content of the Plan and Programme of Measures in the Event of an Emergency and of Informing the Public and Competent Bodies (Official Gazette 123/12) and
- 8) Ordinance on Permissions and Allowances for the Application and Transport of the Ionizing Radiation Sources (Official Gazette 71/12, amended 89/13).

The Ordinance under 1) is relevant for Articles 21 and 22. It prescribes the responsibilities of the licence holders concerning the security of the radioactive and nuclear materials. The Ordinance is briefly described in Section E.1.2.

The Ordinance listed under 2) is already described as well. It is important for Article 23 because it defines the scope of the quality assurance programme which has to be established by the holders of the licence for performing the activities involving ionizing radiation sources. It also prescribes the responsibilities concerning the implementation of the programme, as well as the scope and the form of the quality control manuals.

The Ordinances under 3) to 5) are of relevance for Article 24. The Ordinance listed under 3) is described in Section E.1.2. The Ordinance under 4) sets the requirements on health conditions for exposed workers and students which have to be fulfilled in advance and during the performance of the activities involving ionizing radiation sources. It is in line with the Council Directive 96/29/Euratom. The Ordinance under 5) defines in which way and how often personal exposure has to be measured, how to test ionizing radiation sources and how to determine the levels of the radioactive contamination.

The Ordinances listed under 6) to 8) are of importance for Article 25. The Ordinances under 6) and 7) are already described in Section E.1.2. The Ordinance under 8) is relevant because it introduces the requirement for performing risk analyses and provides the guidelines on how such analyses should be carried out and documented.

G. SAFETY OF SPENT FUEL MANAGEMENT

Spent fuel management has not been practiced in the Republic of Croatia so far. Possible future scope of practice in the field is supposed to be elaborated within National Programme that will be developed up to 23 August 2015. National Programme will be developed in accordance with provisions prescribed under the Articles 57, 58 and 59 of the Act i.e. under the Articles 11 and 12 of the Directive 2011/70/Euratom. Therefore, until then the safety of spent fuel management in the Republic of Croatia will not be an issue. For the purpose of this report it should be noted that obligations prescribed under Articles 4 – 10 of the Convention are transposed into the Act (Article 55 – General safety requirements, Article 14 – Siting of proposed facilities, Articles 15 and 16 – Design and construction of facilities, Articles 40, 41, 42 and 43 – Assessment of facilities and Article 17 – Operation of facilities).

H. SAFETY OF RADIOACTIVE WASTE MANAGEMENT

Obligations that are prescribed under Article 11 (general safety requirements) of the Convention are fully transposed into the Act (Article 55) as well as into the new Strategy (General principles). Therefore it is supposed that obligations prescribed will be applied as prescribed during the execution of the new Strategy goals.

There are two storage facilities for radioactive waste in Croatia. These are IMROH and IRB storage facilities. Radioactive waste and disused sources stored originates from medicine, industry, science, education and from the past public use (lighting rods and smoke detectors).

IMROH storage facility has been operated from 1995 up to 2000 when it is closed. Remediation works assuming segregation, characterization, conditioning and packing in lead containers were undertaken in June 2006 with full assistance of the IAEA. Work was performed under the supervision of former State Office for Radiation Protection. Conditioned waste and used sources are temporary stored at the IMROH facility pending transfer to the future Central National Storage Facility. IMROH storage facility is under 24 hour surveillance with CCTV system. Further segregation and volume reduction of this radioactive waste is planned before the transport and placement to the CNSF.

IRB storage facility was built in 1967 for the purpose of storing radioactive waste and disused sources generated within the Institute. As the time was passing by the storage facility has been used for storing radioactive waste and disused sources that was generated outside the Institute. Because storage capacity has become insufficient in 1987 it was expanded with the additional storing room and with room for radioactive waste treatment. According to the Government Decision in 2009 the IRB storage facility has been designated as the CNSF. Decision has never been implemented due to the technical issues raised by the IRB and because of the public concern. Nowadays, because storage conditions were not in line with the regulatory requirements the IRB storage facility is sealed and a remediation project that assumes segregation, characterization, treatment, conditioning and packing of radioactive waste and disused sources was launched. After the project execution resulting radioactive packages will be transported and placed into the CNSF.

