Republic of Croatia

CROATIAN REPORT ON NUCLEAR SAFETY

7TH CROATIAN NATIONAL REPORT ON THE IMPLEMENTATION OF THE OBLIGATIONS UNDER THE CONVENTION ON NUCLEAR SAFETY

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Impressum

7th 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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State Office for Radiological and Nuclear Safety
(*Državni zavod za radiološku i nuklearnu sigurnost*)
Frankopanska 11, HR-10000 Zagreb, Croatia
Phone: +385 1 4881770
Fax: +385 1 4881780
E-mail: dzrns@dzrns.hr
Web site: www.dzrns.hr

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ABBREVIATIONS

ARPANSA	Australian Radiation Protection and Nuclear Safety Agency
CEWS	Croatian Early Warning System
EC	European Commission
EPD	Extended Planning Distance
EPREV	Emergency Preparedness Review (performed by the IAEA)
EU	European Union
HERCA	Heads of the European Radiological Protection Competent Authorities
IAEA	International Atomic Energy Agency
ICPD	Ingestion and Commodities Planning Distance
IPA	Instrument for Pre-Accession Assistance
IRRS	Integrated Regulatory Review Service (performed by the IAEA)
LILW	Low and Intermediate Level Waste
LPZ	Long Term Protective Action Planning Zone
NPP	Nuclear Power Plant
NPRD	National Protection and Rescue Directorate
OG	Official Gazette
OG IA	Official Gazette - International Agreements
PWR	Pressurized Water Reactor
RODOS	Real-Time On-Line Decision Support System
RW	Radioactive Waste
SNSA	Slovenian Nuclear Safety Administration
SORNS	State Office for Radiological and Nuclear Safety
UPZ	Urgent Protective Action Planning Zone
VVER	Vodo Vodnoj Energetičarskij Reaktor
WENRA	Western European Nuclear Regulators Association

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 eighties of the last century 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. Presently, 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 August 2013 till August 2016. 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 mission recently, the findings, recommendations and follow-up actions 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. New *Strategy for the Management of Radioactive Waste, Disused Sources and Spent Nuclear Fuel* is also described. Finally, the recommendations of the IRRS mission regarding the legislative and regulatory framework are presented. The follow-up actions include the preparation of *the Radiological and Nuclear Safety Strategy* (such document didn't exist so far) and drafting of the new *Act on Radiological and Nuclear Safety*.

Article 8 is addressed by describing the responsibilities and the organization of SORNS, an independent regulatory authority responsible for the activities related to the radiological and nuclear safety. The problem regarding the limited staff is explained and the related IRRS mission findings are presented. Training and education within SORNS is also addressed and an example provided.

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 addressed most extensively because the majority of changes since previous report emerged in the area of emergency preparedness. For a start, the overview of the emergency management system is given covering the threats, threat categorization and the roles and responsibilities in the emergency preparedness and response. After that, the reviews and assessments which were carried out recently are described. Based on the results, major upgrade of the emergency management system was initiated. So far, new threat assessment covering nuclear accidents was performed and emergency planning zones were revised accordingly. Moreover, new concepts of

operation are being developed and roles and responsibilities are being redefined. Croatian Early Warning System (CEWS), as an important component of the national nuclear emergency response system, was upgraded to be suitable also for the routine environmental monitoring and for the dose assessments in case of an accident.

Besides the article-by-article review, the report describes two issues which are seen as the challenges for the future. The first one is the harmonization with Slovenia in the area of emergency preparedness and response. While certain improvements were achieved concerning this issue, the emergency planning zones for the potential accidents in Krsko NPP are still not harmonized. The IRRS team welcomed current efforts and encouraged SORNS to continue the dialogue with Slovenian counterparts. The second challenge is the implementation of *the new Strategy for Management of Radioactive Waste, Disused Sources and Spent Fuel*. Currently this is the policy issue of high priority because of the Croatian obligation to participate in the management of the radioactive waste and spent fuel generated in Krsko NPP and because of the urgent need to find the solution for the safe storage of the radioactive waste and spent sources from institutional use.

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 attaches great importance 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 mentioned 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 eighties of the last century state power utilities of Croatia and Slovenia constructed Krsko Nuclear Power Plant (NPP) in Slovenian territory, some 10 kilometers from the Croatian national border. Presently, two states share the nuclear liability and the ownership of 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 addresses all aspects of the obligations and provides comprehensive information based on actual situation. The report is the 7th in a row and covers the period from August 2013 till August 2016. 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.5*. 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 mission recently, the findings, recommendations and follow-up actions are provided where applicable.

In Section 3 future challenges and actions planned to improve safety are described. In this part of the report two subjects are addressed: the harmonization with Slovenia in the area of emergency preparedness and response and the implementation of *the Strategy for Management of Radioactive Waste, Disused Sources and Spent Fuel*. The former relates to the Article 16 of *the Convention* and to the Challenge 2 as defined in *the Summary Report of the 6th Review Meeting*. The latter is currently the policy issue of high priority.

The main body of the 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 on Nuclear Safety* do not apply. In particular, Croatia declares Articles 6, 9, 10, 12, 13, 14, 17, 18 and 19 as non applicable.

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 on Nuclear Safety* 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

1. ***Each Contracting Party shall establish and maintain a legislative and regulatory framework to govern the safety of nuclear installations.***
2. ***The legislative and regulatory framework shall provide for:***
   - ***(i) the establishment of applicable national safety requirements and regulations;***
   - ***(ii) a system of licensing with regard to nuclear installations and the prohibition of the operation of a nuclear installation without a 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 150/11, 12/13) provides that the ministers, the heads of state offices and directors

of governmental authorities (as for example the director of the State Office for Radiological and Nuclear Safety - SORNS) 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 SORNS, while the other authorities cooperate in line with their responsibilities. The cooperation with the following ministries and directorates is of particular importance:

- the Ministry of Health (responsible for health protection of the public),
- the Ministry of Environmental and Nature Protection (responsible for environmental protection),
- the Ministry of Construction and Physical Planning (responsible for planning of land use and for issuing of construction permits),
- the Ministry of Maritime Affairs, Transport and Infrastructure (responsible for the control of transport),
- the Ministry of Finance (responsible for customs control at the borders)
- the Ministry of the Interior (responsible for security issues) and
- National Protection and Rescue Directorate (responsible for emergency planning and response).

