Republic of Croatia

CROATIAN REPORT ON NUCLEAR SAFETY

6TH CROATIAN NATIONAL REPORT ON THE IMPLEMENTATION OF THE OBLIGATIONS UNDER THE CONVENTION ON NUCLEAR SAFETY

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Impressum

6th 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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LIST OF ABBREVIATIONS

CEWS	Croatian Early Warning System
HPRRC	Headquarter for Protection and Rescue Republic of Croatia
DHMZ	Meteorological and Hydrological Service of Croatia
EC	European Commission
ECURIE	European Community Urgent Radiological Information Exchange
EURDEP	European Radiological Data Exchange Platform
GALs	Generic Action Levels
GILs	Generic Intervention Levels
IAEA	International Atomic Energy Agency
IMI	Institute for Medical Research and Occupational Health
InterRAS	International Radiological Assessment System
IRB	Institute Ruđer Bošković
LILW	Low and Intermediate Level Radioactive Waste
LM	Longer-term protective Measures
LPZ	Longer Term Protective Action Planning Zone
NPP	Nuclear Power Plant
NPRD	National Protection and Rescue Directorate
NC 112	National Center 112
OILs	Operational Intervention Levels
PM	Preventive protective Measures
RODOS	Real-time On-line Decision Support
RAW	Radioactive Waste
SF	Spent Fuel
SORNS	State Office for Radiological and Nuclear Safety
SQP	Small Quantities Protocol
UM	Urgent Protective Measures
UPZ	Urgent Protective Action Planning Zone

INTRODUCTION

The Republic of Croatia continues its successful cooperation with the International Atomic Energy Agency (IAEA) and attaches great importance to the nuclear safety and commends the work of IAEA in this field. The legal regime on nuclear safety was effectively established with acceptance of the Convention on Nuclear Safety (O.G. 13/1995) and the Joint Convention on Spent Fuel and Radioactive Waste Management (O.G. 03/1999). By the virtue of succession, Croatia became a party to the Convention on Physical Protection of Nuclear Material (O.G. 05/2001), Convention on Early Notification in Case of Nuclear Accident (O.G. 01/2006) and the Convention on Assistance in Case of Nuclear Accident or Radiological Emergency (O.G. 01/2006).

Furthermore, Croatia participated in the Fifth Review Meeting of the Parties to Convention on Nuclear Safety in Vienna in 2011 and successfully presented its Fifth National Report and also in the Extraordinary Meeting on the Implementation of the Obligations under the Convention on Nuclear Safety. As one of the first IAEA Member States, Croatia signed and ratified the Protocol Additional to the Agreement between the Republic of Croatia and International Atomic Energy Agency for the application of safeguards in connection with the Treaty on non-proliferation of Nuclear Weapons (O.G. 07/2000).

After joining EU, Commission Regulation (Euratom) No 302/2005 of 8 February 2005 on the application of Euratom safeguards became obligatory to Croatia and the first Physical Inventory List (PIL) is sent to EC on July 2013.

Croatia implements the system of integrated safeguards and all nuclear material in Croatia remains in peaceful activities.

According to the Constitution of the Republic of Croatia the requirements of the Convention became part of the national legislation. By further development of national nuclear safety legislation, the measures and obligations defined by the Convention have been more directly implemented.

In the early eighties of the last century state power utilities of Croatia and Slovenia constructed the Krško nuclear power plant (Krško NPP) on the territory of the Republic of Slovenia. Presently, two states share the nuclear liability and the ownership of the Krško NPP. In March 2003 the Agreement between the Republic of Croatia and the Government of the Republic of Slovenia on regulation of status and Other Legal relations regarding the investment, use and dismantling of Nuclear Power Plant Krško was signed.

Concerning Krško NPP licensing and operation, the Croatian regulatory body was the authority competent to provide appropriate consents. Nowadays, the Croatian regulatory body does not play any role concerning this issue. The Slovenian regulatory body, Slovenian Nuclear Safety Authority, is in charge to

license Krško NPP operators, to review operation and modifications as well as to carry out regulatory inspections.

Croatia does not have intention to build a nuclear power plant in the short term period, although Croatian Energy Strategy foresees the possibility for construction of the first NPP in Croatia after 2020. At this moment there is no plan to include sites for nuclear power plants in the general land use plan of the Republic of Croatia.

This report is the sixth Croatian report in row of previous reports on the implementation of the obligations under the Convention (1998, 2001, 2004, 2007, 2010). Thus, the Report describes new circumstances and situation, and also the changes done and measures implemented since the last report. The Report will be the subject for discussion of all Contracting Parties during the Sixth Review Meeting on the Implementation of the Obligations under the Convention on Nuclear Safety.

COMPLIANCE WITH ARTICLES 4 AND 6 TO 19 – ARTICLE-BY-ARTICLE REVIEW

Since Croatia is the Contracting Party of the Convention on Nuclear Safety without nuclear installations on its territory, only applicable articles are addressed further in this section.

Hence article 6 is not applicable for Croatia. In addition, Croatia further declares articles 9, 10, 12, 14, 17, 18 and 19 to be not applicable and will thus not report on them. Croatia does not plan in the near future to become a nuclear country and to build nuclear installations on its territory.

The remaining articles of the chapter 2 of the Convention will be dealt with in detail in the following subsections. In particular, this includes articles 4, 7, 8, 11, 13, 15 and 16.

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 Act on Radiological and Nuclear Safety (O.G. 28/10) came into the force in 2010. According to the this Act a single regulatory body, the State Office for Radiological and Nuclear Safety (SORNS), replaced the State Office for Nuclear Safety and State Office for Radiation Protection .The approach taken in Croatia provides continuous and addicted fulfilment of the requirements presented in the articles of the Convention.

For the purpose of providing assessments of the state of radiological and nuclear safety in the Republic of Croatia and for the purpose of overseeing the work of the State Office for Radiological and Nuclear Safety in the area of performance of activities of storage of radioactive waste and spent sources originating from the territory of the Republic of Croatia in the central storage facility, the Council for Radiological and Nuclear Safety is established as an advisory body of the Croatian Parliament.

The Council carries out the following activities:

a) gives opinion on proposed acts regulating radiological and nuclear safety, proposed subordinate legislation to be adopted pursuant to the provisions of this Act, as well as other subordinate legislation necessary for its implementation,

b) submits proposals and opinions to the Croatian Parliament regarding:

– the state of radiological and nuclear safety in the Republic of Croatia,

– the development strategy for nuclear safety,

– the organisation of nuclear and radiological safety in the Republic of Croatia,
– international cooperation in the area of nuclear and radiological safety, in particular accession to and implementation of international treaties in this area,
– other aspects of nuclear and radiological safety in the Republic of Croatia.

(c) gives opinion and proposes ways to improve the performance of the disposal of radioactive waste and spent sources originating in the territory of the Republic of Croatia.

The Council has seven members, one of whom is a president.

Current situation is that The Council members are still not appointed by the Parlament.

Article 7. Legislative 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.