According to the new Strategy CNSF is supposed to be developed, constructed and operated within two years from now. Therefore the related project has been launched recently. Development of a basic design of the facility and preliminary safety assessment is under way presently. Major safety requirements that are under implementation for these purposes are those given in Predisposal Management of Radioactive Waste, IAEA Safety Standards, General Safety Requirements, No. GSR Part 5, 2009, Storage of Radioactive Waste, IAEA Safety Standards, Safety Guide, No. WS-G-6.1, 2006 and The Safety Case and Safety Assessment for the Predisposal Management of Radioactive Waste, IAEA Safety Standards, General Safety Guide, No. GSG-3, 2013. However, it should be noted here that obligations

prescribed under Articles 12 – 17 of the Convention are transposed into the Act as well as into the new Strategy. Therefore it is supposed that obligations will be applied as prescribed during the execution of the new Strategy goals.

I. TRANSBOUNDARY MOVEMENT

The Act explicitly bans any import of radioactive waste, disused sources or spent fuel to the country, unless differently prescribed by international agreements. New Ordinance on the Supervision and Control of Transboundary Shipments of Radioactive Waste and Spent Fuel (Official Gazette 11/13) ensures that transboundary movement is undertaken in a manner consistent with the provisions of Article 27 of the Convention. The Ordinance, already described in Section E.1.2, is also in line with the provisions of the Council Directive No 2006/117/Euratom.

In relation to the transboundary movement, it should be mentioned that sub-regional cooperation between ex-Yugoslavian countries regarding the cross-border control of nuclear and other radioactive materials is still active. This cooperation, initiated in 2007, involves Bosnia and Herzegovina, Montenegro, FYR Macedonia, Slovenia, Serbia and Croatia. Within the scope of the cooperation information and data exchange protocols are being established which enable survey of suspicious transports and control over potential illicit trafficking in or through the region. As an example, in July 2013 the Protocol on the Means of Information and Data Exchange between the State Regulatory Agency for Radiological and Nuclear Safety of Bosnia and Herzegovina and the State Office for Radiological and Nuclear Safety of the Republic of Croatia has been established. The Protocol contains step-by-step instructions on how to proceed if undeclared nuclear or other radioactive material is detected at the border crossing. It is focused on particular railway border crossings where the situation requires special arrangements. As the legislative and regulatory framework in Western Balkan countries continues to improve, it is planned to further strengthen already existing sub-regional cooperation.

J. DISUSED SEALED SOURCES

In Croatia ionizing radiation sources are used mainly in medicine, industry and scientific research. The data from the SORNS database indicate that in July 2014 there were 40 users of the sealed sources belonging to the categories 1, 2, 3 or 4 (according to the IAEA classification scheme). Those users were in a possession of 138 such sources altogether (6, 9, 28 and 95 sources in the categories 1, 2, 3 and 4 respectively) (Table J-1).

Table J-1 Sealed sources in use (category 1,2, 3 and 4)

County	Sealed sources by categories				Total
	1	2	3	4	
Bjelovar-Bilogora					
Brod-Posavina		2	3	1	6
Dubrovnik-Neretva					
Istria				1	1
Karlovac				1	1
Koprivnica-Krizevci				5	5
Krapina-Zagorje					
Lika-Senj					
Medimurje					
Osijek-Baranja				9	9
Pozega-Slavonia				3	3
Primorje-Gorski Kotar		1	3	13	17
Sisak-Moslavina				1	1
Split-Dalmatia		1	3	10	14
Sibenik-Knin					
Varazdin					
Virovitica-Podravina				1	1
Vukovar-Syrmia				5	5
Zadar					
City of Zagreb	6	5	19	39	69
Zagreb County				6	6
Total	6	9	28	95	138