The main legislative instrument in the area of interest is *the Act on Radiological and Nuclear Safety*, published in 2013 and amended in 2015 (OG 141/13, 39/15) (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. Most of them were supposed to be issued within two years from the date of the adoption of *the Act*. However, in 2013 *Council Directive 2013/59/Euratom* (new basic safety standards for the protection against ionizing radiation) entered into force. In order to allow for the transposition of *the Directive's* requirements into the national legislation, the deadline for the adoption of the regulations and ordinances was prolonged to February 2018. In the meantime, regulatory acts supervened from previous releases of *the Act* remain in force. The following ones are the most relevant (ordered chronologically):

-
- *Ordinance on nuclear safety requirements for issuing the consent on construction of a nuclear installation (OG 36/16)*
    - 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 Special Requirements Which Expert Organizations Must Fulfill in Order to Perform Certain Activities in the Field Of Nuclear Safety* (OG 74/06)
    - 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 Physical Protection of Radioactive Materials, Nuclear Materials and Nuclear Objects* (OG 38/12)
    - 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
- *Regulation on Measures for Protection Against Ionizing Radiation and Interventions in Case of Emergency* (OG 102/12)
    - 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 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 123/12)
    - 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)
    - 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 Exposure Limits* (OG 59/13)
    - prescribes the exposure limits applicable to the professionals, persons being educated for working with radiation sources and members of the public, as well as the exposure limits and intervention levels to be applied in case of an emergency
- *Ordinance on the Monitoring of the Radioactivity in the Environment* (OG 121/13)

- regulates where, how often and in which way the radioactivity in the environment has to be monitored, as well as how to assess the impact of the facilities where nuclear activities or practices involving the sources of ionizing radiation are performed

Important piece of regulation, adopted in 2014 in accordance with the provisions from *the Act*, is *the Strategy for the Management of Radioactive Waste, Disused Sources and Spent Nuclear Fuel* (OG 125/14). It conforms to the requirements of *the Council Directive 2011/70/Euratom* and allows for the fulfillment of the Croatian obligations regarding the radioactive waste and spent fuel originating from Krsko NPP. The adoption of *the Strategy* was followed by the development of *the National Program for the Implementation of the Strategy*, released as a proposal in January 2016. Both *the Strategy* and *the National Program* are covered in more detail in Section 3.2.

In 2015 Croatia hosted the Integrated Regulatory Review Service (IRRS) mission carried out by the IAEA (more information is provided in Appendix B). One of the main goals of the mission was to review the legislative and regulatory framework in the area of radiation and nuclear safety against the relevant IAEA safety standards. The mission resulted with numerous recommendations and suggestions, where a considerable portion is oriented towards the upgrades of the legislative and regulatory acts (see Table 2 in Appendix B). The Government accepted the results of the mission and concluded as follows:

- Within a year SORNS has to prepare the proposal for *the Radiological and Nuclear Safety Strategy* (such strategy, anticipated by the IAEA safety standards, did not exist so far).
- SORNS is obligated to prepare the proposal for the new *Act on Radiological and Nuclear Safety* till 28th February 2017. The proposal has to reflect all relevant recommendations.
- Public administration institutions are obligated to implement all recommendations and suggestions (including the ones related to the regulation upgrades) till 28th February 2018.

SORNS responded by forming a dedicated unit with the task to provide for timely implementation of the requests made by the Government. Up to now, the analysis of the present status is completed and the regulatory acts which have to be upgraded are identified.

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.***

SORNS is founded by *the Act on Radiological and Nuclear Safety* (OG 141/13, 39/15) as an independent regulatory authority responsible for the activities related to the radiological and nuclear safety and security and for the cooperation with the IAEA and other relevant international institutions. SONRS reports directly to the Croatian Government and the director of SONRS is appointed by the Government.

The responsibilities of SORNS are clearly defined in *the Act* and subordinated regulations and ordinances. SONRS is dealing with the regulatory, inspection and technical tasks, the tasks concerning the early exchange of information in case of nuclear emergencies and the assistance in the event of a nuclear accident. It also covers international cooperation in the field of nuclear safety, safety of nuclear facilities, trade, transport and handling of nuclear materials, accounting for and control of all nuclear facilities and materials, physical protection of nuclear facilities and materials, expert assistance in activities for preventing illicit trafficking of nuclear material, liability for nuclear damage and certain other tasks indicated in the legislation. International cooperation includes the one with the IAEA, where SORNS coordinates the involvement in the national, regional and research projects for all Croatian participants.

SONRS is funded from the state budget only. In the second half of each year, the budget for the next year is proposed to the Government. Moreover, each year SORNS prepares *the Strategic Plan* for the next three years, in accordance with its roles and responsibilities and in line with the proposed budget.

The organizational scheme of SORNS is shown on Figure 1. According *to the Ordinance on Internal Organization*, SORNS should have 49 employees (excluding the Director General), working in the Nuclear Safety and Inspection Sector (20 positions), Radiological Protection Sector (17 positions) and General Affairs Division (12 positions). For each position *the Ordinance* prescribes the basic knowledge, skills, abilities, educational qualifications and working experience required.

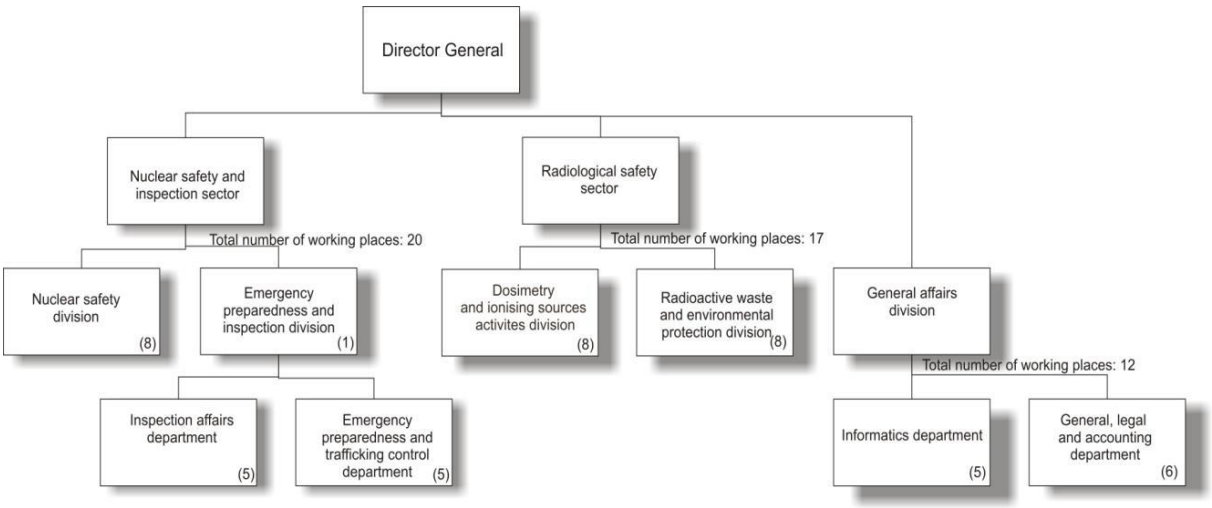

Figure 1 Organizational scheme of SORNS

The organization and the number of employees as shown on Figure 1 should allow for efficient operation in line with the roles and responsibilities. Anyhow, the current number of the employees is only 24. Furthermore, there has been a high turnover of the staff: during the last six years 13 employees have left SORNS (retirement, better paid jobs) and the same number have joined (Table 1).

Table 1 Fluctuation of the employees in SORNS (permanent positions)

Year	Total number of the employees (beginning of the year)	Employees left	Employees recruited
2010	24	0	0
2011	24	2	3
2012	25	3	0
2013	22	6	3
2014	19	2	4
2015	21	0	3
2016	24	-	-

Because of the limitations of the State Budget, it will not be possible to fill all empty positions at SORNS in the near future. Efforts have been made to improve the situation by periodical opening of the temporary positions. While it is clear that temporary staff cannot be trained to perform the most complex tasks, such employees can reduce the workload of the permanent staff by carrying out certain less demanding assignments. Currently, thanks to the additional efforts of the permanent staff and with the help of temporary employees, all main responsibilities (including the safety related tasks) are covered.