The Act on Radiological and Nuclear Safety (O.G. 28/2010) establishes measures for safety and protection against ionising radiation and measures for physical protection in performing nuclear activities and practices involving sources of ionising radiation, with the aim of ensuring adequate protection of individuals, society and the environment, in the present and in the future, from harmful effects of ionising radiation, and ensuring the safe performance of practices involving ionising radiation sources, nuclear activities, radioactive waste disposal and the physical protection of ionising radiation sources and nuclear facilities.

Currently a number of ordinances and regulation supervened from some previous acts still remain in force, until the new ones are promulgated and

issued by the director of the SORNS pursuant to the Act. These ordinances are as follows:

1. Ordinance on the control of nuclear material and special equipment (O.G. 74/2006),
2. Ordinance on performing nuclear activities (O.G. 74/2006),
3. Ordinance on the special conditions for authorisation of legal entities to perform specific expert practices in the field of nuclear safety (O.G. 74/2006).
4. Ordinance on the conditions, manner, places and deadlines for systematic testing and monitoring of the type and activity of radioactive substances in the air, soil, the sea, rivers, lakes, ground waters, solid and liquid precipitation, drinking water, foodstuffs and general use products and dwelling and working spaces (O.G. 60/2008),
5. Ordinance on the method of removal of radioactive contamination, disposal of the radioactive source or undertaking other indispensable measures in order to reduce the damage to people and the environment or eliminate further threats, hazards or damages (O.G. 53/2008),
6. Regulation on conditions and method of disposal of radioactive waste, spent sealed radioactive sources and ionising radiation sources which are not intended for further use (O.G. 44/2008)
7. Regulation on conditions and method of disposal of radioactive waste, spent sealed radioactive sources and ionising radiation sources which are not intended for further use (O.G. 44/2008).

Based on the Croatian Constitution, all the announced and ratified international treaties also form an integral part of the Croatian legislation and can be applied directly. So the following international legal instruments, to which Croatia is a party, should be mentioned as a part of Croatian legislative framework:

- Vienna Convention on Civil Liability for Nuclear Damage,
- Convention on the Physical Protection of Nuclear Material,
- Convention on Early Notification of a Nuclear Accident,
- Convention on Assistance in the Case of a Nuclear Accident of Radiological Emergency,
- Convention on Nuclear Safety,
- Joint Protocol Relating to the Application of the Vienna Convention and the Paris Convention,
- Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management.
- Treaty establishing the European Atomic Energy Community

The following legislation is based on the 2010. Act:

1. Ordinance on the scope and content of the plan and programme of measures in the event of an emergency and informing the public and competent bodies (O.G. 123/2012),

2. Ordinance on the supervision and control of transboundary shipments of radioactive waste and spent fuel (O.G. 11/2013),

3. Ordinance on the physical security of radioactive sources, nuclear material and nuclear facilities (O.G. 38/2012),

4. Ordinance on the conditions and measures of ionizing radiation protection for performing operations involving radioactive sources (O.G. 41/2013),

5. Ordinance on measurement of personal doses, examination of ionising radiation sources and working conditions, and on reports and registers (O.G. 41/2012),

6. Ordinance on the authorisation of expert technical services to carry out professional tasks of protection against ionising radiation (O.G. 72/2011),

7. Ordinance on the training required for handling ionising radiation sources and the implementation of measures for protection against ionising radiation (O.G. 63/2011),

8. Ordinance on medical requirements to be fulfilled by exposed workers and apprentices and students undergoing training or education for working with ionising radiation sources (OG 80/13)

9. Ordinance on dose limits (O.G. 59/2013),

10. Ordinance on the official identity card and badge of the radiological and nuclear safety inspector (O.G. 28/2011),

11. Regulation on measures for protection against ionising radiation and interventions in case of emergency (O.G. 102/2012) (promulgated by Croatian Government based on SORNS proposal),

Also related to SORNS is:

1. Ordinance on the conditions and procedure for issuing and withdrawing the approval for packagings used for transport of radioactive nuclear materials (O.G. 42/2013) (promulgated by SORNS on the basis of Dangerous Goods Transport Act (O.G. 79/2007),

As a state party of European Union, Croatia fully harmonized it legislative with EU laws, regulations and directives.

Also, as a part of Croatian legislative framework it is worth to mention the bilateral agreements with Slovenia and Hungary on the early exchange of information in the event of a radiological emergency as it is recommended by the Convention on Early Notification of a Nuclear Accident and the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency.

In case of nuclear emergency, the relevant information, such as the type of accident, time of its occurrence, location, cause of the accident, source term data, effective height of radioactive release, weather conditions etc, should be exchanged between the appropriate national authorities without any delay.

Information on an emergency event shall be accepted by the 112 system and the National Protection and Rescue Information and Communication Centre which shall proceed in line with the communication protocol prescribed by the directors of the State Office for Radiological and Nuclear Safety and the National Protection and Rescue Directorate.

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

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 fulfil 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 Act on Radiological and Nuclear Safety as an independent regulatory authority responsible for activities relating to radiological and nuclear safety and security and cooperation with the IAEA and other relevant international institutions. The SONRS reports directly to the Government of the Republic of Croatia and the Director of SONRS has been appointed by the Government. The SONRS is funded from the state budget only

The SONRS is dealing with regulatory, inspection and technical tasks, tasks related to the early exchange of information in case of nuclear emergencies, assistance in the event of a nuclear accident, international co-operation in the field of nuclear safety, safety of nuclear facility, 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 in nuclear material, liability for nuclear damage, quality assurance and other tasks defined in positive legislation.

Besides the General Affairs Division, the SONRS is divided into two sectors: Radiological Protection and Nuclear Safety and Inspection. Currently the SONRS has 20 employees and according to the systematisation total number is 50 employees (Figure 1).

