Republic of Croatia

CROATIAN REPORT ON NUCLEAR SAFETY

9TH CROATIAN NATIONAL REPORT ON THE IMPLEMENTATION OF THE OBLIGATIONS UNDER THE CONVENTION ON NUCLEAR SAFETY

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Impressum

9th Croatian National Report on the Implementation of the Obligations under the Convention on Nuclear Safety in accordance with Article 5 of the IAEA's Convention on Nuclear Safety

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CONTENTS

LIST OF FIGURES

ABBREVIATIONS

CPD	Civil Protection Directorate
DS	Dissused Sources
EU	European Union
HERCA	Heads of the European Radiological Protection Competent Authorities
IAEA	International Atomic Energy Agency
IRRS	Integrated Regulatory Review Service (performed by the IAEA)
LILW	Low and Intermediate Level Waste
MoI	Ministry of the Interior
NPP	Nuclear Power Plant
OG	Official Gazette
OG IA	Official Gazette - International Agreements
PWR	Pressurized Water Reactor
RW	Radioactive Waste
VVER	Vodo Vodnoj Energetičarskij Reaktor

SUMMARY

The Republic of Croatia is a country without nuclear installations and without the intention to build such installations in the near future. In the early 80s state power utilities of Croatia and Slovenia constructed the Krsko Nuclear Power Plant (NPP) in Slovenian territory, some 10 kilometers from the Croatian national border. Currently, two states share the nuclear liability and the ownership of the Krsko NPP. As the facility is located in Slovenia, it is subject of Slovenian law, meaning that the Croatian regulatory body does not have any authorities regarding its operation.

Although without nuclear installations, Croatia applies widely recognized principles and tools to achieve and maintain a high level of nuclear safety. This report illustrates how the objectives of *the Convention on Nuclear Safety* have been achieved. It refers to the period from September 2019 till July 2022. In the report the articles of *the Convention* which are applicable for Croatia are addressed, namely Article 4 (Implementing Measures), 7 (Legislative and Regulatory Framework), 8 (Regulatory Body), 11 (Financial and Human Resources), 15 (Radiation Protection) and 16 (Emergency Preparedness). As Croatia hosted the IRRS Follow-up mission from 21 to 29 October 2019, the findings and recommendations related to each article are provided.

Article 4 is of general nature and it is addressed simply by declaring that the approach taken in Croatia allows for continuous fulfillment of all the applicable requirements of the Convention. This follows from the legislative, regulatory and administrative measures implemented.

Article 7 is covered by describing *the Act on Radiological and Nuclear Safety* as the main legislative instrument in the area of interest and by providing basic information about the most important regulatory acts. The *Strategy for the Management of Radioactive Waste, Disused Sources and Spent Nuclear Fuel* and the *National Programme* are also described. The recommendations and suggestions of the IRRS Follow-up mission regarding the legislative and regulatory framework are presented.

Article 8 is addressed by describing the responsibilities and the organization of Civil Protection Directorate of Ministry of the Interior (CPD of MoI) established for the purpose of conducting all professional and administrative tasks in the field of radiological and nuclear safety. The challenge regarding the limited staff is explained and the related IRRS Follow-up mission findings are presented.

Articles 11 and 15 are only partially applicable for Croatia. Article 11 is covered by explaining Croatian obligations towards the management of the radioactive waste and spent fuel from Krsko NPP and by describing how the obligations are fulfilled. Article 15 is addressed by providing the information on how the radiation exposure of the public is controlled, especially the exposure related to the operational discharges from Krsko NPP. The procedure for the surveillance of nuclear propelled vessels which enter Croatian territorial waters is also described.

Article 16 is again extensively addressed because the process of changes addressed in in *the 8th Croatian National Report on the Implementation of the Obligations under the Convention on Nuclear Safety* has continued in the timeframe of this report. Firstly, the overview of the emergency management system is given covering the hazards, emergency preparedness categorization and roles and responsibilities in the emergency preparedness and response. Following that, important international exercises are described. The next chapter presents the current status of the upgrade of the emergency preparedness and response system. The new legal basis, concepts of operation have been developed and the national emergency preparedness and response plan. Finally, further efforts in the harmonization of the response with Slovenia are described, subject whose importance has been proven during the exercises.

Status of implementation of findings from the last National Report

Since the previous National Report, Croatian legislation in the field of radiological and nuclear safety is additionaly harmonized with 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(further in the text Council Directive 2013/59/Euratom) and with 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 (further in the text Council Directive 2014/87/Euratom). Also, recommendations and suggestions from IRRS Follow-up mission in 2019 regarding changes needed in the Croatian legislation in the field of radiological and nuclear safety were taken into account.

Regarding activities in relation with recommendations and suggestions from IRRS Follow-up mission, many of them were implemented since the previous National Report.

Pursuant amendments to the Act on Radiological and Nuclear Safety (OG 21/22) the Croatian legislation additionally implemented the requirements 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 Ammendments to the National Program for the Implementation of the Strategy *for the Management of Radioactive Waste, Disused Sources and Spent Nuclear Fuel* (OG 125/14) - Programme for the period up to 2025, with a view to 2060 (*the Programme*) have been drafted and are currently in the process of adoption by the Government. *The Programme* provides more detailed interpretations of the requirements and goals from *the Strategy* and covers the period up to 2025 with an overview of the developments till 2060. It advocates the application of the proven and widely accepted solutions from international best practice. The Programme foresees the remediation of sites that are contaminated with naturally occurring radionuclides, the establishment of a storage facility (temporary solution) for radioactive waste located on the territory of the Republic of Croatia and for 50% low and low and intermediate level radioactive waste (LILW) located in Krško NPP, which waste the Republic of Croatia is obligated to manage. According to *the Programme,* spent nuclear fuel shall continue to be stored at Krško NPP by 2043 at the least, after which a common permanent solution will be sought with the Republic of Slovenia. *The Strategy,* together with *the Program,* offer a systematic framework for the management of the radioactive waste and spent fuel. Pursuant to the Third revision of Krško NPP Radioactive Waste and Spent Fuel Disposal Program and Krško NPP Decomissioning Program (the Third revision) 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 Slovenia and the Republic of Croatia. The most significant outcomes of the Third revision were that the spent nuclear fuel would be stored at Krško NPP site until 2103 and Croatian half of LILW from Krško NPP would be stored for 40 years in Croatia and finally disposed in near surface repository (vault type).

General conclusion of the report is that the Croatian regulations and practices are in compliance with the obligations of *the Convention on Nuclear Safety*.

1. INTRODUCTION

The Republic of Croatia conserns a considerable attention to the nuclear safety, actively cooperates with the International Atomic Energy Agency (IAEA) and commends the work of IAEA in this field. Croatia became a party of *the Convention on Nuclear Safety* in 1995 (OG IA 13/95). Other nuclear safety related conventions have been accepted as well: *the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management* (OG IA 3/99), *the Convention on the Physical Protection of Nuclear Material* (OG IA 12/93, OG IA 5/01 and amended OG IA 5/06), *the Convention on Early Notification of a Nuclear Accident* (OG IA 12/93, OG IA 1/06) and *the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency* (OG IA 12/93, OG IA 1/06). According to the Constitutional provisions, the requirements of the aforementioned conventions automatically became a part of the national legislation. In order to allow for more direct implementation, the requirements were also transposed into relevant laws and by-laws.

Croatia is a country without nuclear installations and does not have the intention to build such installations in the near future. In the early 80's state power utilities of Croatia and Slovenia constructed Krško Nuclear Power Plant (NPP) in Slovenian territory, some 10 kilometers from the Croatian national border. Currently, two states share the nuclear liability and the ownership of Krško NPP. As the facility is located in Slovenia it is subject of Slovenian law, meaning that the Croatian regulatory body does not have any authorities regarding its operation.

Although without nuclear installations, Croatia applies widely recognized principles and tools to achieve and maintain a high level of nuclear safety. This report illustrates how the objectives of *the Convention on Nuclear Safety* (*the Convention*) have been achieved. It addresses all aspects of the obligations and provides comprehensive information based on actual situation. This is a 9th report the and covers the period from August 2019 till August 2022. It aims to support the review process by indicating the changes since the previous one, while still providing the whole picture. This way it should be possible to perform the review process without the need to go back to the earlier reports.