In 2015, within the scope of IRRS mission, the resources of SORNS needed to effectively discharge its statutory obligations, both nationally and internationally, were reviewed (see Appendix B for more information). The IRRS team noted that the staff is professional and committed to work and that significant experience is accumulated in the field of radiological and nuclear safety. However, it was also recognized that due to the limitations regarding the budget there are certain areas where SORNS obligations are discharged by limited qualified staff. Examples include the licensing, inspection, enforcement, emergency preparedness and response, international cooperation, radioactive waste management and legal affairs. Also, it was determined that SORNS may face serious challenges in the future, caused by the increase of the workload related to the utilization of radiation sources (especially in medicine), management of radioactive waste and spent fuel, preparation and maintenance of a comprehensive legal framework and the fulfillment of international obligations and commitments. Based on such findings, the IRRS team gave the recommendation to the Government to provide additional resources for SORNS, which would allow for continuous fulfillment of all the obligations. Moreover, the team proposed to SORNS to optimize its internal processes by applying the so-called graded approach and to strengthen the cooperation between the organizational units.

The Government accepted the recommendation given by the IRRS team and obligated SORNS to manage its yearly budget in a way which allows for sufficient number of experts and financial means for performing all regulatory control tasks (see Appendix B).

2.3.1 Capacity Buliding Within SORNS

Various forms of training and education are available for the SORNS 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. Good example is the IPA project *"Strengthening*

Administrative Capacity of the State Office for Radiological and Nuclear Safety, Regulatory Body for Nuclear Safety and Security", implemented in the period 2013-2014. It was designed to strengthen the capacities and independent functioning of SORNS and to introduce the arrangements and practices of the experienced EU regulatory authorities.

The objective of the project was to transfer the best available know-how in the fields of inspection of the radiological and nuclear activities, safety and security of radioactive and nuclear materials, safeguards, NPP decommissioning and management of radioactive waste and spent fuel. Two target groups were in the focus of the project: the radiological/nuclear inspectors and the experts who already are or will be involved in the authorization and safety assessments in the areas of NPP decommissioning and radioactive waste/spent fuel management. The following results were achieved:

- defining the required staff competencies and assessment of the gaps between the required and current competencies of the SORNS staff in the areas of the inspection, security and safeguards, radioactive waste/spent fuel management and NPP decommissioning
- development of the training and education plan and program to address required competences
- development of learning materials for the training and education in all targeted areas
- development of the procedures for the inspection activities
- organization of the workshop covering the inspection, safety and security of radioactive and nuclear materials
- organization of the workshop covering the radioactive waste/spent fuel management and NPP decommissioning
- organization of the study tours to the regulatory bodies and specialized companies in Czech Republic, Slovak Republic, Spain and Slovenia

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 IA 09/02) 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, with the following main goals:

- 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* (According to the current *Krsko NPP Decommissioning Program*, Croatian Electric Power Utility makes a EUR 14,25 million annual payments to the Fund. This 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

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 discharges from the installations in the neighboring countries. This refers primarily to the discharges from Krsko NPP. In order to be sure that no individual is exposed to the radiation doses which exceed prescribed national dose limits, dedicated radiological monitoring program is developed and continuously implemented by the accredited laboratory from the Rudjer Boskovic Institute. 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 discharges (the limits are prescribed for the concentration of the radionuclides 500 meters from the containment) and
- the dose assessments for the most exposed individuals inhabited on Croatian territory.

The results indicate that the impacts to the human health of the operational discharges from Krsko NPP are practically negligible. Measured concentrations and activities are usually at least two orders of magnitude lower than the prescribed limits. The most exposed individual, 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 effective dose of some 0,2 microsieverts. This happens to be 0,02% of the prescribed annual dose limit for the population (1 millisievert). Moreover, the contribution of the dose caused by the discharges 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 SORNS quarterly. The newsletter is available for the examination and download at the SORNS web site.

In addition to the described monitoring program oriented towards operational discharges from Krsko NPP, the radiological monitoring related to the Article 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 SORNS. 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. The most recent such event took place on 5th December 2015, when US Navy aircraft carrier "USS Harry S. Truman" anchored some 5 kilometers from the town of Split and stayed there for 5 days.

When nuclear vessel enters Croatian territorial waters SORNS 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 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 Krsko NPP in Slovenia (PWR, 707 MWe) and Paks NPP in Hungary (VVER, 4x440 MWe). Krsko 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 Krsko NPP, could cause serious consequences on Croatian territory.

Besides the accidents related to the NPPs, the following types of events could also trigger nuclear or radiological emergency in Croatia:

- accident on the nuclear ship located in the Adriatic Sea,
- accident in transport of radioactive sources and nuclear materials in and over the Croatian territory,
- accident in a radioactive waste storage,
- accident during the use of radioactive sources in industry, medicine, scientific research and other activities,
- re-entry of a satellite which uses radioisotopes for energy generation,
- accident related to the illicit transport of radioactive sources and nuclear materials,
- import of food and/or other materials polluted by radionuclides and
- radioactive contamination or increased exposure to ionizing radiation caused by other circumstances, including the vandalism, sabotage and terrorism.

Croatian nuclear and radiological emergency management system is based on *the Regulation on Measures for Protection Against Ionizing Radiation and Interventions in Case of Emergency* (OG 102/12). *The Regulation* defines five threat categories (in line with *IAEA requirements GS-R-2*):

- Threat category I includes facilities in which an emergency could result in severe deterministic health effects off-site that warrant the implementation of urgent protection and rescue measures within a limited area, as well as longer term protection and rescue measures at the entire Croatian territory. Krsko NPP, located in Slovenia,

falls under this threat category. A nuclear ship in the Adriatic Sea with reactors with power levels greater than 100 MW also belongs to this category.

- Threat category II includes facilities in which an emergency may result in ionizing radiation doses that warrant the implementation of urgent protection and rescue measures within a limited area and longer term protection and rescue measures in the wider area. There are no such facilities in Croatia, but the described consequences may be caused by a nuclear ship in the Adriatic Sea with reactors with power levels ranging from 2 MW to 100 MW.
- Threat category III includes facilities in which an emergency may result in ionizing radiation doses that warrant the implementation of urgent protection and rescue measures on-site and only exceptionally within a limited area off-site.
- Threat category IV includes activities that may result in an emergency and warrant the implementation of urgent protection and rescue measures in unforeseeable locations.
- Threat category V includes activities that may result in an emergency, but which do not warrant the implementation of urgent protection and rescue measures. Instead, longer term protection and rescue measures may be warranted at the entire Croatian territory. Nuclear accidents in Paks NPP located in Hungary and in other nuclear facilities abroad belong to this category.