Sealed sources which are currently in use are not distributed uniformly across the Croatian territory (Figure J-1). Actually, more than 72% of the sources are concentrated in 3 counties: the City of Zagreb (69), Primorje-Gorski Kotar (17) and Split-Dalmatia (14). All sealed sources belonging to the category 1 are located in the City of Zagreb, as well as 56% of the category 2 sources, 68% of the category 3 sources and 41% of the category 4 sources. Since there are no sealed sources manufacturers in Croatia, all such sources are being imported.



Figure J-1 Locations of the sealed sources in use (category 1, 2, 3 and 4)

The status of disused sealed sources within the framework of Croatian national legislation hasn't changed in the period after the submittal of the previous National Report. According to the Regulation on Conditions and Method of Disposal of Radioactive Waste, Spent Sealed Radioactive Sources and Ionising Radiation Sources Which are not Intended for Further Use (Official Gazette 44/08), the obligation of the owner or the user of disused sealed source is to ensure that the source is adequately managed and to cover all associated costs. Each disused sealed source firstly has to be offered to those who would use it for other purposes. If such users do not exist, the source has to be transported to the central national

repository. The dismantling of the source and the transport to the repository 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 3 years. In order to minimize waste generation, the Regulation obliges the users to contractually bind the manufacturers to take back each disused sealed source with activity which remains above 100 MBq longer than 10 years after the delivery.

The SORNS is keeping records on the sealed sources in use, on the disused sealed sources kept locally at the storages of the owners/users, as well as on the disused sealed sources kept at two radioactive waste storages.

K. PLANNED ACTIVITIES TO IMPROVE SAFETY

Croatian representatives were actively participating at the Review Meeting of Contracting Parties to the Convention organized in 2012. Questions put to the Croatian representatives were mostly related to Krško NPP decommissioning project, long-term policies regarding the joint management of Krško NPP spent fuel and radioactive waste and the establishment of the centralised national storage facility for the radioactive waste and disused sources generated in the country. These issues have received appropriate attention in this Report.

At the Meeting the following has been identified as the challenges to be dealt with in the forthcoming period:

- Reaching common solution for Krško NPP low and intermediate level radioactive waste management by 2013 and for the spent fuel management by 2018,
- Establishment and licensing of the central national storage facility and
- Improving public participation and involvement in the process of site selection for waste storage and disposal facilities for radioactive waste.

All listed challenges are still remain. The common solution on radioactive waste from the Krško NPP has not been reached yet. This was the main reason for development of a new Strategy actually. The common solution for spent fuel, meaning construction of a spent fuel dry storage facility on-site has a pretty good chance to be reached in the few years that follow. Project on development, construction and operation of the CNSF has been launched recently. Expectation is that it will be completed during the next two years. A certain step ahead in respect to public involvement has been achieved meanwhile. In fact, the new Strategy has passed public hearing successfully.

L. ANNEXES

L.1 INVENTORY OF RADIOACTIVE WASTE

Table K-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 K-2 Sources with short lived radionuclides at the storage facility operated by the Institute Ruder Bošković

Radionuclide	Number of sources	Total activity (Bq)
H-3	2	1.1×10^{10}
Na-22	2	5.1×10^2
Fe-55	11	1.6×10^9
Co-57	11	4.7×10^7
Co-60	8	1.9×10^9
	80	2.0×10^{10}
	3	n/k
	42	1.0×10^{13}
Kr-85	6	7.2×10^9
Sr-90	35	1.7×10^{10}
	6	n/k
Ru-106	11	2.8×10^6
Cd-109	5	1.3×10^7
Ba-133	2	8.1×10^4
Cs-137	250	3.0×10^{11}
	2	n/k
	13	2.6×10^9
Pm-147	8	3.6×10^3
Eu-152/154	188	5.6×10^{11}
	5	n/k
	2	4.9×10^9
Ir-192	305	2.3×10^{10}
	25	2.2×10^{12}
	3	1.7×10^7
Tl-204	9	2.2×10^6

n/k - not known

Table K-3 Sources with long lived radionuclides at the storage facility operated by the Institute Rudjer Boskovic