The report is prepared and structured in line with the *Guidelines Regarding National Reports under the Convention on Nuclear Safety, INFCIRC/572/Rev.6*. It consists of three sections (including this one), two appendices and a summary.

Section 2 follows an article-by-article approach. As Croatia is a country without nuclear installations, not all articles of *the Convention* are applicable. The reporting on each applicable article addresses various aspects of the obligations to enable a complete and comprehensive review by other contracting parties. It begins with short description of the current status and continues by focusing on the changes since the last report. As Croatia hosted the IRRS Follow-up mission, the findings, recommendations, follow-up actions and current status are provided where applicable.

The main body of the report contains all the key elements of information necessary to assess in which way Croatia is trying to attain the objectives of *the Convention*. Additional information is provided in the appendices. In the first one the list of the most relevant documents within the Croatian legislative and regulatory framework is given, while the second one explains the purpose, scope, results and follow-up actions of already mentioned IRRS mission.

2. ARTICLE-BY-ARTICLE REVIEW

Since Croatia is a contracting party without nuclear installations and since there are no plans to embark on a nuclear power program in the near future, certain requirements of *the Convention* do not apply.

In the following subsections only applicable or partly applicable articles are addressed, namely Articles 4, 7, 8, 11, 15 and 16. To assist reviewers, the full text of the article is included at the beginning of each subsection. Moreover, each subsection concludes with a summary statement regarding the compliance with the obligations from *the Convention*.

2.1 ARTICLE 4. 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.

The legislative, regulatory, administrative and other measures necessary for implementing Croatian obligations under *the Convention* are addressed in the Subsections 2.2 to 2.6.

The overall conclusion is that the approach taken in Croatia allows for continuous fulfillment of all the applicable requirements of *the Convention*.

2.2 ARTICLE 7. Legislative and Regulatory Framework

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

In Croatia the Constitution stipulates the process by which legislative and regulatory acts are issued. The Parliament, as a representative body of the people, is vested with legislative power by adopting laws. The Government exercises executive powers by proposing bills to the Parliament, executing laws and adopting regulations (decrees) to implement laws. *The Law on the State Administration* (OG 66/19) provides that the ministers, the heads of state offices and directors of governmental authorities adopt ordinances, orders and instructions for the implementation of laws and regulations when explicitly authorized, within the limits of the authorization granted.

Croatian legislative and regulatory framework relevant for the nuclear safety is presented in Appendix A of this report. It consists of a number of acts, governmental regulations, ordinances, strategies, multilateral agreements, bilateral agreements and other documents. It should be mentioned that Croatia, as a member state of the European Union (EU), directly adopts EU regulation and transposes the directives into national legislation. It should also be noticed that the legislative and regulatory framework is constantly evolving in accordance with the changes in the international and domestic practice. The development and upgrade of the framework is the duty of regulator, while the other authorities cooperate in line with their responsibilities. The cooperation with the following ministries is of particular importance:

- the Ministry of Health (responsible for health protection of the public),
- the Ministry of Economy and Sustainable Development (responsible for environmental protection and energy),
- the Ministry of Physical Planning, Construction and State Assets(responsible for planning of land use and for issuing of construction permits),
- the Ministry of Sea, Transport and Infrastructure (responsible for the control of transport),
- the Ministry of Finance (responsible for customs control).

The main legislative instrument in the area of interest is *the Act on Radiological and Nuclear Safety* (OG 141/13, 39/15, 130/17, 118/18 and 21/22) (hereinafter referred to as *the Act*). It establishes measures for safety and protection against ionizing radiation and measures for physical protection in performing nuclear activities and practices involving the sources of ionizing radiation. The aim is to ensure adequate protection of individuals, society and the environment from harmful effects of ionizing radiation and also to ensure safe performance of practices involving ionizing radiation sources, nuclear activities and radioactive waste disposal.

The implementation of *the Act* is supported by more than fifty regulations and ordinances (see Appendix A). The following regulatory acts are the most relevant:

- *Ordinance on the Scope and Content of the Plan and Program of Measures in the Event of an Emergency and of Informing the Public and Competent Bodies* (OG 43/22) prescribes the scope, contents and other issues related to 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 objects,
- *Ordinance on the Supervision and Control of Transboundary Shipments of Radioactive Waste and Spent Fuel* (OG 11/13) regulates the supervision and control system for transboundary shipments of radioactive waste and spent fuel in line with the *Council Directive 2006/117/Euratom,*
- *Ordinance on the Conditions and Procedure for Issuing and Withdrawing the Approval for Packaging Used for Transport of Radioactive and Nuclear Material*s (OG 42/13 and 19/17) regulates the procedure for issuing and withdrawal of the approval for packaging in the transport of radioactive and nuclear materials according to the provisions of the *Dangerous Goods Transport Act* (OG 79/07),
- *Ordinance on Nuclear Safety Requirements for Issuing the Consent on Construction of a Nuclear Installation* (OG 36/16, 79/16 and 108/2021*)* - provides general and specific requirements for issuing the consent on construction of a nuclear installation which shall be applied to nuclear installations, other than nuclear power plants, by means of a graded approach, to account for the complexity and specificity of each nuclear installation.

- *Ordinance on Authorised of Nuclear Safety Experts* (OG 29/17 and 88/21) − provides organizational, technical, technological and quality assurance requirements to be fulfilled by the organizations with the intend to perform nuclear safety related activities,
- *Ordinance on the Management of Radioactive Waste and Disused Sources* (OG 12/18) provides a new radioactive waste categorization in accordance with Classification of Radioactive Waste, IAEA GSG-1, 2009; the definition of 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 of radioactive waste management facilities (design, commissioning, operation, closure and decommissioning); harmonisation with IAEA Safety case and supporting Safety assessment concept for licensing of RW and DS management facilities; definition of requirements for WAC,
- *Regulation on Measures for Protection Against Ionising Radiation and Activities in Case of Emergency* (OG 24/18, 70/20 and 114/21) − 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,
- *Ordinance on Nuclear Security* (OG 38/18) prescribes the type and 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,
- *Ordinance on Dose Limits, Dose Constraints and Personal Dose Assessment* (OG 38/18 and 8/22) prescribes the dose limits and dose constraints for exposed workers, apprentices and students and members of the public, as well as the reference levels in existing and emergency exposure situations,
- *Ordinance on Environmental Radioactivity Monitoring* (OG 40/18 and 6/22) regulates environmental radioactivity monitoring, as well as manner of assessment the environmental impact of nuclear facilities or facilities where practices involving ionizing radiation sources are performed.

On the basis of *the Strategy for the Management of Radioactive Waste, Disused Sources and Spent Nuclear Fuel* (OG 125/14) *the National Program for the Implementation of the Strategy* (the Programme) was adopted by the Government in November 2018. *The Programme* provides more detailed interpretations of the requirements and goals from *the Strategy* and 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 Programme foresees the remediation of sites that are contaminated with naturally occurring radionuclides, the establishment of a storage facility (temporary solution) for radioactive waste located on the territory of the Republic of Croatia and for 50% of low and intermediate level radioactive waste (LILW) located in Krško NPP, which waste the Republic of Croatia is obligated to manage. According to the Programme, spent nuclear fuel shall continue to be stored at Krško NPP by 2043 at the least, after which a common permanent solution will be sought after with the Republic of Slovenia. *The Strategy* together with *the Program* offer a systematic framework for the management of the radioactive waste and spent fuel. In 2022 the Ammendments to the Programme have been drafted and are currently in the process of adoption by the Government. Pursuant to the Third revision of Krško NPP Radioactive Waste and Spent Fuel Disposal Program and Krško NPP Decomissioning Program (the Third revision) 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 Slovenia and the Republic of Croatia, the ammendments of the Programme were drafted in 2022. The process of adoption of the Ammendments to the Programme by

the Government is ongoing. The most significant outcomes of the Third revision were that the spent nuclear fuel would be stored at Krško NPP site until 2103 and Croatian half of LILW from Krško NPP would be stored for 40 years in Croatia and finally disposed in near surface repository (vault type).