According to *the Regulation*, most of the activities in the field of nuclear/radiological **emergency preparedness** are carried out or coordinated by SORNS and NPRD. The tasks performed by SORNS include the preparation of the laws, by-laws and other documents in the area of radiological and nuclear safety, providing expert support in their implementation, defining the emergency planning zones, monitoring safety conditions at NPPs in the region, prescribing the criteria for intervention and coordination of the public education and information. NPRD prepares and supervises the implementation of the legislation and regulation in the area of protection and rescue, performs risk assessments, provides risk management guides, manages the operational units for protection and rescue, maintains national notification system and organizes training and exercises (including nuclear exercises at national level). SORNS, NPRD and all other institutions having roles in the emergency response (see Figure 2 and Figure 3) are obliged to develop operational procedures in line with the activities they would have to carry out.

As for the **emergency response**, *the Regulation* distinguishes between two schemes: (1) the scheme applicable for the threat categories I and II and (2) the scheme to be implemented for the categories III, IV and V. In case of an emergency under the threat category I or II (Figure 2) most of the crisis management and decision making is carried out by NPRD, while SORNS provides technical support. The protective measures are implemented by the operational forces and special teams formed at the state, regional and local levels.

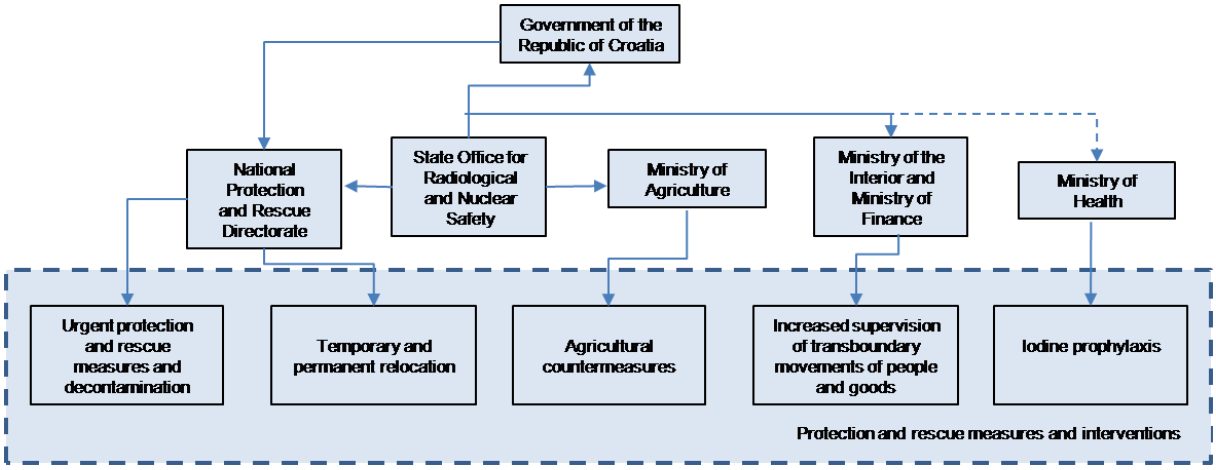

Figure 2 Response system for the threat categories I and II

The scheme for the response system to be applied for the threat categories III, IV and V is somewhat simpler (Figure 3). In this case the most involved institution is SORNS. Basically, SORNS sets out and implements urgent protection and rescue measures and required interventions, in line with the scope of the emergency and on-site situation. When needed, SORNS activates emergency services, holders of the license for practice involving ionizing radiation sources, authorized technical services, scrap metal operators, border police and customs for the implementation of urgent protection and rescue measures and required interventions.

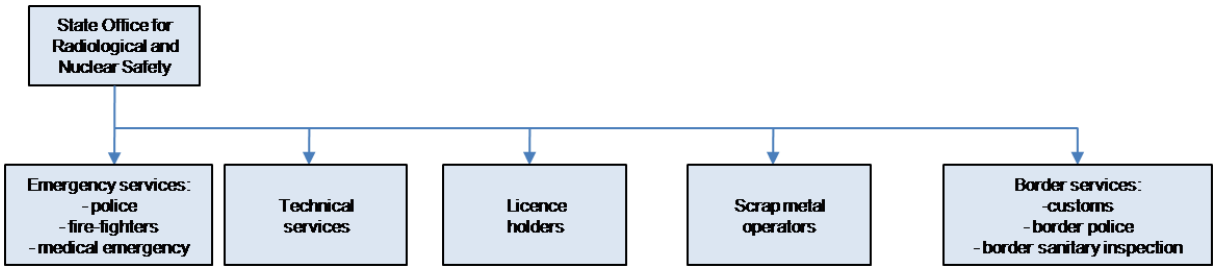

Figure 3 Response system for the threat categories III, IV and V

2.6.1 Reviews, Assessments and Evaluations Through Exercising

Croatian nuclear and radiological emergency management system has been under review three times recently: (1) in 2012 EPREV mission was carried out by the IAEA expert team[1], (2) in 2013-2014 the assessment of the system was performed within the scope of the IPA project and (3) in 2015 IRRS mission was conducted, again by the IAEA experts.

EPREV mission was conducted as full-scope review, i.e. as a complete and thorough appraisal of the country's emergency preparedness and response capability. The overall objectives of the mission were:

[1] Although EPREV mission was carried out in 2012 (i.e. out of the timeframe for this national report), it is covered here because the mission report has been accepted in 2015.

- to provide an assessment of the Croatian legislation, arrangements and capability to respond to possible nuclear or radiological emergencies on the basis of international standards and the EU acquis,
- to assist Croatia in the development of interim arrangements to respond to possible nuclear or radiological emergencies and
- to provide recommendations upon which Croatia can develop a longer-term program to enhance the ability to respond to such emergencies.

The mission resulted with 67 recommendations, where 54 were interim (should be addressed as early as possible using existing capabilities) and 13 were long term (pertaining to the national and local response organization - longer implementation time is acceptable). Most of the interim recommendations were related to the drafting or implementation of *the National Emergency Plan* consistent with IAEA requirements and EU acquis.

IPA project titled *"Upgrading of Emergency Preparedness System in the Republic of Croatia"* was launched to further strengthen Croatian capabilities in the area of nuclear and radiological emergency management. The project was carried out by the company *Resources and Logistics (RaL)* and funded through *the IPA Horizontal Programme on Nuclear Safety and Radiation Protection*. Within the scope of the project all components of the Croatian nuclear and radiological emergency preparedness and response system were assessed in detail. The findings indicated that the system, as it was in 2013-2014, doesn't allow for timely implementation of certain protective measures and that improvements are needed. Based on the findings 29 recommendations were given and for each one the priority was determined. Moreover, 6 recommendations were provided on how to upgrade the regulatory framework.

IRRS mission is described in more detail in Appendix B. The mission resulted with 36 recommendations and 22 suggestions altogether, out of which 6 recommendations and 5 suggestions directly address emergency preparedness and response (see Table 2 in Appendix B).