Radionuclide	Number of sources	Total activity (Bq)
Ni-63	5	2.0×10^9
Am-241/Be	19	2.8×10^{11}
Am-241	16.857	1.4×10^{10}
	7.140	n/k
	700	4.4×10^7
	9	6.5×10^{10}
Ra-226/Be	2	7.4×10^{10}
Ra-226	367	3.7×10^6
	28	n/k
	328	5.3×10^{10}
	1	3.7×10^7
	13	4.0×10^9
	4	n/k
	2	5.6×10^5
	3	n/k
Th-232	3	n/k
Depleted uranium	10	n/k
n/k	3	n/k

n/k - not known

L.2 STRUCTURE AND CONTENTS OF NEW ACT ON RADIOLOGICAL AND NUCLEAR SAFETY

In Croatia the basic legislative act related to the safety of spent fuel management and radioactive waste management is the Act on Radiological and Nuclear Safety. On 1 December 2013 former Act published in 2010 has been replaced with new one carrying the same title (Official Gazette 141/13). New Act on Radiological and Nuclear Safety comprises of 15 chapters and 102 articles. The structure and the contents are as follows:

I. GENERAL PROVISIONS

- Subject matter
- Exemption from the application of the Act
- Definitions
- Council for Radiological and Nuclear Safety

II. STATE OFFICE FOR RADIOLOGICAL AND NUCLEAR SAFETY

- Competencies of the State Office for Radiological and Nuclear Safety
- Appointment of the head

III. APPROVALS AND LICENCES

- Approval for performance of operations involving ionizing radiation sources
- Licence for use of ionising radiation sources
- Exemption from the requirement to obtain the approval or licence for use
- Announcement of the intention to perform operations
- Approval for performance of nuclear operations
- Analysis of the safety of the area selected for the location of a nuclear installation
- Construction works affecting nuclear safety
- Approval for the construction of a nuclear installation
- Trial operation of a nuclear installation
- Approval of the use permit
- Withdrawal of the approval for performance of operations involving ionizing radiation sources, the licence for use of ionizing radiation sources and the approval for performance of nuclear operations
- Responsibilities of holders of the approval for performance of operations involving ionizing radiation sources and holders of the approval for performance of nuclear operations
- Import, export, transport and transit

IV. RADIOLOGICAL AND NUCLEAR SAFETY

1. Principles of radiological safety

2. Measures of radiological safety

Dose limits

Age limits for exposed workers, apprentices and students

Protection during pregnancy and breastfeeding

Medical exposure

Personal dose measurement

Medical fitness

Obligations of educational institutions

Requirements concerning premises and devices

Obligations of the holder of the approval

Method, scope and deadlines for measurements and inspections, content of the report, frequency, deadlines and reporting procedure

Obligation to implement self-protection measures

Person responsible for protection against ionizing radiation

Prohibition to use radioactive substances

3. Nuclear Safety

Prohibition and responsibility for the safety of nuclear installations

Use of operating experience

Periodic safety review

Reporting on the operation of an installation

4. Authorised professional technical services and authorised nuclear safety experts

Authorised professional technical services

Authorised nuclear safety experts

Foreign legal or natural persons

5. Quality assurance

6. Professional competency

V. RADIOACTIVE WASTE AND SPENT NUCLEAR FUEL

Management of radioactive waste, disused sources and spent nuclear fuels

Approval for performance of operations involving management of radioactive waste, disused sources and spent nuclear fuel

Disposal and storage pursuant to bilateral commitments

Financing the management of radioactive waste, disused sources and spent nuclear fuel