In 2019, Croatia hosted the Integrated Regulatory Review Service (IRRS) Follow-up mission carried out by the IAEA (more information is provided in Section 3). The main goals of the mission were to review of the implementation of recommendations and suggestions given to the Government of Croatia during the IRRS Mission in June 2015 and to exchange information and experience in the areas covered by the IRRS. The Follow-up mission resulted in 17 recommendations and 8 suggestions that remained open of 36 recommendations and 22 suggestions from the IRRS mission in 2015. The considerable portion of recommendations was oriented towards implementation of the integrated management system in the CPD of MoI, strenghtening the human capacities in CPD of MoI and procedures in EPR and inspection.

In conclusion, the Croatian regulations and practices are in compliance with the obligations of Article 7.

2.3 ARTICLE 8. Regulatory Body

1. ***Each Contracting Party shall establish or designate a regulatory body entrusted with the implementation of the legislative and regulatory framework referred to in Article 7, and provided with adequate authority, competence and financial and human resources to fulfill its assigned responsibilities.***
2. ***Each Contracting Party shall take the appropriate steps to ensure an effective separation between the functions of the regulatory body and those of any other body or organisation concerned with the promotion or utilisation of nuclear energy.***

The tasks and activities pertaining to radiological and nuclear security fall under the competence of the Civil Protection Directorate (CPD) of Ministry of the Interior as of 1 January 2019. The CPD of MoI Functionally separated from any other state body or organization dealing with use of ionizing radiation sources, radioactive waste or spent fuel management or concerned with the promotion or utilization of nuclear energy and does not seek or take instructions from any such body or organisation to carry out the regulatory tasks.

The responsibilities of CPD of MoI are defined in the Act on Radiological and Nuclear Safety (OG 141/13, 39/15, 130/17, 118/18 and 21/22).

CPD of MoI and its organizational units involved in the field of radiological and nuclear safety (shown in Figure 1) are dealing with the regulatory, inspection and tehnical tasks to ensure protection of the people and the environment from harmfull effects of ionizing radiation. This includes ensuring safe performance of activities and facilities involving ionising radiation sources, nuclear activities and radioactive waste management, trade, transport and handling of nuclear materials, expert assistance in activities for preventing illicit trafficking of nuclear material, keeping a register of nuclear activities and materials; accounting for and control of all nuclear facilities and material; the assistance in the event of a nuclear accident and early exchange of information in the event of an emergency and fulfillment of the international obligations and commitments and international cooperation with EU and IAEA.

Implementing measures for radiological and nuclear safety are pursued through regular activities

of organisational units of the Civil Protection Directorate:

- Radiological and Nuclear Safety Sector,
- Radiological and Nuclear Emergency Unit and
- Radiological and Nuclear Safety Inspection.

Radiological and Nuclear Safety Sector is resposnible for: authorisation of activities with ionizing radiation sources; nuclear activities; activities of managing radioactive waste and disused sources; issuing permits for transportation and transit of ionizing radiation sources; conducting independent analyses od safety and issuing decisions and approvals for location, design, construction, use and decommissioning of a nuclear facility. It takes part in the procedure for issuing location permits and building permit and in the procedure for issuing use permits for objects in tasks of managing radioactive waste and disused sources in accordance with the building code. This Sector is also competent for: authorizing technical support organisations, radiation protection experts and nuclear safety experts; organising and where necessary also carrying out tests on the presence of the type and intensity of ionizing radiation in the environment, food, feed, medicaments and general use items under regular conditions and in cases of suspected emergency; keeping records and organising professional education on the implementation of radiological safety measures and nuclear safety measures.

Radiological and Nuclear Emergency Unit within the CPD provides expert assistance in the case of a radiological or nuclear incident/accident; takes part in organising the system of preparedess in the case of an emergency; prepares and carries out necessary expert and technical activities of the preparedness program and activities in the case of an emergency which includes radiological or nuclear accident and analyses possible consequences; drafts the Assessment of nuclear and radiological risk for the Republic of Croatia; approves the preparedness and response plans for a radiological emergency and plans and programs of holders of approvals for performance of operations involving ionizing radiation sources and other tasks within its scope.

Radiological and Nuclear Safety Inspection within the CPD is responsible for carrying out inspections and monitoring the implementation of provisions of the Act and provisions adopted on the basis thereof.

Cooperation with international and national organisations and associations in the field of ionising radiation protection and nuclear safety and coordination of technical cooperation activities with the International Atomic Energy Agency for all participants is implemented through regular activities of the Civil Protection International Relations Unit within the CPD.

All organisational units of the CPD of MoI shall be responsible for their work to the Director General of the CPD, who is responsible to the Minister of the Interior. Cooperation between organisational units within CPD of MoI at horizontal level is determined by act of general scope.

Cooperation of the internal organisational units of the CPD of MoI with organisational units of other organisational entities within the Ministry of the Interior is also determined by act of general scope.

Organisational chart of the Civil Protection Directorate, shown in Figure 1, enables effective performance of all planned activities in the area of radiological and nuclear safety.

The total planned number of professional staff is in aforementioned organisational units of CPD is 32. Currently, 19 are employed, all university graduates in the field of natural sciences, biotechnology and technical sciences of which 2 have Doctoral degree and 1 has Master degree. In year 2021-August 2022, four employees left the regulatory body due to retirement or finding a new job.

Limits for hiring new employees in public administration prevent important progress. CPD of MoI is funded from the state budget. The annual budget is proposed by Ministry of the Interior to the Government. Because of the limitations of the State Budget, it will not be possible to fill all empty positions at CPD of MoI in the near future but in the period until 2024, the plan is to hire two new employees each year.

