



Republic of Croatia

CROATIAN REPORT ON NUCLEAR SAFETY

***5TH CROATIAN NATIONAL REPORT ON THE
IMPLEMENTATION OF THE OBLIGATIONS UNDER THE
CONVENTION ON NUCLEAR SAFETY***

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Impressum

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EXECUTIVE SUMMARY

Currently there are no nuclear facilities or installations within the jurisdiction of the Republic of Croatia. The Croatian national utility HEP remains co-owner with a 50% share of the Krško nuclear power plant situated in Slovenia. There are no persons or undertakings in Croatia that fall under the scope of chapter VI of the Euratom Treaty, so no nuclear fuel transaction contracts exist. Furthermore, there are no special fissile materials or enriched uranium on the territory of Croatia. However, small quantities of nuclear materials are used for shielding devices in medical and industrial applications. Low and medium level radioactive waste is stored temporally at two facilities in Zagreb that are attached to the Ruder Bošković Institute and the Institute for Medical Research, of which the latter is closed and does not hold a licence. Spent and disused sources at the Institute for Medical Research from past activities have been conditioned and secured and are prepared for transfer to a national radioactive waste storage facility. A national radioactive waste storage facility is established on the premises of Ruder Bošković Institute with the Government's decree in December 2009 and it is in a licensing process.

Croatia has joint responsibility with Slovenia for the decommissioning and waste management liabilities relating to the Krško NPP that is based on co-owning arrangement over the plant. According to a 2003. agreement between the two co-owners, a specific segregated funds was set up in Croatia and Slovenia to cover its share of liabilities to allocate required financial resources to the funds to ensure availability of adequate resources for implementation of decommissioning and waste management programme.

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 passed by the Croatian Parliament at its session in 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. Furthermore, resources for the financing of the decommissioning of the Krško NPP and the disposal of radioactive waste and spent nuclear fuel from Krško NPP shall be contributed to Fund every three months until the Krško NPP has ceased operation in accordance with the Agreement, or until the planned amount fixed by the Decommissioning Programme in force has been reached. These resources are being paid into the account of the Fund by Hrvatska elektroprivreda d.d. (HEP), Zagreb.

Programme of NPP Krško decommissioning and SF & RW disposal (Decommissioning Programme) Rev. 2 was finalised recently and is going through the process of both, national and international revisions. It is intended to substantially improve technological detail and reliability of Decommissioning Programme projects, based on dedicated new supporting studies, and to incorporate new developments since Rev. 1. Using these new data, Rev. 2 updates costs estimates and financing requirements, taking also into account all administrative costs as well as current discounting parameters trends.

In October 2009 Croatian Government adopted new national Energy Strategy, the basic act that outlines the energy policy and planning of the development of the energy sector in Croatia for the period up to year 2020, with an outlook till year 2030.

According to the new Energy Strategy there is a new momentum present in terms of nuclear energy and nuclear safety. The decision on construction on NPP is expected to be made in year 2012 at the latest. It will be possible to accede decision making on construction of NPP after preparatory activities. The decision on construction of nuclear power plant will be made by the Croatian Parliament. The Government of the Republic of Croatia will elaborate the programme of preparatory activities, as a part of the Strategy Implementation Programme, in order to come up to the decision making on the construction of NPP.

In accordance with the requirements from the EU Common Position (CONF-HR 5/08), Croatia adopted the Strategy for Radioactive Waste and Spent Nuclear Fuel Management in July 2009. 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 to dispose it in Slovenia or in a third country.

The Government of the Republic of Croatia adopted the National Plan and Programme of Measures of Protection against Ionising Radiation and Intervention in the Event of an Emergency (Official Gazette 49/2008). This is a strategic document of the Republic of Croatia that relates to the measures taken in emergency situations in Croatia or in other countries, which might arise during the carrying out of activities involving sources of ionising radiation or during the carrying out of nuclear activities.

Croatia provides data from its national dose rate monitoring network to the European Radiological Data Exchange Platform (EURDEP) system on a regular basis.

The ECURIE agreement on Exchange of information in the event of radiological emergency with the Community ran into the force in 2007, and Croatia participates in the EU radiological emergency preparedness activities.