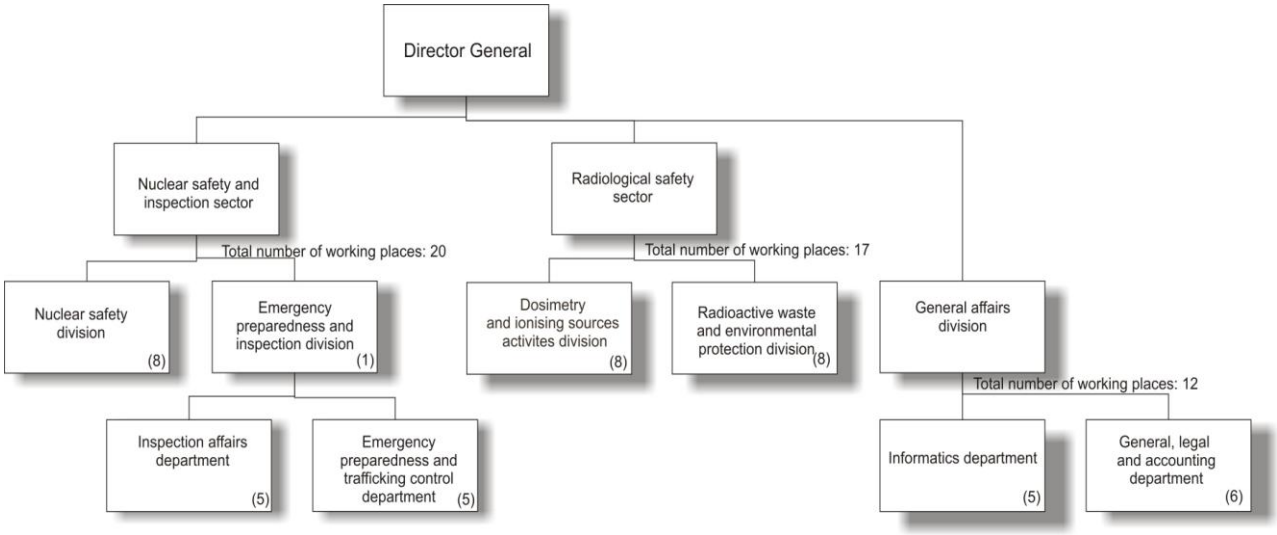

Figure 1: Organizational scheme of SORNS

For the purpose of implementing measures for nuclear safety and protection against ionising radiation SORNS performs the following tasks:

1. approve the carrying out of nuclear activities,
2. approve the carrying out of practices involving sources of ionising radiation,
3. approve procurement, import, export, transport and transit of ionising radiation sources,
4. authorise the use of ionising radiation sources,
5. conduct independent safety analyses and issue decisions or certificates regarding the location, design, construction, operation and decommissioning of a facility in which a nuclear activity is to be performed,
6. take part in the procedure for issuing location permits, construction permits, permits for removal and in the procedure for issuing use permits for structures that accommodate sources of ionising radiation or in which practices involving sources of ionising radiation are carried out in accordance with lex specialis,
7. approve and supervise the operations of authorised technical services and authorised experts for nuclear safety,
8. organise and supervise, and where necessary also carry out tests on the presence of the type and intensity of ionising radiation in the environment, food and feed, medicinal products and general use products under regular conditions as well as in cases of suspected emergency,

9. keep records on the licences, approvals, decisions and certificates which it has issued within the scope of its authority, and maintain and supervise records on ionising radiation sources, licensees and licence holders, beneficiaries, exposed workers, level of irradiation of exposed workers as well as the level of irradiation of persons subject to medical exposure and of other persons,

10. carry out inspections to ensure the implementation of the provisions of this Act and regulations adopted on the basis thereof,

11. elaborate technical platforms for teaching curricula and programmes for regular and additional education as well as for renewal of knowledge in the field of protection against ionising radiation,

12. ensure expert assistance in implementing the national plan and programme for procedures in the event of a nuclear accident and emergencies connected with sources of ionising radiation,

13. inform the mass media, competent bodies, organisations, associations and international institutions on emergencies connected with sources of ionising radiation,

14. provide expert assistance and cooperation in activities for preventing illicit trafficking in nuclear and other radioactive material to state administration bodies competent for such activities,

15. monitor safety conditions at nuclear power plants in the region and carries out assessments of the threat of nuclear accidents there, especially in the Krško Nuclear Power Plant in Slovenia and the Paks Nuclear Power Plant in Hungary,

16. provide dosimetric assessments of exposure to ionising radiation of exposed workers, of the population from medical exposure and from exposure to ionising radiation originating from environmental radionuclides,

17. fulfil the obligations which the Republic of Croatia has assumed through international conventions and bilateral agreements concerning protection against ionising radiation, nuclear safety and the application of protective measures aimed at the non-proliferation of nuclear weapons,

18. cooperate with international and domestic organisations and associations in the area of protection against ionising radiation and nuclear safety, and appoint its own expert representatives to take part in the work of such organisations and associations or to monitor their work,

19. coordinate technical cooperation with the International Atomic Energy Agency for all participants from the Republic of Croatia,

20. stimulate and support scientific and research and development activities, encourage professional, statistic and other research in accordance

with the demands and requirements of the development of nuclear safety and protection against ionising radiation in the Republic of Croatia,

21. issue instructions for implementing international recommendations and standards in the area of protection against ionising radiation and nuclear safety and design the standards and methods in monitoring the state of protection against ionising radiation,

22. carry out other activities under its competence pursuant to this Act, regulations adopted on the basis thereof, and other regulations.

Inspectional supervision over the implementation of this Act and subordinate legislation adopted on the basis thereof shall be performed in the first instance by the inspectors for radiological and nuclear safety of the SORNS (hereinafter referred to as: the inspectors). Sanitary inspection of the Ministry of Health and Social Welfare shall perform inspectional supervision in the second instance. Administrative supervision of the implementation of the provisions of this Act and regulations adopted on the basis thereof shall be performed by the ministry competent for health.

According to The Ordinance on Measures for Protection Against Ionising Radiation and Interventions in Case of Emergency (O.G. 102/2012) SORNS:

1. State Office for Radiological and Nuclear Safety designates the areas/zones for implementing urgent protection and rescue measures and threat perimeters based on the Republic of Croatia's Risk Assessment for threat categories I and II,

2. identifies the List of facilities that fall under threat category III in the territory of the Republic of Croatia,

3. in case of threat categories III, IV and V, in line with the scope of the emergency and situation on the site of the emergency, sets out and implements urgent protection and rescue measures and required interventions,

4. in case of threat categories I and II, proposes to the Government of the Republic of Croatia temporary or permanent relocation of population,

5. sets out decontamination of persons, as well as buildings, agricultural, public and other areas and other environmental remediation measures in the area affected by the consequences of an emergency,

6. in case of an emergency assesses the need for carrying out extraordinary measurements for the purpose of monitoring environmental radioactivity,

7. carries out information of public, international organisations, neighbouring countries and European Commission on emergencies

According to The Dangerous Goods Transport Act SORNS:

1. issues the approval for packaging for the carriage of radioactive substances and nuclear material,

2. issues the authorisation for the carriage of radioactive substances and nuclear material.

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.*

Financial resources

There are no nuclear installations in Croatia, however The Republic of Croatia is addressing the issues relating to the financing of decommissioning and management of radioactive waste and spent nuclear fuel with regard to the Krško NPP, jointly owned by the Republic of Croatia and the Republic of Slovenia, in accordance 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.

After the adoption of the Regulation on the Manner of Payment of Funds for the Financing of the Decommissioning and for the Storage of Radioactive Waste and Spent Nuclear Fuel of the Krško NPP (O.G. 50/2006 and 77/2006), the Fund for Financing Decommissioning and Management of Radioactive Waste and Spent Nuclear Fuel of the Krško NPP was established (O.G. 107/2007); all necessary means are regularly paid into the Fund in line with the Regulation.

By the decision of the Government of The Republic of Croatia in 2012, Fund became responsible for implementation of articles 10. and 11. of Treaty between the Government of the Republic of Croatia and the Government of the Republic of Slovenia on the regulation of the status and other legal relations regarding investment, exploitation and decommissioning of the Krško Nuclear Plant. Accordingly, Fund also changed its structure and now is divided in two sectors, one dealing with financial and management issues and second with coordination of activities related to decommissioning and disposal of radioactive waste and spent fuel from NPP Krško.