Prohibition to import radioactive waste and spent nuclear fuel

Strategy for management of radioactive waste, spent nuclear fuel, disused sealed radioactive sources and ionizing radiation sources which are not intended for further use

VI. REPONSE TO AN EMERGENCY

Plan and programme of measures for protection in emergency cases

Obligations of the holder of the approval in the planning of an emergency response

International notifications and cooperation

Remediation

Subsidiary liability of the Republic of Croatia

Remediation of an area of permanent exposure

VII. PHYSICAL PROTECTION OF IONIZING RADIATION SOURCES AND NUCLEAR INSTALLATIONS

VIII. NON-PROLIFERATION OF NUCLEAR WEAPONS

Licenses and prohibition to produce possess and use nuclear materials and special equipment

IX. MONITORING THE STATUS OF RADIOACTIVITY IN THE ENVIRONMENT

X. REPORTING AND SELF-ASSESSMENT OBLIGATIONS

Reporting obligation

Content of the report

Obligation and implementation of self-assessment

XI. REGISTERS

Obligation to keep registers and their content

XII. FINANCIAL OBLIGATIONS

Provision of financial resources for ensuring safety of a nuclear installation

XIII. INSPECTION SUPERVISION

Inspectors

Official identification card and badge

Inspectors' rights, obligations and powers

XIV. PENAL PROVISIONS

Misdemeanours

XV. TRANSITIONAL AND FINAL PROVISIONS

L.3 RELEVANT LEGISLATION IN FORCE (AS OF SEPTEMBER 2014)

The list provided below includes all legislation and regulation cited in Section E, as well as other legal acts relevant for the spent fuel management and/or radioactive waste management.

L.3.1 Acts

- Act on Liability for Nuclear Damage (Official Gazette 143/98)
- Act on Protection and Rescue (Official Gazette 174/04, amended 79/07, 38/09 and 127/10)
- Dangerous Goods Transport Act (Official Gazette 79/07)
- Act on Fund for Krško NPP Decommissioning, Radioactive Waste and Spent Nuclear Fuel Management (Official Gazette 107/07)
- Act on Sanitary Inspections (Official Gazette 113/08, amended 88/10)
- Act on Criminal Procedure (Official Gazette 152/08, amended 76/09, 80/11, 121/11, 91/12, 143/12, 56/13 and 145/13)
- Act on Radiological and Nuclear Safety (Official Gazette 141/13)

L.3.2 Regulations

- Regulation on Conditions and Method of Disposal of Radioactive Waste, Spent Sealed Radioactive Sources and Ionising Radiation Sources Which are not Intended for Further Use (Official Gazette 44/08)
- Regulation on Measures for Protection Against Ionising Radiation And Interventions in Case of Emergency (Official Gazette 102/12)

L.3.3 Ordinances

- Ordinance on Performing Nuclear Activities (Official Gazette 74/06)
- Ordinance on Special Requirements Which Expert Organisations Must Fulfil in Order to Perform Certain Activities in the Field Of Nuclear Safety (Official Gazette 74/06)
- 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 (Official Gazette 114/07)
- Ordinance on Radioactive Decontamination, Radioactive Source Management and Carrying Out Of All Other Necessary Measures in Order to Reduce Impacts on

Human Health and Environment or to Avoid Additional Risks, Dangers or Damages (Official Gazette 53/08)