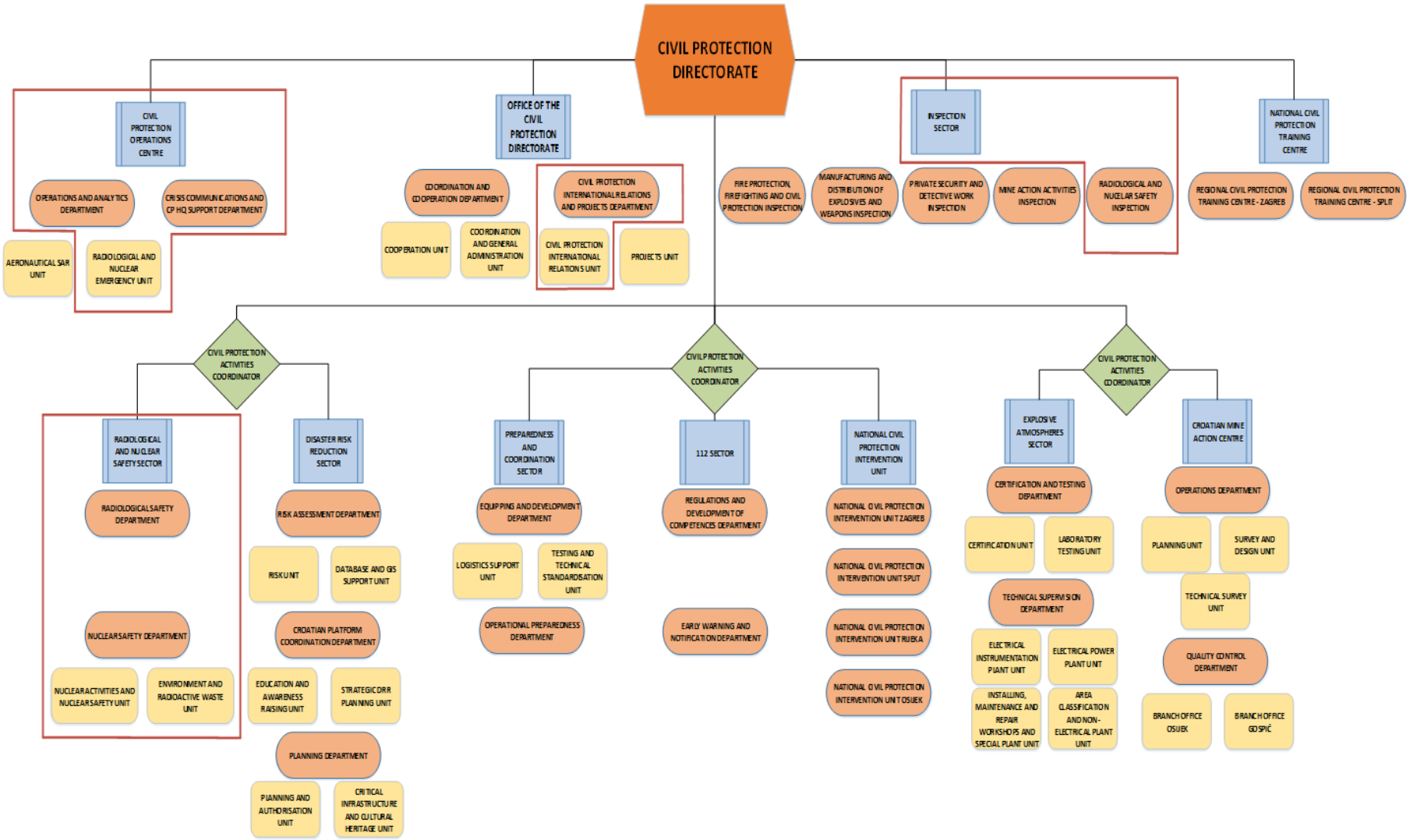

Figure 1 Organizational scheme of CPD

2.3.1 Capacity Building within the Regulatory Body

Various forms of training and education are available for the regulatory body employees. Besides the continuous in-house training and compulsory education organized by the State School for Public Administration, the employees are engaged in training and education provided through the cooperation with the IAEA and within the scope of EU projects.

Because of the specific nature of the activities pertaining to radiological and nuclear safety, education of employees is organised through IAEA and the European Union.

IAEA conducted the Integrated Regulatory Review Service (IRRS) Follow-up Mission in the Republic of Croatia from October 21 to 29, 2019. The IRRS review team concluded that Croatia, through the MoI and the CPD, has been responsive to each recommendation and suggestion made in 2015, and continues to place appropriate focus on implementing a framework that provides for effective radiation and nuclear safety for workers, patients, the public and the environment. Nineteen out of 36 recommendations and 14 out of 22 suggestions identified in 2015 have been closed.

In conclusion, the Croatian regulations and practices are in compliance with the obligations of Article 8.

2.4 ARTICLE 11. Financial and Human Resources

1. ***Each Contracting Party shall take the appropriate steps to ensure that adequate financial resources are available to support the safety of each nuclear installation throughout its life.***
2. ***Each Contracting Party shall take the appropriate steps to ensure that sufficient numbers of qualified staff with appropriate education, training and retraining are available for all safety-related activities in or for each nuclear installation, throughout its life.***

There are no nuclear installations in Croatia. However, *the 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 Krsko Nuclear Power Plant* (OG 09/02) (the Bilateral agreement) specifies that the management of the radioactive waste and spent fuel originating from Krsko NPP is joint responsibility of Croatia and Slovenia. In particular, Croatia (owning 50% of the facility) is obliged to ensure the disposal of a half of the radioactive waste and spent fuel. The approach taken in Croatia concerning this issue is in line with *the European Commission Recommendation of 24 October 2006 on the Management of Financial Resources for the Decommissioning of Nuclear Installations, Disposing Spent Fuel and Radioactive Waste* and pursuant to *the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management*.

In 2008 the Fund for Financing the Decommissioning of the Krsko NPP and the Disposal of Krsko NPP Radioactive Waste and Spent Nuclear Fuel was founded (the Fund). The main goals and responsibilities of the Fund are prescribed in the 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 and 21/22):

- timely acquisition of a half of the amount of financial means necessary for the implementation of *the Krsko NPP Decommissioning Program* and *Radioactive Waste and Spent Nuclear Fuel Disposal Program* and the Bilateral Agreement. The Croatian

Electric Power Utility pays EUR 14,25 million in quarterly payments to the Fund. These amount will be paid until Krsko NPP is in operation, that is, until the planned amount of funds in reached.

- preservation and increase of the value of assets through effective investments, in order to ensure that the assets are sufficient and that the obligations aren't handed down to the next generations
- cooperation with Slovenia in periodical revising of *the Krsko NPP Decommissioning Program*
- implementation of the provisions from *the Strategy for the Management of Radioactive Waste, Disused Sources and Spent Nuclear Fuel* (OG 125/14), regarding the disposal of the radioactive waste and spent fuel originating from Krsko NPP
- responsible for management and disposal of the radioactive waste originating from the Croatian territory
- keeping record on available financial and material assets, tributarys of fees for radioactive waste management and the fees received,
- operates the future Radioactive waste management Center

To create prerequisites for successful development of mentioned goals, the Fund is gathering Croatian scientists and experts, and improving cooperation with the relevant international organizations. From the date of the establishment of the Fund onwards, financial means are being collected as planned.

In conclusion, the Croatian regulations and practices are in compliance with the obligations of Article 11.

2.5 ARTICLE 15. Radiation Protection

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

As there are no nuclear installations in Croatian territory, the radiation exposure of the workers is not an issue. However, the public might be exposed due to the releases from the installations in the neighboring countries. This refers primarily to the release from Krško NPP. In order to be sure that no individual is exposed to the radiation doses exceeding prescribed national dose limits, dedicated radiological monitoring program is developed by NPP Krško and continuously implemented by the accredited laboratory from the Rudjer Boskovic Institute, Zagreb, Croatia and Institute Jožef Stefan, Ljubljana, Slovenia. The program includes:

- the monitoring of the radioactivity of the liquids discharged from Krsko NPP into Sava river (the limits are prescribed (1) for the concentrations of radionuclides, (2) for the activity of tritium and (3) for the total activity of other radionuclides),
- the monitoring of the radioactivity of the gaseous effluents (the limits are prescribed for the concentration of the radionuclides 500 meters from the containment) and
- the dose assessments for the representative person inhabited on Croatian territory.

The results indicate that the impacts to the human health of the operational releases from Krško NPP are practically negligible. Measured concentrations and activities are usually at least two orders of magnitude lower than the prescribed limits. The reprezentative person, who is supposed to consume 730 liters of the water from Sava river and 16 kilograms of fish caught in that river annually, would receive the equivalent dose of some 0,0857 μSv (data from Q1 2022). Moreover, the contribution of the dose caused by the releases from Krsko NPP to the total dose from man-made sources amounts to few percent only. All the results are presented in the newsletter which is issued by CPD of MoI quarterly. The newsletter is available for the examination and download at the CPD web site 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.

In addition to the described monitoring program conducted by NPP Krsko and oriented towards operational releases from Krsko NPP, the radiological monitoring related to the Article 35 and 36 of *the Euratom Treaty* is continuously carried out in Croatia. It conforms to *the Recommendation 2000/473/Euratom* and covers various constituents of the environment: air, precipitation, soil, groundwater, surface water, rainwater, drinking water, food and feedstuff. The number of samples and the sampling locations are determined within the annual measurement programs developed by CPD of MoI. No unexpected measuring results were obtained so far.

2.5.1 Surrveilance of Nuclear Propelled Vessels

Every few years, nuclear propelled vessel enters Croatian territorial waters within the scope of a planned visit. In the period since the 8th Report no entrance in Croatian territorial waters took place.

When a nuclear propelled vessel enters Croatian territorial waters, the MoI is obliged to develop (in advance) the radiation monitoring program to be implemented with the support of the organization authorized for performing the measurements. The program specifies the type, number and location of the measurements which will be carried out before and after the arrival of the vessel.

In this particular case, the radiation monitoring program was carried out with the support of the Institute for Medical Research and Occupational Health, Zagreb, and by the utilization of its mobile measuring laboratory. The results indicated that there were no statistically significant differences in the radiation levels before and after the arrival of the vessel. In other words, no individual was exposed to the radiation doses which exceed prescribed national dose limits because of the presence of the vessel. The same was determined for all the previous visits. It should be mentioned that all costs related to the development and implementation of the radiological monitoring program have to be covered by the owners/operators of the nuclear vessels.

In conclusion, the Croatian regulations and practices are in compliance with the obligations of Article 15.