Human resources (Administrative capacity)

The Regulation of the Government of The Republic of Croatia from 2012 defined the structure and the total number of posts in SORNS as 50. As this number was not reached at the beginning, three persons with a university degree and two with secondary school were recruited during the time, but the drain of personnel was much higher in this period, so the total number of employees in SORNS today is 20, that is 40 per cent of planned number.

Article 13. Quality Assurance

Each Contracting Party shall take the appropriate steps to ensure that quality assurance programmes are established and implemented with a view to providing confidence that the specified requirements for all activities important for nuclear safety are satisfied throughout the life of a nuclear installation.

According to the Act on Radiological and Nuclear Safety (O.G. 28/2010) the director of SORNS is obliged to perform a self-assessment of the national legislative framework and of the competent authorities at least every 10 years, as well as invite an international audit for important segments of the national legislative framework and competent authorities with the purpose of continuous improvement of protection against ionising radiation and nuclear safety. The results of the preformed this self-assessment shall be available to the public.

After self-assessment performed by SORNS, as a part of international assistance, the IAEA Integrated Regulatory Review Service (IRRS) mission is expected in Croatia in 2015 with goal to enhance its organization and performance.

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.

The radiation protection and safety of ionising radiation sources in Croatia is regulated by the Act on Radiological and Nuclear Safety and following ordinances: Ordinance on the conditions and measures of ionizing radiation protection for performing operations involving radioactive sources (O.G. 41/2013), Ordinance on dose limits (O.G. 59/2013), and Ordinance on

medical requirements to be fulfilled by exposed workers and apprentices and students undergoing training or education for working with ionising radiation sources (OG 80/13).

RW management is still regulated by the Ordinance on conditions and method of disposal of radioactive waste, spent sealed radioactive sources and ionising radiation sources which are not intended for further use (O.G. 44/2008).

Radiation protection of the environment is regulated by the Ordinance on the conditions, manner, places and deadlines for systematic testing and monitoring of the type and activity of radioactive substances in the air, soil, the sea, rivers, lakes, ground waters, solid and liquid precipitation, drinking water, foodstuffs and general use products and dwelling and working spaces (O.G. 60/2008) and Ordinance on the method of removal of radioactive contamination, disposal of the radioactive source or undertaking other indispensable measures in order to reduce the damage to people and the environment or eliminate further threats, hazards or damages (O.G. 53/2008) .

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.*
3. *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.*

According to the paragraph 3 of the article 16 of the Convention the Republic of Croatia has to submit a report about its emergency preparedness system.

There are 40 nuclear facilities operating within the distance of 1.000 km from the Croatian national territory. There are 89 power reactors inside these nuclear power plants (1 to 4 reactor units per facility) of different power, age and technology. Nearest to the territory of the Republic of Croatia are Krško NPP (PWR, 707 MWe, Slovenia) and Paks NPP (VVER, 4x440 MWe, Hungary). Krško NPP is situated 10.6 km from the western border, and Paks NPP 74.1 km from the northern border. Samobor (population around 15.000) is 22 km distant from Krško to the south-east, Zaprešić (population around 23.000) 24 km, and Zagreb (population around 1.000.000) 38 km. Beli Manastir (population around 11.000) and Osijek (population around 150.000) are 90 and 120 km away respectfully from Paks NPP to the south.

Even thou it is not located on Croatian territory, Krško NPP is proclaimed as Threat Category I (According to IAEA Threat categorisation) because of proximity to Croatian territory.

Organisational structure

National nuclear emergency preparedness system is based on the Regulation on measures for protection against ionising radiation and interventions in case of emergency (O.G. 102/2012). This Regulation defines five threat categories in line with IAEA Threat categorisation:

1. Threat category I includes facilities in which an emergency could result in severe deterministic health effects off the site in which a nuclear activity or practice involving ionising radiation sources is performed that warrant the implementation of urgent protection and rescue measures within a limited area, and longer term protection and rescue measures in the entire territory of the Republic of Croatia.

2. Threat category II includes facilities in which an emergency may result in ionising 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 territory of the Republic of Croatia.

3. Threat category III includes facilities in which an emergency may result in ionising radiation doses that warrant the implementation of urgent protection and rescue measures on the site of an emergency, and only exceptionally within a limited area around the site of the emergency.

4. Threat category IV includes activities that may result in an emergency and warrant the implementation of urgent protection and rescue measures in unforeseeable locations.

5. Threat category V includes activities that may result in an emergency, but which do not warrant the implementation of urgent protection and rescue

measures, but direct and longer term protection and rescue measures may be warranted in the entire territory of the Republic of Croatia.

Organizational schemes for different threat categories are given in Figures 2 and3.

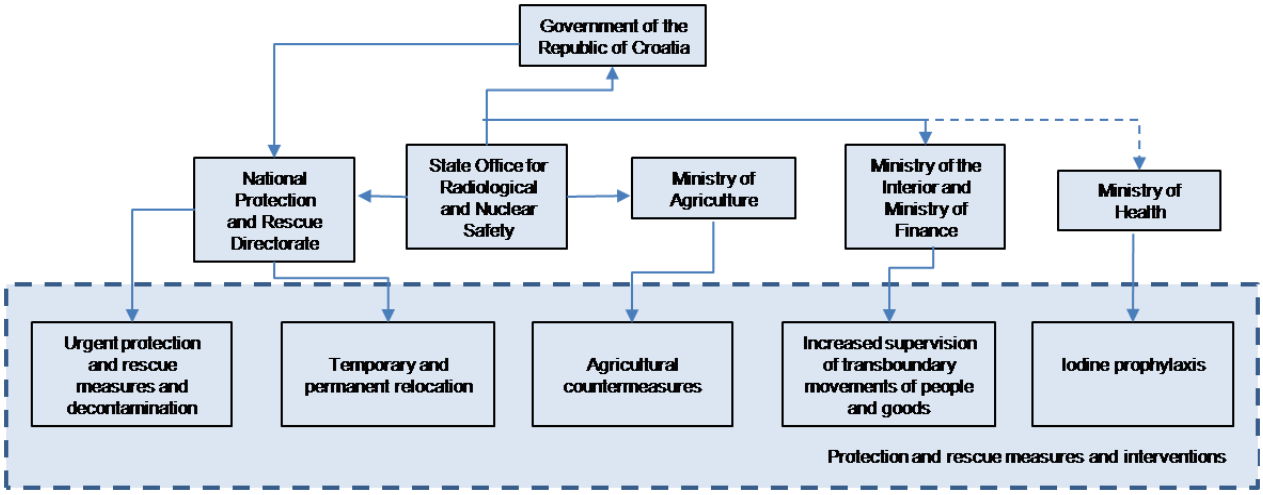

Figure2. Organisational structure of Croatian emergency preparedness system – category I or II emergency