The results of the mentioned reviews/assessments are in good agreement. The overall conclusion is that although Croatian nuclear and radiological emergency management system includes all the components foreseen by the international standards, there is a lot of space for improvements. The same conclusion was drawn by evaluating a number of exercises organized in the period covered by this report. Those were:

- Motel Plitvice 2013 (October 2013) - exercise organized as one of the activities of the EU funded project *"Preparedness and Evacuation in Case of Nuclear Accident"*, based on the potential severe accident in Krsko NPP (field exercise)
- JARUN 2014 (March 2014) - exercise for the first responders in Zagreb area, which referred to the potential accident in the transport of radioactive material (field exercise)
- BLATO 2014 (April 2014) - exercise organized in Zagreb area with the scenario in which catastrophic earthquake was combined with additional challenges including the radiological accidents (field exercise)
- NEK 2014 (November 2014) - Slovenian national exercise related to the potential accident in Krsko NPP, with the participation of several Croatian institutions and organizations (table-top exercise)
- INEX 5 (March 2016) - exercise based on the potential catastrophic accident in Krsko NPP organized by Slovenia and joined by Austria, Italy, Hungary and IAEA (table-top exercise)

- Motel Plitvice (May 2016) - exercise founded on the potential severe accident in Krsko NPP, organized to evaluate the practices and procedures improved after already mentioned exercise Motel Plitvice 2013 (field exercise)
- ConvEx exercises 1a/1c/2a/2c/2d (October 2014, November 2014, April 2015, March 2015, July 2015, December 2015, May 2016) (table-top exercise)

2.6.2 Major Upgrade of the System

SORNS 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. The upgrade process was launched in the second half of 2015. As a starting point, the plan for carrying out the process was developed. It consists of the following main steps:

1) upgrade of the threat 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.

Listed steps should bring Croatian nuclear and radiological emergency management system completely in line with the EU requirements and IAEA recommendations (including the most recent ones). All existing components should be utilized as much as possible. Various limitations (human capacities, financial means etc.) will be taken into consideration in order to come up with realistic and achievable solutions. Up to now, significant progress has been made concerning the steps 1), 2) and 3), which is described in the following subsections.

2.6.3 Threat Assessment and Emergency Planning Zones

Threat assessments provide the basis for the emergency planning. The assessments which were performed in Croatia in the past and which pertained to nuclear accidents had serious limitations. Within the scope of the reviews described in subsection 3.6.1 those assessments were found to be incomplete and outdated. As such, they could not provide adequate basis for the initiated emergency management system upgrade.

New threat assessment covering threat categories I and II (as defined by *the IAEA requirements GS-R-2*) has been completed in June 2016. It refers to the emergencies at Krsko NPP and to the potential accidents at nuclear ships located in the Adriatic Sea. The part of the assessment related to the emergencies at Krsko NPP is based on the information presented in the IAEA publication *"Actions to Protect the Public in an Emergency due to Severe Conditions at a Light Water Reactor - EPR-NPP Public Protective Actions, 2013"*, as well as on several site-specific assessments. In those assessments the effects of the post-Fukushima measures implemented in Krsko NPP were taken into consideration. For the other part of the threat assessment (i.e. the part which is related to the accidents at nuclear ships) the data from the ARPANSA document titled *"The 2000 Reference Accident Used to Assess the Suitability of Australian Ports for Visits by Nuclear Powered Warships"*

were used. In addition, consequence assessments for the worst-case accident scenarios were performed by SORNS experts using the RODOS code.

The results of the newly performed threat assessment were utilized for the revision of the emergency planning zones. Existing zones for the accidents in Krsko and Paks NPPs were defined back in 1998 in a way that the most conservative values have been chosen from the ranges recommended at that time by the IAEA. By such approach, the radius for the urgent protective action planning zone (UPZ) was set to 25 km and the radius for long term protective action planning zone (LPZ) to 100 km. Revised emergency planning zones, officially adopted in June 2016, follow the most recent IAEA and HERCA/WENRA recommendations. Instead of two, three planning zones/distances are introduced: UPZ with 20 km radius, EPD (extended planning distance) with 100 km radius and ICPD (ingestion and commodities planning distance) with 300 km radius. EPD and ICPD are applicable for both Krsko and Paks NPPs, while UPZ applies for Krsko NPP only (UPZ of Paks NPP does not reach the Croatian territory).

Two goals were supposed to be achieved by the revision of the planning zones: (1) to bring the zones and sizes in line with the international post-Fukushima recommendations and (2) to achieve the harmonization with the neighboring countries, especially with Slovenia. The first goal has been reached, while the second one hasn't so far (see Section 3.1).

2.6.4 Concepts of Operation, Roles and Responsibilities

In Croatia detailed concepts of operation for the nuclear and radiological accidents haven't been developed in the past. That was identified as one of the main reasons for certain inadequate solutions within the emergency management system. According to the plans, in the upgrade process of the system 12 comprehensive concepts of operation will be developed. They correspond to the threats identified, which means that the following types of emergencies will be covered:

1) accident on the nuclear ship,
2) accident in the use of dangerous fixed source,
3) lost or stolen dangerous source,
4) serious overexposure,
5) transport accident or the accident with the mobile source,
6) found source or the detection of increased radiation levels,
7) detection of the medical symptoms of radiation exposure,
8) transboundary contamination,
9) re-entry of the satellite with radioactive material,
10) terrorist activities which include radioactive or nuclear materials,
11) emergency at Krsko NPP and
12) emergency at Paks NPP.

Up to now, the concepts of operation listed under 2), 5), 6), 11) and 12) were finalized while the rest is under development. The concepts which refer to the accidents in NPPs are based on the IAEA publication *EPR-NPP Public Protective Actions*. For the rest, 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 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.

Newly developed concepts of operations provide the basis for the revision of the roles and responsibilities in the nuclear and radiological emergency preparedness and response systems. In this ongoing activity the recommendations and suggestions from all mentioned reviews and assessments

are taken into consideration. For instance, the revised roles and responsibilities of SORNS will reflect the recommendations and suggestions of the IRRS mission given in Table 2 under R-19, R-22 and S-16.

2.6.5 CEWS Upgrade

CEWS (Croatian Early Warning System) is important component of the national nuclear emergency response system. It consists of 33 measuring stations and the central unit where the data is collected, analyzed and stored. Each station continuously monitors ambient gamma dose rate. At two stations radionuclide concentrations in the atmosphere and certain meteorological parameters are also measured. If elevated radiation levels are detected, an alarm system is automatically triggered and measurement data is examined by the SORNS duty officer.

The objective of the IPA project *"Upgrading the systems for the on- and off-line monitoring of radioactivity in the environment in Croatia in regular and emergency situations"* was to upgrade the CEWS to be suitable also for the routine environmental monitoring and for the dose assessments in case of an accident. Within the scope of the project all gamma dose rate measurement sites were visited. On each site the deviations from the standard measuring conditions were analyzed. In addition, accurate dose rate and gamma-spectrometric measurements were carried out. The following has been achieved:

- measuring locations suitable for routine environmental monitoring were identified, as well as those suitable for dose assessments in case of an accident,
- correction factors for dry and wet deposition were determined, to be used for dose assessments in case of an accident,
- cosmic and terrestrial components of radiation were determined, as well as the concentration of radionuclides in the soil and
- corrective actions for further improvement of the CEWS were proposed.