2.6 ARTICLE 16. Emergency Preparedness

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

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

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

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

Although the Republic of Croatia has no nuclear installations on its own territory, there are 40 operational nuclear power plants (NPPs) within 1.000 km from its national borders. The closest to the Croatian territory are Krško NPP in Slovenia (PWR, 707 MWe) and Paks 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 Paks 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.

Article 7. of *the Regulation on Measures for Protection Against Ionising Radiation and Activities in Case of Emergency* (OG 24/18, 70/20 and 114/21) stipulates that the MoI is responsible for carrying out the Radiological and Nuclear Hazard Assessment of the Republic of Croatia. The Hazard Assessment shall be updated at least every five years, taking into account the experience and the lessons learned from exercises, real events or new knowledge.

The Radiological and Nuclear Hazard Assessment of the Republic of Croatia, which is a stand-alone document, has been drafted and approved in 2018. The Hazard Assessment includes analytical evaluation of the potential radiological emergencies that could occur within the national territory and nuclear emergencies abroad with radiological impact in the country. It describes also the basic elements of the protection strategy for each scenario, in order to guide the development or update of the Emergency Preparedness and Response Plan of the Republic of Croatia in the Event of a Radiological or Nuclear Emergency.

Croatian nuclear and radiological emergency management system is based on the Regulation on Measures for Protection against Ionizing Radiation and Actions in Case of Emergency (OG 24/18, 70/20 and 114/21).

The provisions of this Regulation relate to the system for preparedness and response to the following emergencies:

a) emergency in the nuclear power plant Krško (Republic of Slovenia), nuclear power plant Pakš (Hungary) and in other nuclear power plants in the world,
b) emergency in a nuclear ship located in the internal waters or territorial sea of the Republic of Croatia,
c) emergency at the location of a stationary ionising radiation source of the approval holder, which is known in advance, i.e. the storage location for mobile ionising radiation source of the approval holder, which is known in advance
d) emergency during radioactive waste management,
e) emergency on an unknown location, including transport emergencies, emergency during operations involving mobile sources, discovery of an orphan source, terrorist

act, loss or theft of a radioactive source, re-entry of a satellite, illicit transport of radioactive sources, radioactive waste and nuclear material

f) radioactive contamination or increased exposure to ionising radiation caused by unknown or other circumstances.

The Regulation defines five emergency preparedness categories (in line with IAEA requirements GSR Part 7):

- Facilities belonging to emergency preparedness category I (hereinafter: threat category I) are facilities in which an emergency could result in severe deterministic health effects off the site in which an activity involving ionising radiation sources is performed that warrant the implementation of urgent and early response measures and other off-site measures.
- Facilities belonging to emergency preparedness category II (hereinafter: threat category II) are facilities in which an emergency may result in ionising radiation doses for the population that warrant the implementation of urgent protection and early response measures and other off-site measures. Threat category II, as opposed to threat category I, does not include facilities in which emergencies could give rise to severe deterministic health effects off the site.
- Facilities belonging to emergency preparedness category III (hereinafter: threat category III) are facilities in which an emergency may result in ionising radiation doses that warrant the implementation of protection measures on the location of the approval holder. Threat category III does not include facilities for which planning zones and distances have to be designated.
- Emergency preparedness category IV (hereinafter: threat category IV) includes activities and practices that may result in an emergency and warrant the implementation of urgent protection measures in unforeseeable locations.

  Threat category IV includes:

  - emergencies in transport of radioactive sources, nuclear materials and radioactive waste
  - emergencies involving mobile ionising radiation sources such as industrial radiography,
  - illicit transport of radioactive sources and nuclear materials on road and railroad border crossings and seaports, river ports and airports,
  - emergency involving the re-entry of a satellite which uses radioisotopes for energy generation,
  - emergencies of detecting orphan sources in scrap metal and other locations,
  - emergencies which result in radioactive contamination or increased exposure to ionising radiation, and are caused by other circumstances, e.g. vandalism, sabotage and terrorism
  - transnational emergencies resulting from emergencies on the territory of other countries, in facilities not covered by threat category V.
- Facilities belonging to emergency preparedness category V (hereinafter: threat category V) are facilities belonging to threat category I and II located on the territory of another country, for which planning zones and distances have been designated on the territory of the Republic of Croatia.

Emergency Preparedness and Response Plan of the Republic of Croatia in the Event of a Radiological or Nuclear Emergency has been adopted in February 2022. The Plan covers radiological and nuclear emergencies that could occur in the Republic of Croatia, as well as emergencies in other countries with the potential to cause significant consequences on Croatian territory, including those

arising from events of very low probability. The Plan does not include preparedness and response to a nuclear attack.

2.6.1 Reviews, Assessments and Evaluations through Exercising

Croatia has continued participating in exercises organized by the Slovenian regulatory body dealing with accident in NPP Krško, and does so once a year. Croatia also participates in the exercises organized by the Slovenian regulatory body about the use of Slovenian emergency communications system.

Croatia has continued its participation in ConvEx exercises organized by the IAEA. Especially important was the ConvEx-3 exercise, organized by IAEA and United Arab Emirates . The exercise lasted 36 hours continuously. The exercise was based on a severe accident at the Barakah NPP . Croatia successfully tested the ability of expert team to organize shifts and successfully work continuously through an extended period.

2.6.2 Major Upgrade of the System

As was previously reported in *the 8th Croatian National Report on the Implementation of the Obligations under the Convention on Nuclear Safety*, Croatia responded to the results of the reviews, assessments and evaluations by initiating the major upgrade of the nuclear and radiological emergency preparedness and response system, launched in the second half of 2015. The main steps of the upgrade are:

1) upgrade of the hazard assessment and the revision of the emergency planning zones,
2) development of the concepts of operation,
3) revision of the roles and responsibilities,
4) development of the national emergency preparedness and response plan (for the radiological and nuclear accidents),
5) revision of the national protection and rescue plan,
6) development or revision of the emergency plans for the local and regional self-government units and institutions/organizations participating in the response and
7) development of the operational procedures.

The Regulation, establishing the legal basis for the whole upgrade process, was enacted in early 2018 and amended in 2021 and 2022. Concepts of operation, the assignment of roles and responsibilities were updated and finalized in 2021 taking into account the new role of the MoI CPD, taking over for SORNS and National Protection and Rescue Directorate (NPRD).

The final list of concepts is:

1) N1 – emergency at Krško NPP,
2) N2 – emergency at Pakš NPP,
3) N3 – emergency in other NPPs in the world,
4) N4 – accident on the nuclear propelled vessels,
5) R1 – accident during the use of dangerous fixed source,
6) R2 – transport accident or the accident with the mobile source,
7) R3 – lost or stolen dangerous source,
8) R4 – found source or the detection of increased radiation levels,
9) R5 – detection of the medical symptoms of radiation exposure,
10) R6 – terrorist threat or attack which includes radioactive or nuclear materials,
11) R7 – re-entry of the satellite with radioactive material.

The concepts which refer to the accidents in NPPs are based on the IAEA publication *EPR-NPP Public Protective Actions*. For the remainder, the recommendations provided in the documents *EPR-Method, GS-G-2.1, TECDOC-1162* and *TS-G-1.2* were followed. In all concepts of operation, the so-called graded approach is applied, which means that the response is proportional to the severity of the accident. Also, the response time objectives are introduced.

The Radiological and Nuclear Hazard Assessment for the Republic of Croatia covers both nuclear and radiological hazards. It was developed in 2018, after *the Regulation* enabled legally to include radiological hazards. The emergency planning zones and distances have remained the same as the ones described in *the 7th Croatian National Report on the Implementation of the Obligations under the Convention on Nuclear Safety*.

2.6.3 Harmonization with Slovenia in the Area of Nuclear Emergency Preparedness and Response

While the activities described in the chapter 2.6.3 of *the 8th Croatian National Report on the Implementation of the Obligations under the Convention on Nuclear Safety* did not result in harmonization of the emergency planning zones and distances, Croatia and Slovenia have continued to discuss their emergency preparedness and response systems and to attempt to reach a higher level of harmonization. In 2016, Croatian regulatory body received full access to KID (at that time called MKSID), the Slovenian information exchange system used in nuclear emergencies. This allows Croatia to have a real-time access to all the information and documents shared with all Slovenian response bodies, although it does not cover direct communication between the NPP Krško and Slovenian regulatory body during the emergencies, so some delay in access to information is still possible.