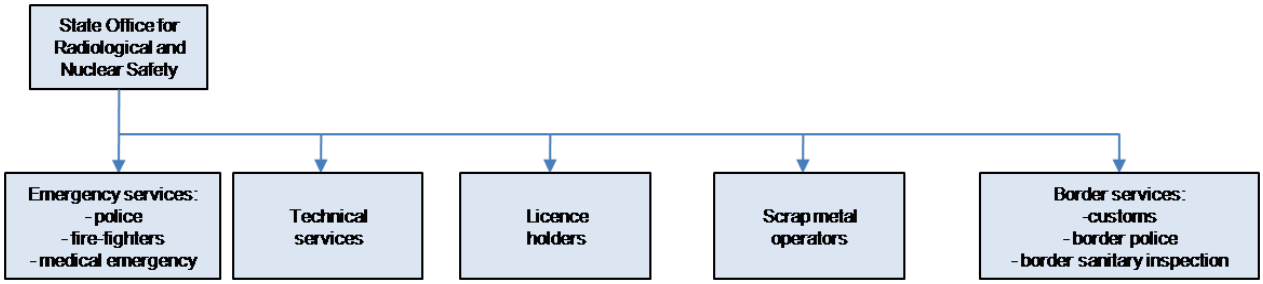

Figure 3. Organisational structure of Croatian emergency preparedness system – category III, IV or V emergency

Nuclear emergency response system includes following state administration bodies:

a) State Office for Radiological and Nuclear Safety,

b) National Protection and Rescue Directorate,

c) National Meteorological and Hydrological Service,

d) Ministry of Health,

e) Ministry of the Interior,

f) Ministry of Agriculture,

g) Ministry of Defence,

h) Ministry of Finance,

i) Ministry of Environmental and Nature Protection,

j) Ministry of Maritime Affairs, Transport and Infrastructure,

k) Ministry of Science, Education and Sports,

l) Ministry of Social Policy and Youth,

m) Ministry of Foreign and European Affairs

The emergency response system at the national level also includes the following participants:

a) fire-fighting commands and fire-fighting units,

b) Croatian Institute of Emergency Medicine,

c) Croatian Mountain Rescue Service,

d) Croatian Red Cross,

e) civil protection units,

f) state intervention units

National Center 112 is operational 24 hours a day, so its task is to gather initial information about the accident and to activate emergency preparedness system. During the accident NC 112 receives and passes on the data arriving from various international and home institutions, organizations and individuals.

Crisis management in case of nuclear disaster is the task of the National Protection and Rescue Directorate (NPRD). The NPRD makes the decisions concerning the countermeasures and supervises their implementation.

In case of threat categories I and II, the NPRD shall order the implementation of urgent protection and rescue measures in the threatened area or in the area affected by the consequences of an emergency at the proposal of the SORNS.

Implementation of the countermeasures is the duty of the operational forces and special teams. The operational forces are formed from the

professional state and local government units, firefighters, civil protection units and specialized companies personnel. Special teams are well trained and equipped units able to accomplish the tasks such as decontamination, damage repair or radiological monitoring installation.

In case of threat categories III, IV and V, SORNS shall, in line with the scope of the emergency and situation on the site of the emergency, set out and implement urgent protection and rescue measures and required interventions.

SORNS may, when required, in the implementation of urgent protection and rescue measures and required interventions include emergency services, holders of the licence for practice involving ionising radiation sources, authorised technical services, scrap metal operators and border police and customs.

Croatian Early Warning System

SORNS operates the Croatian Early Warning System (CEWS). CEWS is important component of the national nuclear emergency preparedness system. It is capable of raising the alarm in the case of significant increase of the radioactivity in the environment. In addition, it provides the input for dose assessments for the population. The latest modernization of CEWS resulted in:

- unification of measuring equipment and putting under single control (of the SONRS),
- introduction of automatic alarming/alerting and remote maintenance features,
- a wider network of measuring stations, including aerosol monitoring stations (Figure 1 below),
- an integrated system with back-up, capable of overcoming computer and power failures, and
- new meteorological data from selected locations which are essential for decision makers.

Today, the upgraded CEWS consists of 25 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. The data from the measurement stations is fed back to the central unit after each measuring cycle. If elevated radiation levels are detected, an alarm system is automatically triggered and measurement data is examined by the SONRS duty officer.

The map below shows the locations of all measuring stations belonging to the CEWS. Colours on the station markers provide the information about the gamma dose rate levels according to the last available measurement results. A click on a station marker provides an interested user with more information.

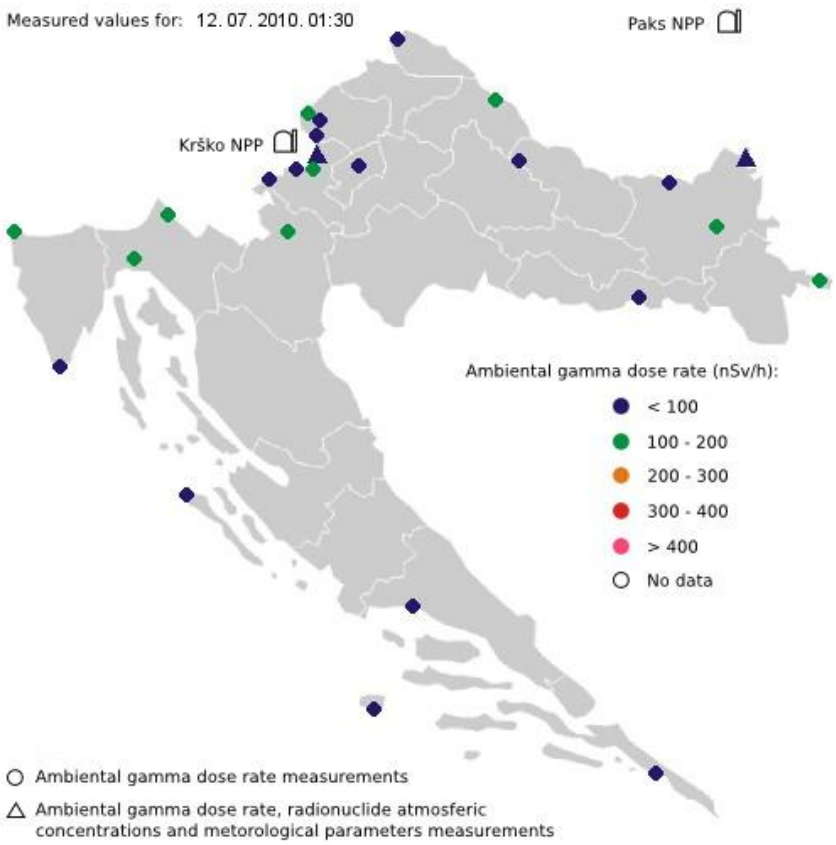

Figure 1: Locations of all measuring stations belonging to the CEWS

The SORNS web portal is intended to inform general public about the nuclear emergency preparedness system in Croatia and the existence of the CEWS, its operation principles and the data it provides.

All measurement results gathered with CEWS are continuously sent to the EURDEP system managed by the European Commission. EURDEP is a system for the exchange of the radiological monitoring data in which the majority of the European countries is participating. Besides EURDEP, measurement results are exchanged with Slovenia and Hungary based on bilateral agreements covering assistance in the field of nuclear emergency preparedness.