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

3. CHALLENGES AND PLANNED ACTIVITIES TO IMPROVE SAFETY

In *the Summary Report of the 6th Review Meeting* five challenges were identified for consideration by the contracting parties. Furthermore, at the 7th Organizational Meeting the contracting parties were reminded that in drafting their national reports they are encouraged to take into account those challenges.

Section 3.1 refers to the Challenge 2 (*How to achieve harmonized emergency plans and response measures?*) and it is associated with Article 16 of *the Convention*. The rest of the challenges listed in *the Summary Report of the 6th Review Meeting* are not addressed because they appear to be oriented more towards the countries with nuclear installations.

Section 3.2 describes the challenge which is specific for Croatia: the implementation of *the Strategy for Management of Radioactive Waste, Disused Sources and Spent Fuel*. This is considered to be policy issue of high priority, clearly related to the nuclear safety.

3.1 Harmonization With Slovenia in the Area of Nuclear Emergency Preparedness and Response (Article 16 / Challenge 2)

In Croatia the importance of the harmonization in the area of nuclear emergency preparedness and response was recognized as important issue already in the pre-Fukushima period. Because of the locations of Krsko NPP (Slovenia) and Paks NPP (Hungary), the harmonization with Slovenia and Hungary is of greater importance than the harmonization with other neighboring countries (Serbia, Bosnia Herzegovina, Montenegro and Italy). The harmonization with Slovenia is the priority, since Krsko NPP is positioned only some 10 km from the Croatian border.

In the period 2013/2014 the project *"Upgrading of the Croatian Emergency Preparedness and Response Plan and Harmonization with Neighboring Countries"* was carried out. One of the objectives of the project was to provide the basis for the harmonization with the neighboring countries, in particular with Slovenia and Hungary, in the area of nuclear and radiological emergency management. The task was accomplished by identifying emergency management system components which are the main candidates for the harmonization. It was shown that those components are (1) the threat assessments, (2) emergency planning zones, (3) emergency classification, (4) intervention levels, (5) operational intervention levels, (6) decision support tools, (7) protection of emergency workers and (8) public information. After the identification, current status of each component in Croatia, Slovenia and Hungary was analyzed and compared, so that the need for the harmonization can be determined. It turned out that the highest level of harmonization is achieved in the areas of emergency classification, intervention levels, operational intervention levels and protection of emergency workers, while the other areas were not harmonized in satisfactory manner.

The opportunity to increase the level of the harmonization with Slovenia arose in 2013 when the revision of *the Slovenian National Protection and Rescue Plan for Nuclear and Radiological Emergencies* was initiated. For this process dedicated working group was established by the Slovenian Nuclear Safety Administration (SNSA). Croatian representatives were invited to join the group and to contribute in the harmonization issues related to the potential accidents in Krsko NPP.

The activities of the working group were completed in 2015. One of the important areas of the harmonization were the emergency planning zones. Unfortunately, the attempts to achieve the harmonization in this area produced no results. The position of the Croatian side was that the planning zones for Krsko NPP should be harmonized by following the latest international recommendations, in particular the recommendations given in the document "*Actions to Protect the Public in an Emergency due to Severe Conditions at a Light Water Reactor, EPR-NPP Public Protective Actions, IAEA, 2013"* and the ones provided in the publication *"Approach for a better cross-border coordination of protective actions during the early phase of a nuclear accident, HERCA/WENRA, 2014"*. According to the Croatian side, site-specific analyses (i.e. the analyses made specifically for Krsko NPP) should be used primarily in order to select optimal values of the zone sizes from the recommended ranges. If the results of the site-specific analyses are used as the arguments for the deviation from the international recommendations, such analyses should meet the highest standards and the results should be interpreted with a full understanding of the implemented methods and their limitations. The Slovenian side, however, advocated the zones which are identical or similar to the existing ones and which do not follow a considerable portion of the recommendations from the mentioned documents. Its position was based on certain site-specific analyses in which significant deficiencies were identified by the Croatian side.

It is important to mention that, regardless of the failure considering the emergency planning zones, the activities of the working group contributed to the harmonization in other areas. For example, information exchange in case of the accident in Krsko NPP should be upgraded in a way that Croatian institutions will obtain the access to the Slovenian information exchange system used in nuclear emergencies (KSID). This should reduce the delays in the information flow from Krsko NPP to the Croatian side and increase the level of understanding about the actions and measures carried out during the emergency on each side.

During the IRRS mission (see Appendix B) SORNS took the opportunity and asked for advice on further steps in the harmonization process with Slovenia. IRRS team welcomed current efforts and encouraged SORNS to continue the dialogue with Slovenian counterparts about the planning zones and other opened issues. SORNS was advised to extend the collaboration at a technical level, e.g. by carrying out joint exercises, as this may help both sides to better understand each other's needs and capabilities, as well as to build mutual trust. SORNS staff benefitted from presented experiences in the harmonization of the zone sizes and response strategies between Bulgaria and Romania and their collaboration regarding the potential accidents at Kozloduy NPP.

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

In the early eighties of the last century state power utilities of Croatia and Slovenia constructed Krsko NPP on the Slovenian territory. Presently, two states share the nuclear liability and the ownership of the plant. In March 2003 *the Agreement between the governments of Slovenia and Croatia on the status and other legal issues related to the investment, exploitation and decommissioning of the Nuclear power plant Krsko* (OG IA 9/02) was signed. It specifies that the management of radioactive waste and spent fuel from the plant is joint responsibility of contracting parties, who should ensure efficient common solutions regarding both the economic and environmental protection aspects. If the contracting parties do not reach consensus on joint waste management during the regular lifetime of the plant (i.e. until 2023), within the next two years the radioactive waste and spent fuel has to be split in equal parts and removed from the site. After signing

the Agreement, the contracting parties formed the Intergovernmental Commission as the body which will monitor its implementation.

The Agreement asks for the preparation and periodical revision (each 5 years) of *the NPP Decommissioning Program*, which is covering both the decommissioning and radioactive waste/spent fuel management issues. The first revision was prepared and approved by Slovenian and Croatian governments in 2004. This happened to be the only revision formally approved by now. In this revision three facilities were planned (either in Slovenia or in Croatia, on unspecified locations): (1) a low and intermediate level waste (LILW) repository, (2) a spent fuel dry storage facility and (3) a spent fuel repository. Each was supposed to be a shared facility financed in equal parts and jointly used by both countries.

However, in 2004 Slovenia started an independent process of a national LILW repository establishment, with the aim to construct it before 2013. In the following period Slovenia continued with the process which became known as the Vrbina Repository Project. The repository is supposed to be sited in the Municipality of Krsko, few hundred meters from the NPP. An underground silo facility was chosen as the most appropriate design for that location. The repository concept was developed in two variants: (1) to accommodate the Slovenian LILW only and (2) to accept the Croatian share of LILW from the NPP as well.

The second revision of *the Krsko NPP Decommissioning Program* was completed in 2010. In this revision 5 scenarios were analyzed. Two of them covered the case in which the NPP would stop operation in 2023 (which was still possible at the time) and the rest was oriented towards the case where life extension till 2043 will be achieved. The terms of reference for this revision took into account Slovenian intent to build a national LILW repository at Vrbina, but also anticipated the possibility that Croatia will choose to manage a half of LILW on its own. The second revision, which happens to be the last revision of *the Decommissioning Program* proposed so far, has never been approved by Slovenian and Croatian authorities.