In 2017, the new harmonization process started, where emphasis was not on trying to harmonize full response, but on identifying situations where response will not be harmonized and harmonizing explanations to the public, so that public trust is preserved. The process was based on *the Guidance for Bilateral Arrangements* developed by HERCA in 2015. The process is still ongoing.

In 2018, the new above-meantioned IAEA initiative started, with a consultancy meeting on harmonization of the implementation of protective actions in the event of a nuclear or radiological emergency with transboundary or transnational consequences held in October 2018 in Vienna. One of the working groups consists of Slovenia and neighbouring countries. One of the conclusions of the meetings is that full and open access to all information is necessary to be able to have any chance of harmonized response.

Croatian and Slovenian emergency planning zones used to prepare for the potential accidents in Krško NPP still remain not harmonized. Although both counties have recognized the importance of the coordinated response in case of an emergency, the attempts to harmonize the zones didn't produce any results so far (although, during those attempts both countries significantly improved the understanding of each other's emergency preparedness and response systems and improved communication).

Regarding harmonization of implementation of protecitve actions in case of emergency at NPP Krško, currently efforts are being made to ensure as much coordinated response as possible with non-harmonized planning zones, in order to cover the period until the harmonization is achieved. While it might be possible to reach certain level of coordination this way, fully aligned response cannot be guaranteed. In addition, the differences in the planning zones tend to increase the complexity of the emergency preparedness arrangements, which will probably result with the increase of the resources

spent on both sides. Because of all this, the harmonization within reasonable timeframe should stay the priority.

In conclusion, the Croatian regulations and practices are in compliance with the obligations of Article 16.

3. Status of implementation of findings (or challenges) from the last National Report

Since the previous National Report, Croatian legislation in the field of radiological and nuclear safety is harmonized with the Council Directive 2013/59/Euratom and with Council Directive 2014/87/Euratom. Also, recommendations and suggestions from the IRRS Follow-up mission in 2019 regarding changes needed in the Croatian legislation in the field of radiological and nuclear safety were taken into account.

Regarding activities in relation with recommendations and suggestions from IRRS Follow-up mission, the status of implementation of recommendations and suggestions since the prevuious National Report are as follows:

1. „Responsibilities and functions of the Government“ 2 recommendations are closed (meaning implemented) and 2 recommendations and 1 suggestion are still opened (meaning not implemented);
2. „The global safety regime“ 1 recommendation is opened;
3. „Responsibilities and functions of the regulatory body“1 suggestion is closed and 2 recommendations are opened, 1 recommendation from the review team;
4. „Management system of the regulatory body“ 2 recommendation and 2 suggestions are opened;
5. „Authorization“ 2 recommendations and 1 suggestion are closed;
6. „Review and Assessment“ 1 recommendation is closed and 1 suggestion is opened;
7. „Inspection“ 2 recommendations are closed, 1 reccomendation and 1 suggestion are opened;
8. „Enforcement“ 1 recommendation and 1 suggestion are closed ;
9. „Regulations and guides“ 2 suggestions are closed and 1 suggestion is opened;
10. „Emergency Preparedness and response – regulatory aspects“ 3 recommendations and 4 suggestions are closed and 3 recommendations and 1 suggestion are opened;
11. „Control of medical exposures“ 2 recommendation and 1 suggestion are closed and 5 recommendations and 1 suggestion are opened;
12. „Occupational radiation protection“ 2 recommendations and 3 suggestions are closed and 1 recommendation is opened;
13. „Control of radioactive discharges, materials for clearance, and existing exposures; environmental monitoring for public radiation protection“ 4 recommendations and 1 suggestion are closed.

The IRRS review team identified new findings warranting attention or needing improvement that in order to enhance the legal and regulatory framework for radiation and nuclear safety in Croatia. In particular, during the follow-up mission, the IRRS review team developed one new recommendation.

To complete the implementation of the recommendation and suggestion from 2015 and to implement the new recommendation from the follow-up mission, Croatia needs to take further actions to:

- Provide the CPD with human and financial resources enabling the CPD to completely fulfil its statutory obligations for regulatory control;
- Strengthen the capacity and competence of the CPD to carry out its regulatory functions, especially inspections and the licensing of complex facilities and activities;
- Develop an integrated management system for the CPD that clearly specifies the interfaces among different internal sections and units performing tasks related to radiation and nuclear safety in an integrated manner;

- Continue its efforts to coordinate and harmonize emergency planning zones with its Slovenian
- counterparts in relation to Krsko NPP;
- Continue its efforts to establish the criteria for the qualification and recognition of medical
- physicists;
- Continue its efforts to establish a national waste management centre.

The overview of IRRS mission recommendations and suggestions status is given in Appendix B. All recommendations and suggestions regarding regulatory review are closed (implemented). Open ones refer to the implementation of changes to the regulatory framework. The reasons are mainly related to the lack of staff and their insufficient education and training.

Implementation of the Strategy for Management of Radioactive Waste, Disused Sources and Spent Fuel

In accordance with the Act on Radiological and Nuclear Safety and 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 Program for the Implementation of the Strategy for the management of radioactive waste, disused sources and spent nuclear fuel - Programme for the period up to 2025, with a view to 2060* (*the Programme*) was adopted by the Government. *The Programme* provides more detailed interpretations of the requirements and goals from *the Strategy* and covers the period up to 2025 with an overview of the developments till 2060.

In 2022 the draft of the Ammendments to the Programme has been produced and the process of Adoption by the Government is ongoing.

The Programme advocates the application of the proven and widely accepted solutions from international best practice.

In the period up to 2025 *The programme* goals for management of radioactive waste are:

- establishment of a central storage facility for institutional RW and DS
- establishment of a storage facility for LILW from Krško NPP.

According to *the Programme*, the central storage facility for institutional RW and DS and storage facility for LILW from Krško NPP are supposed to be located in the Dvor municipality at the Cerkezovac site. This site hosted a military installation, but it has been declared as a non-perspective for further military utilization.

In the case of confirming of the Čerkezovac site, the design and construction of the adequate infrastructure would follow.

After 2025, field research will be started on the macrolocation of Trgovska gora in order to select the optimal microlocation for the disposal of LILW. At the selected location, LILW created by the decommissioning of Krško NPP will be disposed of.

It should be emphasized that storage facility is not going to be transformed into a disposal facility automatically, since they are physically different facilities with different security and other

requirements, and that for each stage a process of environmental impact assessment and safety analyses are required with the appropriate site-based research carried out.

Although *The Strategy* together with *the Program* offer a systematic framework for the management of the radioactive waste and spent fuel the implementation will be still demanding in the aspects mentioned in the 8th National Report:

- Considering that the storage facility for the LILW has to be licensed before the end of 2023, it is clear that the schedule is tight.
- No alternatives to Cerkezovac site are currently offered in Croatia. While it seems that there are no technical reasons for its exclusion, it still hasn't been approved as a site for LILW radioactive waste storage.
- Solving sociopolitical problems could prove to be more complex than fullfiling technical requirements. It is still uncertain whether the consent will be obtained from the local community to host LILW radioactive waste management facilities.
- The location is close to the border with Bosnia and Herzegovina, which gives the realization of the RW Center an international importance.

Harmonization with Slovenia in the Area of Nuclear Emergency Preparedness and Response

At the moment efforts are being made to ensure as much coordinated response as possible with non-harmonized planning zones, in order to cover the period until the harmonization is achieved. While it might be possible to reach certain level of coordination this way, fully aligned response cannot be guaranteed. In addition, the differences in the planning zones tend to increase the complexity of the emergency preparedness arrangements, which will probably result with the increase of the resources spent on both sides. Because of all this, the harmonization within reasonable timeframe should stay the priority.