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RODOS system

The systems EURDEP, ECURIE (European Community Urgent Radiological Information Exchange) and RODOS (Real-time On-line Decision Support) are used in many European countries for rapid data exchange and for the assessment of the radiological status in the case of nuclear emergency. Croatia participates in the EURDEP system and the measured data from the gamma measuring stations managed by the SONRS is sent three times a day to

the central EURDEP system database. The establishment of the modern decision support system and inclusion into the real-time international measured radiological data exchange was a major improvement of the nuclear emergency response preparedness system in the Republic of Croatia. As a member of the European Union, Croatia is a part of ECURIE system. Also, as a state party to the Convention on Early Notification of a Nuclear Accident and the Convention on Assistance in the Case of a Nuclear Accident of Radiological Emergency Croatia participates in the USIE system coordinated by the IAEA.

The RODOS System is the modern decision support system included into the real-time international measured radiological data exchange.

Emergency planning zones

The general approach related to Emergency Planning Zones recognizes the Urgent Protective Action Planning Zone (UPZ) and the Longer Term Protective Action Planning Zone (LPZ). The UPZ is defined as an area within the radius of 25 km around the NPP, and the LPZ is defined as an area within the radius of 100 km around the NPP. The LPZ includes the UPZ.

The western part of the Croatian territory is within the UPZ and the LPZ with regard to the Krško NPP (5). The UPZ of the Croatian territory covers a 550 km^2 area and it has about 66.000 inhabitants, so that the average population density is quite high (120 inhabitants/km^2). The LPZ includes big population centres such as Zagreb, Karlovac, etc.

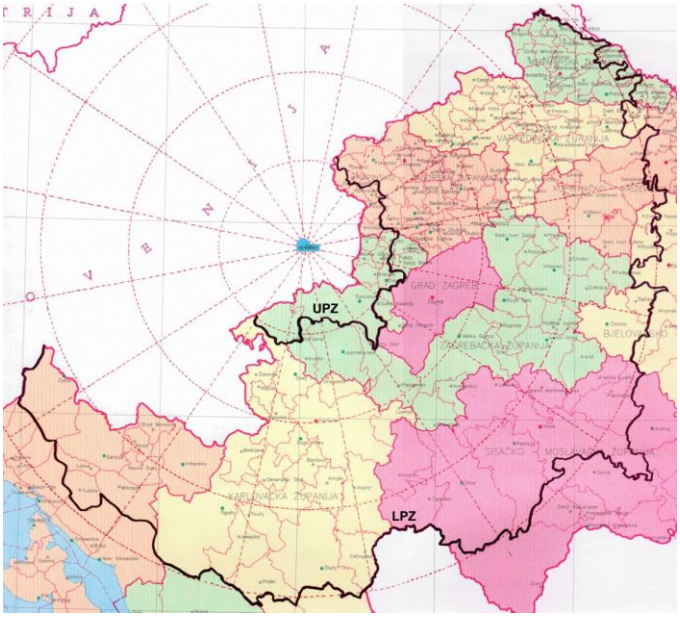

Figure5: UPZ and LPZ in the Croatian territory regarding Krško NPP

The eastern part of the Croatian territory is within the LPZ with regard to Paks NPP. Paks NPP is located 75 km north of the Hungarian-Croatian border on the left bank of the Danube river. The LPZ covers a big part of the Osijek-Baranja County (Figure6:), which is a well-known corn-producing region and agriculturally one of the most outstanding parts of Croatia.

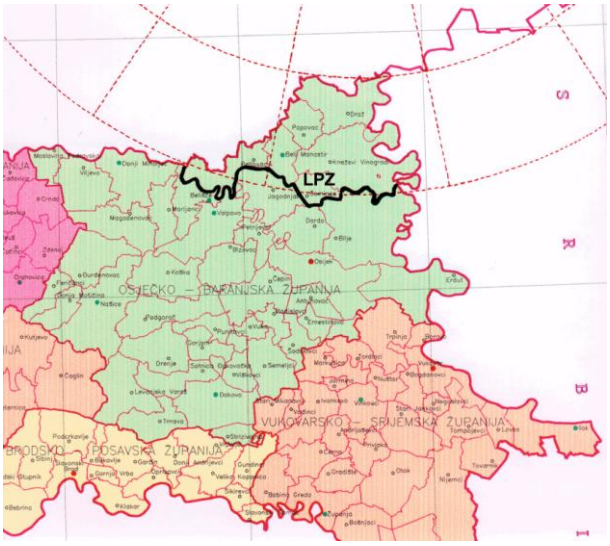

Figure6: LPZ on the Croatian territory regarding the Paks NPP

Emergency Classification

The emergency classification is based on an assessment of plant conditions and three possible levels of emergency have been defined. These are:

- Alert,
- Site Area Emergency, and
- General Emergency.

The Croatian Emergency Preparedness System is based on the assumption that in the case of a nuclear accident the relevant authorities in Slovenia and Hungary are supposed to provide the appropriate information to the NC112 (national warning point for this purpose), immediately after an alert or any other higher level of emergency is declared in their NPPs. Only this approach will save time to start the nuclear emergency response system properly.

Protective Measures

Croatia is well aware that harmful consequences of a nuclear accident can be reduced by the timely application of protective measures. The Regulation on Measures for Protection Against Ionising Radiation and

Interventions in Case of Emergency (O.G. 102/2012) recognizes five threat categories according to IAEA Safety Standard Series No. GS-R-2.

Threat category I includes facilities in which an emergency could result in severe deterministic health effects off the site in which a nuclear activity or practice involving ionising radiation sources is performed that warrant the implementation of urgent protection and rescue measures within a limited area, and longer term protection and rescue measures in the entire territory of the Republic of Croatia. The nuclear power plant Krško in the Republic of Slovenia falls under this threat category and also a nuclear ship in the Adriatic Sea that has reactors of power levels greater than 100 MW.

Threat category II includes facilities in which an emergency may result in ionising 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 territory of the Republic of Croatia. There are no such facilities in the Republic of Croatia, but the listed consequences may be caused by a nuclear ship in the Adriatic Sea with reactors with power levels 2 MW to 100 MW.

Threat category V includes activities that may result in an emergency, but which do not warrant the implementation of urgent protection and rescue measures, but direct and longer term protection and rescue measures may be warranted in the entire territory of the Republic of Croatia. The threat of a nuclear accident in the nuclear power plant Paks in Hungary and other nuclear facilities in the world fall under this threat category.

Response to these emergencies in the Republic of Croatia includes the following tasks:

1. activation of the emergency response system,
2. emergency management
3. implementation of protection and rescue measures,
4. expert support to emergency management,
5. education and information of the population,
6. international exchange of information and international co-operation in the implementation of protection and rescue measures
7. education and training of participant

Measures and activities implemented for each threat category are regulated by the Ordinance on Measures for Protection Against Ionising Radiation and Interventions in Case of Emergency (O.G. 102/2012)

Public Information

Information of the population on protection and rescue measures in case of an emergency shall be the duty of all participants in the emergency response system in accordance with their competences. Education shall be focused on basic facts about radioactivity and its effects on human beings and on the environment, on various types of radiological hazards and their consequences for the general public and the environment, on extraordinary measures envisaged to alert, protect and assist the general public in the case of a radiological hazard.