In July 2015, after 5 years of inactivity, the Intergovernmental Commission held its session and formally set up the scene for further development of *the Decommissioning Program*. At that session the life extension of the Krsko NPP till 2043 was approved. The owner's proposal to build dry spent fuel storage on-site and to put it into operation in 2018 was approved too, which considerably relaxed the spent fuel management issues. At the same session Slovenian representatives made the first formal offer to Croatia to consider participating in the Vrbina Repository Project. Anyhow, it hasn't been clarified what such participation would actually mean.

Presently, each country is pursuing its strategic goal to manage (at least) one half of LILW from the Krsko NPP on its territory. Slovenia did not introduce any major conceptual changes into the Vrbina Repository Project. Apart from demanding facility design, major disadvantage of this project is high cost mostly related to the extensive compensations offered to the local community. The preparation of the project documentation was contracted in 2014 and is currently on-going.

In Croatia the approach to manage the radioactive waste and spent fuel from Krsko NPP is laid down in the (1) *Strategy for the Management of Radioactive Waste, Disused Sources and Spent Nuclear Fue*l, adopted by the Parliament in 2014 and (2) the *National Program for the Implementation of the Strategy for the Management of Radioactive Waste, Disused Sources and Spent Nuclear Fuel*. *The Strategy*, was developed in accordance with the requirements from *the Bilateral Agreement* and in line with the relevant EU legislation (including *the Council Directive 2011/70/EURATOM*), international standards and best practice. *The Strategy* declares that Croatia will establish its national Center for Radioactive Waste Management (the RW Center) with storage and disposal capabilities. All

of Croatian spent sources and LILW, including the Croatian share of the LILW originating from the Krsko NPP, will at first be stored at the central storage facility and later transferred to a repository. Spent fuel will be stored at the site of Krsko NPP. The strategic goals are specified as follows:

- Short-term goals (2 years):
  - establishment of the central storage for institutional radioactive waste and disused sources
  - preparation of the program of exploration, development and establishment of the long-term storage for radioactive waste from Krsko NPP
- Mid-term goals (10 years):
  - implementation of the program of exploration, development and establishment of the long-term storage for radioactive waste from Krsko NPP
  - preparation of the program of exploration, development and establishment of the repository for institutional radioactive waste, disused sources and the waste from Krsko NPP
- Long-term goals
  - implementation of the program of exploration, development and establishment of the repository for institutional radioactive waste, disused sources and the waste from Krsko NPP

The Program, which is currently the subject of the strategic environmental assessment, 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. According to *the Program*, the RW Center is supposed to be located in the Dvor municipality at the Cerkezovac site. This site hosted a military installation, but now it is declared as non-perspective for further military utilization. Within *the Program* the cost estimates for the radioactive waste management are presented, including the anticipated compensations to the local community.

The Strategy together with *the Program* offer a systematic framework for the management of the radioactive waste and spent fuel. However, the implementation will be demanding from various aspects:

- 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. While it seems that there are no technical reasons for its exclusion, it still hasn't been approved as a site for radioactive waste storage (or permanent disposal).
- Solving sociopolitical problems could prove to be more complex than solving technical issues. It is still uncertain whether the consent will be obtained from the local community to host radioactive waste management facilities.
- The location is close to the border with Bosnia and Herzegovina, which makes the realization of the RW Center an international issue.

The current situation, the problems and the planned ways to solve them were presented to the IRRS mission (see Appendix B). The IRRS team encouraged Croatian authorities to approve and implement *the Program*. The team advised SORNS to devote specific attention to the following:

- exercising their regulatory role in relation to radioactive waste management,
- evaluation of the preselected site for radioactive waste disposal and determination of the need for a safety assessment,

- development of the safety analysis and public communication expertise with the involvement of the international experts,
- development of a comprehensive set of regulations and guides for radioactive waste disposal and
- development of the waste acceptance criteria for the future disposal facility.

4. **APPENDIX A -** List of the Most Relevant Documents Within the Croatian Legislative and Regulatory Framework (as of July 2016)

4.1 National Legal Frame

Acts:

- Act on Radiological and Nuclear Safety (OG 141/13 and amended OG 39/15)
- Act on Liability for Nuclear Damage (OG 143/98)
- Act on Fund for Krsko NPP Decommissioning, Radioactive Waste and Spent Nuclear Fuel Management (OG 107/07)
- Act on Civil Protection System (OG 82/15)

Governmental regulations:

- Regulation on Measures for Protection Against Ionizing Radiation and Interventions in Case of Emergency (OG 102/12)

Ordinances:

- Ordinance on nuclear safety requirements for issuing the consent on construction of a nuclear installation (OG 36/16)
- Ordinance on Special Requirements Which Expert Organizations Must Fulfill in Order to Perform Certain Activities in the Field Of Nuclear Safety (OG 74/06)
- Ordinance on Physical Protection of Radioactive Materials, Nuclear Materials and Nuclear Objects (OG 38/12)
- 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 123/12)
- Ordinance on the Supervision and Control of Transboundary Shipments of Radioactive Waste and Spent Fuel (OG 11/13)
- 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)
- Ordinance on Exposure Limits (OG 59/13)
- Ordinance on the Monitoring of the Radioactivity in the Environment (OG 121/13)

Strategies and implementation programs:

- National Energy Strategy (OG 130/09)
- Strategy for the Management of Radioactive Waste, Disused Sources and Spent Nuclear Fuel (OG 125/14)

- National Program for the Implementation of the Strategy for the Management of Radioactive Waste, Disused Sources and Spent Nuclear Fuel (proposal, 2016)

Other documents:

- Protection and Rescue Plan for the Republic of Croatia (OG 96/10)
- Threat Assessment for the Republic of Croatia Covering Threat Categories I and II (SORNS, 2016)
- Decision on Areas/Zones for the Implementation of Urgent Protective and Rescue Measures and on Threat Perimeters (SORNS, 2016)

4.2 Multilateral Agreements

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- Convention on Nuclear Safety (OG IA 13/95)
- Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (OG IA 3/99)
- Convention on the Physical Protection of Nuclear Material (OG IA 12/93, OG IA 5/01 and amended OG IA 5/06)
- Convention on Early Notification of a Nuclear Accident (OG IA 12/93, OG IA 1/06)
- Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (OG IA 12/93, OG IA 1/06)
- Vienna Convention on Civil Liability for Nuclear Damage (OG IA 12/93, OG IA 1/06)
- Joint Protocol Relating to the Application of the Vienna Convention and the Paris Convention (OG IA 12/93)

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 IA 9/98, OG IA 3/00)
- Agreement Between the Government of the Republic of Croatia and the Government of the Republic of Hungary on the Early Exchange of Information in the Event of a Radiological Emergency (OG IA 11/99)
- Agreement Between the Government of the Republic of Croatia and the Government of the Republic of Slovenia on Regulating the Status and Other Legal Relations Pertaining to Investments, Use and Decommissioning of the Krsko Nuclear Power Plant (OG IA 09/02)

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 - IRRS Mission: Purpose, Scope, Results and Follow-Up Actions

In April 2013 SORNS, as a state administration body competent for activities pertaining to radiological and nuclear safety, submitted the request to the IAEA to conduct an Integrated Regulatory Review Service (IRRS) mission. In the preparation for the mission SORNS carried out a self-assessment and developed a preliminary action plan. The results of the self-assessment and supporting documentation were provided to the IRRS review team as advance reference material for the mission.