4. APPENDIX A - List of the Most Relevant Documents Within the Croatian Legislative and Regulatory Framework

4.1 National Legal Frame

Acts:

- Act on Radiological and Nuclear Safety (OG 141/13, amended 39/15, 130/17, 118/18 and 21/22)
- Act on Liability for Nuclear Damage (OG 143/98)
- Act on Civil Protection System (OG 82/15, 118/18, 31/20 and 20/21)
- Dangerous Goods Transport Act (OG 79/07)
- Act on Fund for Krško NPP Decommissioning, Radioactive Waste and Spent Nuclear Fuel Management (OG 107/07 and 21/22)

Governmental regulations:

- Regulation on Measures for Protection Against Ionising Radiation and Activities in Case of Emergency (OG 24/18, 70/20 and 114/21)

Ordinances (chronologically):

- Ordinance on Health Conditions of the Exposed Workers and Persons Being Educated to Work with the Ionising Radiation Sources (OG 66/18 and 36/22)
- Ordinance on Notification, Registration, Approvals and Trade of Ionising Radiation Sources (OG 54/18 and 6/22)
- Ordinance on Conditions and Measures for the Protection Against the Ionising Radiation in Performing the Activities with Ionising Radiation Sources (OG 53/18 and 6/22)
- Ordinance on Conditions for Application of Ionising Radiation Sources for the Purpose of Medical and Non-medical Irradiation (OG 42/18 and 8/22)
- Ordinance on Education Necessary for Handling Ionising Radiation Sources, Application of Radiological Safety Measures and Managing the Technical Processes in Nuclear Installations (OG 42/18)
- Ordinance on the Monitoring State of Radioactivity in the Environment (OG 40/18)
- Ordinance on authorisations of the Technical Support Organisations to Perform Tasks Related to the Radiological Safety (OG 40/18 and 104/21)
- Ordinance on Dose Limits, Dose Constraints and Individual Dose Assessment (OG 38/18 and 8/22)
- Ordinance on Content and Conditions, Criteria and Approval of the Remediation Plan (OG 38/18 and 147/21)
- Ordinance on Nuclear Security (OG 38/18)
- Ordinance on Radiation Protection Experts (OG 36/18)
- Ordinance on the Management of Radioactive Waste and Disused Sources (OG 12/18)

- Ordinance on the Content, Scope and Frequency of the Reports on the Operation of the Nuclear Installation (OG 94/17 and 96/21)
- Ordinance on the Periodicity, Content, Scope and Implementation of the Periodic Safety Reviews of the Nuclear Installations (OG 94/17 and 103/21)
- Ordinance on the Content of a request for Approval for the Start or End of Operation or Decommissioning of a Nuclear Installation (OG 47/17)
- Ordinance on the Validation of a Location for a Nuclear Installation (OG 38/17 and 98/21)
- Ordinance on the Required Documents and their Content for Approval of Nuclear Activities (OG 29/17 and 100/21)
- Ordinance on Content of the Request for Approval for the Commissioning of Nuclear Installation (OG 29/17)
- Ordinance on the Safety Analysis Report for Nuclear Installations (OG 29/17)
- Ordinance on Certified Expert Organizations in the Field of Nuclear Safety (OG 29/17 and 88/21)
- Ordinance on Establishing Quality Assurance Programme for Management of Nuclear Facilities (OG 29/17)
- Ordinance on Nuclear Safety Requirements for Nuclear Installation Construction (OG 36/16, amended 79/16)
- Ordinance on Official ID Card and Badge of Radiological and Nuclear Safety Inspectors (OG 125/15)
- Ordinance on the Conditions and Procedure for Issuing and Withdrawing the Approval for Packaging Used for Transport of Radioactive and Nuclear Materials (OG 42/13 and 19/17)
- Ordinance on the Supervision and Control of Transboundary Shipments of Radioactive Waste and Spent Fuel (Official Gazette 11/13)
- 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 (OG 43/22)
- 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)

Strategies and implementation programs:

- National Energy Strategy (OG 130/09)
- Protection and Rescue Plan for the Republic of Croatia (OG 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, Disused Sources and Spent Nuclear Fuel (OG 125/14)
- Strategy on Radiological and Nuclear Safety 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 (adopted 09 November 2018)

Other documents:

- Decision on Areas/Zones for the Implementation of Urgent Protective and Rescue Measures and on Threat Perimeters (SORNS, 2018)
- The Radiological and Nuclear Hazard Assessment of the Republic of Croatia (SORNS, 2018)
- Emergency Preparedness and Response Plan of the Republic of Croatia in the Event of a Radiological or Nuclear Emergency (2022)

4.2 Multilateral Agreements

- Joint Protocol Relating to the Application of the Vienna Convention and the Paris Convention (OG IA 12/93)
- 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 03/99)
- Convention on the Physical Protection of Nuclear Material (OG IA 05/01, amended 05/06)
- Vienna Convention on Civil Liability for Nuclear Damage (OG IA 01/06)
- Convention on Assistance in the Case of a Nuclear Accident of Radiological Emergency (OG IA 01/06)
- Convention on Early Notification of a Nuclear Accident (OG IA 01/06, amended 05/06)
- 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).

4.3 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 06/98, 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 (Official Gazette 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 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)
- Arrangement between the State Office for Radiological and Nuclear Safety of the Republic of Croatia and the United States Nuclear Regulatory Commission for the Exchange of Technical Information and Cooperation in Nuclear Safety Matters (September 19, 2018)

Remark: The Republic of Croatia, as a member state of the European Union, directly adopts EU regulation and transposes EU directives into national legislation.

5. Appendix B Status of IRRS Mission Recommendations and Suggestions

AREA		RECOMMENDATIONS (R) AND SUGGESTIONS (S)		STATUS (July 2022)
1	RESPONSIBILITIES AND FUNCTIONS OF THE GOVERNMENT	R1	The Government should establish a national policy and strategy for safety in accordance with Requirement 1 of GSR Part 1.	Closed
		R2	The Government should complement the framework for safety with: provisions for ensuring the continuity of responsibility where activities are carried out by several persons or organizations successively; provisions related to a graded approach; provisions on criteria for release from regulatory control; provision that stipulates that compliance with regulations does not relieve the person or organization responsible for a facility or an activity of its prime responsibility for safety.	Closed
		R3	The Government should provide SORNS with human and financial resources enabling SORNS to completely fulfill its statutory obligations for regulatory control.	Open
		S1	The Government should consider organizing training and refresher courses in a way that do not compromise effective independence of SORNS.	Closed
		R4	The Government should implement the provisions for the safe management of radioactive waste in particular with the construction and operation of the Central National Storage Facility in compliance with the Strategy for the Management of Radioactive Waste, Disused Sources and Spent Nuclear Fuel.	Open
2	GLOBAL SAFETY REGIME	R5	SORNS should established and maintain process and procedures for analyzing and disseminating the lessons learned from national and international operating experience and regulatory experience to be used by SORNS, other authorities and authorized parties.	Open
3	RESPONSIBILITIES AND FUNCTIONS OF THE REGULATORY BODY	R6	SORNS should have sufficient resources and optimize them in order to discharge its responsibilities and perform its functions in a manner commensurate with the radiation risks associated with facilities and activities.	Closed
		R7	SORNS should prepare and implement comprehensive training plans in order to improve knowledge, skills and abilities to perform all the functions and responsibilities.	Open

		S2	SORNS should consider performing systematic periodic screening/review of radiological and nuclear safety legislation, to ensure keeping regulatory safety requirements complete and up-to-date.	Closed
4	MANAGEMENT SYSTEM OF THE REGULATORY BODY	R8	SORNS should appoint an individual with the authority to coordinate and develop the integrated management system and to raise issues relating to the management system to the senior management.	Open
		R9	SORNS should develop an integrated management system in line with IAEA safety standard GS-R-3.	Open
		S3	SORNS should consider revising its strategic plan to expand the requirements on management system from the quality assurance programme to the integrated management system.	Open
		S4	SORNS should consider preparing the plan for establishment, development, and implementation of an integrated management system where the priorities are stressed out such as defining responsibilities for the management system, defining key processes related to inspection, licensing, etc. and defining the interactions among the processes.	Open
5	AUTHORIZATION	R10	The Government should establish a regulatory system for protection and safety that includes notification process, with criteria for when notification only is sufficient.	Closed
		S5	SORNS should consider developing a system of authorization commensurate with the radiation risks associated with the facility or activity taking into account a graded approach.	Closed
		R11	SORNS should develop and approve Ordinance regarding the detailed requirements for licensing the site, construction, operation and closure radioactive waste management facility as prescribed in the 2013 Act.	Closed
6	REVIEW AND ASSESSMENT	R12	SORNS should establish process and procedures governing the review and assessment activities for all types of facilities and activities under their regulatory control, taking into account graded approach.	Closed
		S6	SORNS should consider introducing pre-licensing verification of the contents of the documents submitted for review and assessment of an application for authorization to confirm credibility of submitted documents, where appropriate.	Open