The population that could be affected by the consequences of a particular emergency shall, without submitting a request, be provided information on the protection and rescue measures intended for them and on actions they should take in case of such an emergency. Information shall be permanently available to the general public and updated and circulated regularly and in case of significant changes. Information of the public and media representatives on the occurred emergency under threat category I and II and on potential hazards and required protection and rescue measures shall be implemented without delay by the National Protection and Rescue Directorate in co-operation with SORNS.

Information of the public and media representatives on the occurred emergency under threat category III, IV and V and on hazards and potentially required protection and rescue measures shall be implemented without delay by SORNS.

The distribution of calendars with children's artistic works on the subject of power plants and the influence of energy sector on the environment is also important to mention as one of the SORNS' activities for informing of the population in the UPZ about the Croatian Emergency Preparedness System. Additional information about the possible protective measures is given in the calendar. The calendar itself is distributed among all primary-school pupils of the UPZ.

Training and exercises

All participants in the emergency response system at all levels of protection and rescue organisation in areas that could be affected by the consequences of an emergency are obliged to carry out education and training in emergency response.

The training of participants in the protection and rescue system is carried out periodically at the level of participants in the protection and rescue system and at the national level every ten years.

The organisation of the system training at the national level is under competence of the National Protection and Rescue Directorate.

IAEA Emergency Preparedness Review (EPREV) mission

The IAEA Emergency Preparedness Review (EPREV) mission was in Croatia in 2012 with goal to provide an assessment of the Croatian legislation, arrangements and capability to respond to possible radiological emergencies on the basis of international standards and the EU acquis for emergency preparedness and response, to assist Croatia in the development of interim arrangements to respond to possible radiological emergencies and to provide recommendations upon which Croatia can develop a longer-term programme to enhance their ability to respond to a nuclear or radiation emergency

EPREV submitted extensive report with many recommendations for improving emergency preparedness system in Croatia.

CHALLENGES AND PLANNED ACTIVITIES AND MEASURES

Nuclear option in National Energy Strategy

In October 2009 Croatian Government adopted national Energy Strategy, the basic act that outlines the energy policy and planning of the development of the energy sector in Croatia. The National Energy Strategy (O.G. 130/2009) is prepared for the period up to year 2020, with an outlook till year 2030 and it provides directions for the development of energy sectors, investments in nuclear and renewable energy resources and facilities for their exploitation, and energy efficiency programmes.

The Strategy Implementation Programme was planned to follow accordingly, but it is not adopted until now.

Republic of Croatia has an experience in building and operation of Krško NPP and belongs to the group of countries which use the nuclear power for energy production. However, before the decision on building a new NPP is made, it is necessary to carry out the whole set of preparatory activities in compliance with the methodology of the IAEA.

According to the Strategy, the decision on construction of nuclear power plant will be made by the Croatian Parliament.

The second formal statement/decision in Strategy is: *The decision on construction on NPP is expected to be made in year 2012 at the latest* and this decision is postponed due to a number of unfavoured events including economic crisis and accident in Fukushima NPP in Japan.

National Strategy for Management of RAW and SF

In accordance with the requirements from the EU Common Position (CONF-HR 5/08), Croatia prepared the Strategy for Radioactive Waste and Spent Nuclear Fuel Management. The Strategy covers highly radioactive waste, medium-level and low-level radioactive waste, sources of ionising radiations that are no longer going to be used, and orphan sources. The Strategy also includes an option of disposing radioactive waste and spent fuel, which was generated during the operating lifetime of the Krško NPP, on Croatian territory should it not be possible/optimal to dispose it in Slovenia or in a third country.

The Strategy considers the state, circumstances and methods for management of the mentioned radioactive waste and spent nuclear fuel in the forthcoming ten-year period, from 2008 to 2018.

There is only a small quantity of RAW in the Republic of Croatia. The Republic of Croatia has a system in place that is capable of carrying out all tasks in the management of this waste, in compliance with international recommendations and best practices. Safe management will continue through the setting up of central storage, whereby such solutions shall be decided upon in a transparent manner, along with providing complete information to the public. The decision expected to be made by Government still did not take place.

The Republic of Croatia will take the necessary steps in seeking out a safe and efficient solution for management of radioactive waste and spent nuclear fuel generated from the operation of the Krško nuclear power plant. The obligation of management can be met only in agreement with the Republic of Slovenia. Joint management of radioactive waste and spent fuel generated by the operation and decommissioning of the Krško nuclear power plant should be in the interest of both countries.

The Republic of Croatia will continue to cooperate with the Republic of Slovenia on programmes and projects for management of spent nuclear fuel and radioactive waste, particularly through taking decisions on equal footing within the framework of the joint Programme for the Decommissioning of the Krško NPP.

The Republic of Croatia advocates that final management of the spent nuclear fuel from the Krško NPP be achieved by permanent disposal in a local geological repository. However, several decades of storage would need to precede that final phase, due to the properties of the spent nuclear fuel and to enable a more rational selection of the final solution which may in turn depend on technological development.

Since the Agreement between the Republic of Croatia and the Government of the Republic of Slovenia on regulation of status and other legal relations regarding the investment, use and dismantling of Nuclear Power Plant Krško (O.G. 09/2002), in the case of failure to reach joint arrangements, stipulates that the radioactive waste and spent nuclear fuel be divided up, and that one half be overtaken by the Republic of Croatia two years after the expiry of operating lifetime of the Krško NPP at the latest (according to valid permits that means by 2025) it is necessary to:

- by 2013 at the latest, reach an agreement with the Republic of Slovenia on joint management of low-and intermediate-level radioactive waste, and in the case that the agreement is not reached, start preparations for takeover;
- by 2018 at the latest, reach an agreement with the Republic of Slovenia on joint storage of spent nuclear fuel, and in the case the agreement is not reached, start preparations for takeover;

The Strategy was adopted by the Croatian Government in July 2009.

In the meantime The Republic of Croatia joined EU and a new Directive (Euratom 70/2011) came to the force. Also an accident in Fukushima NPP had occurred.

Due to changed circumstances Croatia is currently working on new Act on Radiological and Nuclear Safety which will transpose Directive and set basis for a new program on LILW and SF management in line with Directive by 2015.

Revision of the Decommissioning Programme (Programme of Krško NPP decommissioning and SF & RW disposal)

Programme of Krško NPP decommissioning and SF & RW disposal is an integrated programme of a single NPP decommissioning and its RW and SF management.

Decommissioning Programme Rev. 1 from 2004 was the first jointly undertaken project to asses the prospects for joint Slovenian-Croatian plant decommissioning and its RW and SF management.

In 2010 decommissioning Programme Rev. 2 was in the final stage. At that time significant delay occurred due to some procedural and substantial problems. Difficulties are still not removed and Rev 2. of the Joined Programme is still pending for IAEA review.