IRRS mission took place in Zagreb from 7 to 17 June 2015. The purpose of the mission was to review Croatia's radiation and nuclear safety regulatory framework and activities against the relevant IAEA safety standards, to report on regulatory effectiveness and to exchange information and experience. The IRRS team carried out the review in the following areas: responsibilities and functions of the government, the global nuclear safety regime, responsibilities and functions of the regulatory body, the management system of the regulatory body, the activities of the regulatory body including authorization, review and assessment, inspection and enforcement processes, development and content of regulations and guides, emergency preparedness and response, occupational radiation protection, patient protection, public and environmental exposure control, waste management and decommissioning. In addition, policy issues of high priority were discussed: (1) the revision of emergency planning zones and (2) the implementation of *the Strategy for Management of Radioactive Waste, Disused Sources and Spent Fuel*.

The IRRS team made the following general observations:

- Croatia established SORNS as an effectively independent regulatory body empowered by *the Act for Nuclear and Radiation Safety* to fulfill their regulatory responsibilities, roles and functions in line with the IAEA standards
- Croatia is an active member of the international safety regime
- Croatia established *the Strategy for the Management of Radioactive Waste, Disused Sources and Spent Nuclear Fuel* and started its implementation

Within the scope of the mission 36 recommendations and 22 suggestions oriented towards the improvements in the fields of radiological and nuclear safety were given (see Table 2). In addition, the IRRS team identified the areas where significant efforts are needed to comply with international standards. Those are:

- Review and strengthening of the governmental, legal and regulatory framework for safety in order to make it consistent with IAEA safety standards. In particular, establishing and implementing the graded approach in all regulatory processes.
- Providing SORNS with the necessary human and financial resources to discharge effectively its statutory obligations and responsibilities.
- Improvement of SORNS staff qualifications and competence for effective performing of regulatory functions.
- Establishment of an integrated management system in line with the requirements of IAEA safety standards to achieve stability and consistency of the regulatory control. This system should include processes and procedures for authorization, review and assessment, inspection, enforcement, emergency preparedness and response.

- Improving patient protection in medical exposure situations in close cooperation with the Ministry of Health and professional societies.

The report of the IRRS mission[2] (incl. all the recommendations and suggestions) was accepted by the Croatian Government on 5th November 2015 in the form of governmental conclusion. The Government concluded as follows:

- Within a year SORNS has to prepare the proposal for *the Radiological and Nuclear Safety Strategy*.
- SORNS is obligated to prepare the proposal of the new *Act on Radiological and Nuclear Safety* till 28th February 2017. The proposal has to reflect all relevant recommendations.
- SORNS is obligated to manage its yearly budget in a way which allows for sufficient number of experts and financial means for performing all regulatory control tasks.
- SORNS and the Fund for financing the decommissioning and disposal of the radioactive waste and spent nuclear fuel from Krsko NPP are obligated to provide for safely radioactive waste management and in particular for the implementation of the requirements and deadlines related to the construction and operation of the Central National Radioactive Waste Storage Facility as prescribed by *the Strategy*.
- Within 1 year SORNS is obligated to re-examine its roles within the emergency response system.
- Within 1 year the Ministry of Health is obligated to officially recognize medical physics as an occupation and to introduce the education in the field of medical physics in order to increase the protection from the ionizing radiation for the patients.
- Within 6 months SORNS is obligated to introduce complementary education in the implementation of radiation protection measures in a way which will not jeopardize its independence.
- Public administration institutions are obligated to implement all relevant recommendations and suggestions till 28th February 2018.

The Conclusion can be considered a general action plan which should have provide the basis for the development of more detailed action plans at the institutional level. As an example, in January 2016 a dedicated unit was formed within SORNS with the task to provide for timely implementation of *the Conclusion*.

[2] The Report is available to the public and others at http://cms.dzrns.hr/_news/10680/IRRS_Croatia_final_report.pdf

Table 2 Recommendations and suggestions of the IRRS mission

AREA		RECOMMENDATIONS (R) AND SUGGESTIONS (S)	
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.
		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.
		R3	The Government should provide SORNS with human and financial resources enabling SORNS to completely fulfill its statutory obligations for regulatory control.
		S1	The Government should consider organizing training and refresher courses in a way that do not compromise effective independence of SORNS.
		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.
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.
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.
		R7	SORNS should prepare and implement comprehensive training plans in order to improve knowledge, skills and abilities to perform all the functions and responsibilities.
		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.
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.
		R9	SORNS should develop an integrated management system in line with IAEA safety standard GS-R-3.
		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.

AREA		RECOMMENDATIONS (R) AND SUGGESTIONS (S)	
		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.
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.
		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.
		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.
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.
		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.
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.
		R14	The Government should empower SORNS inspectors to carry out announced inspections.
		R15	SORNS should review the draft “Manual for conducting inspection supervision” to cover all elements of inspections and approve it.
		S7	SORNS should review its inspection programme and include tests and measurements as a method of inspection.
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.
		S8	SORNS should consider providing inspectors with legal support to carry out enforcement actions.
9	REGULATION AND GUIDES	S9	SORNS should consider developing guides to help users striving to achieve the high levels of safety.
		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.
		S11	SORNS should consider reviewing its ordinances for compliance with GSR Part 3.

AREA		RECOMMENDATIONS (R) AND SUGGESTIONS (S)	
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.
		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.
		S12	SORNS should consider setting response time objectives for notification of an emergency and for activation of an emergency response.
		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.
		R20	SORNS shall require operators to implement clear command and control system to manage effectively the on-site emergency response.
		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.
		S14	SORNS should consider continuing its efforts to coordinate and harmonize emergency planning zones with their Slovenian counterparts in relation to Krsko NPP in line with relevant IAEA Safety Standards.
		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.
		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.
		R22	SORNS should develop its own emergency arrangements consistently with IAEA Safety Standards to fulfill its roles in emergency response.
		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.
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.

AREA		RECOMMENDATIONS (R) AND SUGGESTIONS (S)	
		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.
		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.
		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.
		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.
		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.
		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.
		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.
		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.
11.2	OCCUPTIONAL 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.
		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.
		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.

AREA		RECOMMENDATIONS (R) AND SUGGESTIONS (S)	
		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.
		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.
		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.
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.
		R34	SORNS should ensure that monitoring programmes are developed and implemented in accordance with IAEA standards and supported by its regulatory framework.
		S22	SORNS should consider implementing a calibration programme for all of its monitoring and measuring instruments.
		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.
		R36	SORNS should revise their Ordinances to address the remediation process of areas contaminated with residual radioactive material in accordance with IAEA standards.