7	INSPECTION	R13	SORNS should establish inspection programme that commensurate with the radiation risks associated with the facility or activity in accordance with a graded approach that covers all areas relevant to safety and radiation protection and implement this programme.	Open
		R14	The Government should empower SORNS inspectors to carry out announced inspections.	Closed
		R15	SORNS should review the draft "Manual for conducting inspection supervision" to cover all elements of inspections and approve it.	Closed
		S7	SORNS should review its inspection programme and include tests and measurements as a method of inspection.	Open
8	ENFORCEMENT	R16	SORNS should establish detail procedures for determining and exercising enforcement actions. All inspectors and other staff of SORNS should be trained in, and knowledgeable about, the procedures.	Closed
		S8	SORNS should consider providing inspectors with legal support to carry out enforcement actions.	Closed
9	REGULATION AND GUIDES	S9	SORNS should consider developing guides to help users striving to achieve the high levels of safety.	Closed
		S10	SORNS should establish within its regulatory framework processes and procedures for reviewing and revising regulations, taken into account internationally agreed standards and the feedback of relevant experience.	Open
		S11	SORNS should consider reviewing its ordinances for compliance with GSR Part 3.	Closed
10	EMERGENCY PREPAREDNESS AND RESPONSE	R17	SORNS should revise and strengthen its regulatory framework in EPR consistently with IAEA Safety Standards to also include inspection, enforcement and evaluation of some of operator's exercises and should implement a graded approach.	Open
		R18	SORNS should require that operators develop and implement a system for classifying all potential nuclear or radiological emergencies and for activation of an adequate level of emergency response consistently with IAEA Safety Standards.	Closed
		S12	SORNS should consider setting response time objectives for notification of an emergency and for activation of an emergency response.	Closed

		R19	The Government should review and revise the responsibility of SORNS to manage the on-site emergency response, to implement urgent protective actions on-site in relation to facilities and activities under the responsibility of an operator and, in this regard, to provide public information as a single source.	Closed
		R20	SORNS shall require operators to implement clear command and control system to manage effectively the on-site emergency response.	Closed
		S13	SORNS should consider requesting that operators establish formal arrangements or protocols with off-site emergency services providing the operator with an assistance and support during the on-site emergency response.	Closed
		S14	SORNS should consider continuing its efforts to coordinate and harmonize emergency planning zones with their Slovenian counterparts in relation to Krško NPP in line with relevant IAEA Safety Standards.	Open
		S15	SORNS should consider updating the intervention levels and generic action levels for taking protective actions set forth in Ordinance 59/13 taking account of the latest IAEA Safety Standards.	Closed
		R21	SORNS should develop a regulatory guide to facilitate systematic development of on-site emergency arrangements by operators and an internal process to facilitate its systematic review and assessment of the operator's emergency plan and programme.	Open
		R22	SORNS should develop its own emergency arrangements consistently with IAEA Safety Standards to fulfill its roles in emergency response.	Open
		S16	The Government should consider reviewing and revising the roles and responsibilities assigned to SORNS in emergency response in order to avoid compromising SORNS regulatory responsibilities and taking into account IAEA Safety Standards as well as the responsibilities of other State bodies and organizations.	Closed
11.1	CONTROL OF MEDICAL EXPOSURES	R23	SORNS, in coordination with The Ministry of Health, should initiate arrangements for assigning responsibilities for justification. SORNS should also ensure that only justified practices are authorized.	Open
		R24	The Ministry of Health and SORNS should issue the necessary guidelines, in cooperation with the relevant professional and scientific bodies, in accordance with the requirement of GSR Part 3.	Open

		R25	The Government should recognize medical physicists as a profession at a national level and develop specialization in medical physics with objective to ensure the radiation protection of patients.	Open
		R26	SORNS should review its regulation to supplement the responsibilities of medical physicists so that they are fully integrated in all medical practices in accordance with GSR Part 3.	Closed
		S17	SORNS should consider making provisions for informing carers, comforters and patients, in particular breast feeding women, about the radiation risks, in accordance with GSR Part 3.	Closed
		R27	SORNS should ensure that the existing requirements for optimization are fully implemented in all medical practices and that requirements regarding responsibilities of medical physicists, quality assurance, quality control and calibration are in accordance with the IAEA standards.	Open
		R28	SORNS should ensure that the existing requirements for reviews and records related to medical exposure are implemented in all medical practices and supplement its Ordinances to improve assessment and recording of patient doses in accordance with GSR Part 3.	Open
		R29	SORNS should ensure that all requirements related to unintended and accidental medical exposure are implemented in compliance with the requirement of GSR Part 3.	Closed
		S18	Since SORNS has not received any unintended or accidental exposure reports to date, SORNS should consider supporting this notification process through developing guidelines or/and training of medical staff and medical physicists.	Open
11.2	OCCUPATIONAL RADIATION PROTECTION	R30	SORNS should put in place a programme of inspection of authorized TSOs as part of their annual inspection programme to establish that all authorized TSOs are maintaining the prescribed requirements of their authorizations.	Open
		R31	SORNS should initiate in consultation with the relevant government departments and state agencies the development of a formal recognition for qualified experts and an additional requirement for TSOs to have a qualified expert on their staff should be included in SORNS process for authorizing TSOs.	Closed

		R32	The Government should define the concept of an emergency worker taking into account the IAEA safety standards and should establish a programme for managing, controlling and recording the doses received in an emergency by emergency workers. This programme should be implemented by response organizations, licensees and SORNS.	Closed
		S19	SORNS should consider reviewing and revising its regulatory system for existing exposure situations with a view to implementing only those relevant requirements for occupational exposure of exposed workers.	Closed
		S20	SORNS should consider revising Article 23 (3) of the Ordinance on Measurement of Personal Doses, Examination of Ionizing Radiation Sources and Working Conditions and on Reports and Registers (OG 41/12) in accordance with IAEA Safety Guide RS-G-1.3 Section 8.	Closed
		S21	SORNS, in light of the introduction of the new dose limit for the lens of the eye and the development of the radwaste management programme, should consider introducing arrangements so that a national capability for extremity dose assessment *Hp*(0.07) and *Hp*(3) together with a national capability for internal dosimetry is available. The relevant ordinance on Measurement of Personal Doses, Examination of Ionizing Radiation Sources and Working Conditions and on Reports and Registers (OG 41/12) should be revised in accordance with IAEA Safety Guides.	Closed
11.3	CONTROL OF RADIOACTIVE DISCHARGES AND MATERIAL FOR CLEARANCE, ENVIRONMENTAL MONITORING ASSOCIATED WITH AUTHORIZED PRACTICES FOR PUBLIC RADIATION PROTECTION PURPOSES CONTROL OF CHRONIC EXPOSURES	R33	SORNS should review their regulatory framework with regards to liquid and gaseous radioactive discharges and ensure the optimization of protection and safety is achieved and discharge limits imposed on licensees that cover such discharges.	Closed
		R34	SORNS should ensure that monitoring programmes are developed and implemented in accordance with IAEA standards and supported by its regulatory framework.	Closed
		S22	SORNS should consider implementing a calibration programme for all of its monitoring and measuring instruments.	Closed
		R35	The Government should ensure that existing exposure situations that have been identified are evaluated to determine which occupational exposures and public exposures are of concern from the point of view of radiation protection, in accordance with IAEA standards.	Closed

		R36	SORNS should revise their Ordinances to address the remediation process of areas contaminated with residual radioactive material in accordance with IAEA standards.	Closed