- Ordinance on Conditions for Nuclear Safety and Protection With Regard to the Siting, Design, Construction, Use and Decommissioning of a Facility in Which a Nuclear Activity is Performed (Official Gazette 71 /08)
- Ordinance on the Requirements for the Design, Construction and Removal of Structures Accommodating Sources of Ionising Radiation or in Which Practices Involving Sources of Ionising Radiation Take Place (Official Gazette 99/08)
- Ordinance on the Official Identity Card and Badge of the Radiological and Nuclear Safety Inspector (Official Gazette 28/11)
- Ordinance on Required Professional Training for Operating Sources of Ionising Radiation and for the Application of Measures for Protection Against Ionising Radiation (Official Gazette 63/11)
- Ordinance on Giving Permissions to the Expert Technical Services to Perform Expert Tasks Related to the Ionizing Radiation (Official Gazette 72/11)
- Ordinance on Physical Protection of Radioactive Materials, Nuclear Materials and Nuclear Objects (Official Gazette 38/12)
- Ordinance on the Personal Dosimetry on the Examination of Ionizing Radiation Sources and Working Conditions and on the Reports and Inquest Registers (Official Gazette 41/12, amended 89/13)
- Ordinance on Permissions and Allowances for the Application and Transport of the Ionizing Radiation Sources (Official Gazette 71/12, amended 89/13)
- Ordinance on the Scope and Content of the Plan and Programme of Measures in the Event of an Emergency and of Informing the Public and Competent Bodies (Official Gazette 123/12)
- Ordinance on the Supervision and Control of Transboundary Shipments of Radioactive Waste and Spent Fuel (Official Gazette 11/13)
- Ordinance on Conditions and Measures for the Protection Against the Ionizing Radiation in Performing the Activities with Radioactive Sources (Official Gazette 41/13)
- Ordinance on the Conditions and Procedure for Issuing and Withdrawing the Approval for Packaging Used for Transport of Radioactive and Nuclear Materials (Official Gazette 42/13)
- Ordinance on Exposure Limits (Official Gazette 59/13)
- Ordinance on Health Conditions of the Exposed Workers and Persons Being Educated to Work with the Ionizing Radiation Sources (Official Gazette 80/13)

- Ordinance on the Conditions for Application of Ionizing Radiation Sources in Medicine and Dentistry (Official Gazette 89/13)
- Ordinance on the Monitoring of the Radioactivity in the Environment (Official Gazette 121/13)

L.3.4 Strategies and Plans

- National Energy Strategy (Official Gazette 130/09)
- Protection and Rescue Plan for the Republic of Croatia (Official Gazette 96/10)
- Threat Assessment for the Republic of Croatia for the Case of Natural and Technological Disasters and Severe Accidents (2013)
- Strategy for Management of Radioactive Waste and Spent Nuclear Fuels (2014)

L.3.5 Multilateral agreements

- Joint Protocol Relating to the Application of the Vienna Convention and the Paris Convention (Official Gazette 12/93)
- Convention on Nuclear Safety (Official Gazette 13/95)
- Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (Official Gazette 03/99)
- Convention on the Physical Protection of Nuclear Material (Official Gazette 05/01, amended 5/06)
- Vienna Convention on Civil Liability for Nuclear Damage (Official Gazette 01/06)
- Convention on Assistance in the Case of a Nuclear Accident of Radiological Emergency (Official Gazette 01/06)
- Convention on Early Notification of a Nuclear Accident (Official Gazette 01/06)

L.3.6 Bilateral agreements

- Agreement Between the Republic of Croatia and the International Atomic Energy Agency for Application of Safeguards in Connection with the Treaty on Non-proliferation of Nuclear Weapons (Official Gazette 13/94)
- Agreement Between the Republic of Croatia and the Republic of Slovenia on the Early Exchange of Information in the Event of a Radiological Emergency (Official Gazette 09/98 and 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 (Official Gazette 11/99)

- Protocol Additional to Agreement Between the Republic of Croatia and the International Atomic Energy Agency for the Application of Safeguards in Connection with the Treaty on the Non-proliferation of Nuclear Weapons (Official Gazette 7/00)
- 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 (Official Gazette 09/02)
- Protocol on the Means of Information and Data Exchange Between the State Regulatory Agency for Radiological and Nuclear Safety of Bosnia and Herzegovina and the State Office for Radiological and Nuclear Safety of the Republic of Croatia (2013)