Fund for financing the decommissioning of the Krško NPP and the disposal of radioactive waste and spent nuclear fuel from Krško NPP

The Act on the Fund for Financing the Decommissioning of the Krško NPP and the Disposal of Radioactive Waste and Spent Nuclear Fuel from Krško NPP (O.G. 107/2007) passed by the Croatian Parliament at its session on 3 October 2007. The founder of the Fund is the Republic of Croatia, and the founding rights and obligations is held by the central state administration body responsible for energy affairs.

The Fund's activities includes activities related to the acquisition, maintenance and increase of value of assets for financing the preparation, review and implementation of the Programme for decommissioning of the Krško NPP and the disposal of radioactive waste and spent nuclear fuel from Krško NPP (Decommissioning Programme) in accordance with Articles 10 and 11 of the Agreement between the Government of the Republic of Slovenia and the Government of the Republic of Croatia on the Regulation of the Status and Other Legal Issues Regarding Investments in Krško NPP and its Exploitation and Decommissioning (Official Gazette - International Agreements, 09/02).

By the Governmental decision from the end of 2012, Fund replaced APO d.o.o. as responsible national organization for the activities in coordination of preparing and drafting Programme of decommissioning and disposal of radioactive waste and spent fuel.

With respect to new obligation in October 2012 a revised version of the Statute of Fund was adopted. It defines a new structure in which two separate function of the Fund are recognised.

As of June 2013 the Fund has an amount of approximately EUR 150 million at its disposal, as well as a legally regulated manner of collecting financial means for the purpose of financing all affairs related to management of the Croatian part of low and intermediate level radioactive waste, spent nuclear fuel and for the decommissioning of the Krško NPP.

APPENDICES

Appendix A – List of Most Relevant Legislation in Force in Croatia (as of 1 July 2010)

Appendix B – References

Appendix A – List of the Most Relevant Legislation in Force in Croatia (as of July 2010)

A.1 National legal frame

A.1.1. Parliamentary documents

Acts

- Act on Radiological and Nuclear Safety (Official Gazette 28/10)
- Act on Fund for Krško NPP Decommissioning, Radioactive Waste and Spent Nuclear Fuel Management (Official Gazette 107/07)
- Act on Protection and Rescue (Official Gazette 174/04 and amended 79/07, 38/09 and 127/10)
- Act on Sanitary Inspections (Official Gazette 113/08, amended 88/10)
- Act on Liability for Nuclear Damage (Official Gazette 143/98)
- Joint Convention on the safety of spent fuel management and on the safety of radioactive waste managemnt (Official Gazette 03/99)
- Agreement between the European Atomic Energy Community (Euratom) and non-member States of the European Union on the participation of the latter in the Community arrangements for the early exchange of information in the event of radiological emergency (ECURIE) (Official Gazette 08/07) .

Policy (Strategy)

- National Energy Strategy (Official Gazette 130/09)
- Strategy for Management of Radioactive Waste and Spent Nuclear Fuels, July 2009

A.1.2. Governmental decrees and ministerial regulations

Ordinances

- Ordinance on the register of activities, requirements and the manner of issuing, and the validity of licences for work with sources of ionising radiation and the use of sources of ionising radiation (Official Gazette 125/06)
- Ordinance on performing nuclear activities (Official Gazette 74/06)
- Ordinance on special requirements which expert organisations must fulfil in order to perform certain activities in the field of nuclear safety (Official Gazette 74/06)
- Ordinance on the control of nuclear material and special equipment (Official Gazette 15/08)

- Ordinance on the conditions and procedure for issuing and withdrawing the approval for packagings used for transport of radioactive nuclear materials (Official Gazette 42/13)
- Ordinance on the manner and procedure for supervision during import or export of material for which there is justified suspicion of contamination by radionuclides or of containing radioactive sources (Official Gazette 114/07)
- Ordinance on the supervision and control of transboundary shipments of radioactive waste and spent fuel (Official Gazette 11/13)

Regulations

- Regulation on conditions and method of disposal of radioactive waste, spent sealed radioactive sources and ionising radiation sources which are not intended for further use (Official Gazette 44/08)
- Regulation on measures for protection against ionising radiation and interventions in case of emergency (Official Gazette 102/12)

A.1.3. Other legislation

- Dangerous Goods Transport Act (Official Gazette 79/07)

A.2 International conventions and agreements to which Croatia is a party

A.2.1. Multilateral agreements

- Vienna Convention on Civil Liability for Nuclear Damage (Official Gazette 01/06)
- Convention on the Physical Protection of Nuclear Material (Official Gazette 05/01)
- Convention on Early Notification of a Nuclear Accident (Official Gazette 01/06)
- Convention on Assistance in the Case of a Nuclear Accident of Radiological Emergency (Official Gazette 01/06)
- Convention on Nuclear Safety (Official Gazette 13/95)
- Joint Protocol Relating to the Application of the Vienna Convention and the Paris Convention (Official Gazette 12/1993)
- Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (Official Gazette 03/99)

A.2.1. Bilateral agreements

- Bilateral agreements with Slovenia on the early exchange of information in the event of a radiological emergency (Official Gazette 09/99)
- Bilateral agreements with Hungary on the early exchange of information in the event of a radiological emergency (Official Gazette No.11/99)

- Agreement between the Government of the Republic of Croatia and the Government of the Republic of Slovenia on regulating the status and other legal relations pertaining to investments, use and decommissioning of the Krško Nuclear Power Plant (Official Gazette 09/02)

Appendix B – References

- Convention on Nuclear Safety, IAEA, 1994
- Guidelines regarding National Reports under the Convention on Nuclear Safety, IAEA, 1999
- 5th National Report on the Implementation of Obligations under the Convention on Nuclear Safety, 2011
- 4th National Report on the Implementation of Obligations under the Convention on Nuclear Safety, 2007
- 3rd National Report on the Implementation of Obligations under the Convention on Nuclear Safety, 2004
- 2nd National Report on the Implementation of Obligations under the Convention on Nuclear Safety, 2001
- 1st National Report on the Implementation of Obligations under the Convention on Nuclear Safety, 1998
- Statement by the Head of Delegation of the Republic of Croatia at 53rd IAEA General Conference, Vienna, 14-18 September 2009
- Screening Report for Croatia, Chapter 15 – Energy, European Commission, March 2007
- Report on the fulfilment of obligations under Chapter 15 – Energy within the framework of EU accession negotiations, Government of the Republic of Croatia, July 2009
- Program of NPP Krško Decommissioning and SF & LILW Disposal, Revision 2, ARAO Ljubljana & APO Zagreb, 2010
- Croatian EWS, Task 1 – Public Web Portal Development, Technical Report for EC and SONS on the Project "Support to the State Office for Nuclear Safety in Upgrading and Modernization of the Croatian Early Warning System", July 2009.
- Croatian EWS, Task 3 – Report Maintenance Plan and Procedures Development, Technical Report for EC and SONS on the Project "Support to the State Office for Nuclear Safety in Upgrading and Modernization of the Croatian Early Warning System", July 2009.