In 2008, the project called "Installation of RODOS System in the Republic of Croatia" was completed within the framework of the 2005 PHARE Nuclear Safety Programme, which will strengthen the professional and technical planning base as well as improve readiness in the case of a nuclear accident in the Republic of Croatia or other countries.

Croatia has also finished "Support for the State Office for Nuclear Safety in Upgrading and Modernising the Early Warning System" project within the framework of the 2006 PHARE Nuclear Safety Programme. By co-ordinating this project in 2009, the State Office for Nuclear Safety contributed to the reliability of the early warning system within the framework of the preparedness for a nuclear accident.

Croatia states that its administrative capacity is not sufficient for the implementation of all its obligations including the provisions of the Euratom Treaty, and needs to be strengthened. The State Office for Nuclear Safety (SONS) is the regulatory body in charge of nuclear issues, financed from the state budget and it reports directly to the Government which also appoints its director general and his/her assistants. The SONS responsibilities are set down in the Nuclear Safety Act (O.G. 173/2003), the Act on Liability for Nuclear Damage (O.G. 143/1999) and the Ordinance on Control of Nuclear Material and Special Equipment (O.G.15/2008). For historical reasons, regulatory functions in radiation protection field were shared by two bodies: the State Office for Radiation Protection (SORP) and the Ministry of Health and Social Welfare. SORP is financed from the state budget and reports directly to the Government which also appoints its director.

The new Act on Radiological and Nuclear Safety (Official Gazette 28/2010) was adopted early this year. According to this act a single independent regulatory body, the State Office for Radiological and Nuclear Safety (SORNS), will replace the current State Office for Nuclear Safety and State Office for Radiation Protection (SORP) by overtaking responsibilities, staff and joint budget of the two former state offices. It is expected for SORNS to be operational by the end of 2010.

Croatia is a signatory state of the international Convention on Nuclear Safety, the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management and several other international agreements. It has bilateral agreements with Hungary and Slovenia on the early exchange of information in case of an emergency.

CONTENTS

Executive Summary	III
Contents	VI
List of Abbreviations	VIII
Introduction	1
Compliance with Articles 4 and 6 to 19 – Article-by-article Review	3
<i>Article 4. Implementing Measures</i>	3
<i>Article 7. Legislative Regulatory Framework</i>	5
<i>Article 8. Regulatory Body</i>	9
<i>Article 11. Financial and Human Resources</i>	12
Financial resources	12
Human resources (Administrative capacity).....	13
<i>Article 13. Quality Assurance</i>	13
<i>Article 15. Radiation Protection</i>	14
<i>Article 16. Emergency Preparedness</i>	14
Organisational structure	15
Technical Support Center	17
Croatian Early Warning System	18
RODOS system.....	21
Emergency planning zones	21
Emergency Classification.....	23
Protective Measures	23
Public Information.....	24
Training and exercises.....	25
Challenges and Planned Activities and Measures	26
<i>Nuclear option in new National Energy Strategy</i>	26
<i>National Strategy for Management of RAW and SF</i>	28
<i>Decision of the Government of Croatia on new national radioactive waste storage facility</i>	30
<i>New revision of the Decommissioning Programme (Programme of Krško NPP decommissioning and SF & RW disposal)</i>	30
<i>Fund for financing the decommissioning of the Krško NPP and the disposal of radioactive waste and spent nuclear fuel from Krško NPP</i>	31

Appendices	32
<i>Appendix A – List of the Most Relevant Legislation in Force in Croatia (as of July 2010)</i>	33
<i>Appendix B – References</i>	36

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
EG	Expert Group
EURDEP	European Radiological Data Exchange Platform
FER	Faculty of Electrical Engineering and Computing
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
SONS	State Office for Nuclear Safety
SORP	State Office for Radiation Protection
SORNS	State Office for Radiological and Nuclear Safety
SQP	Small Quantities Protocol
TSC	Technical Support Center
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 Third Review Meeting of the Parties to the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management in Vienna in 2009 and successfully presented its Third National Report.

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). In that respect, last year IAEA verified Initial Report under SQP for Croatia.

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.

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 a new 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 fifth Croatian report in row of previous reports on the implementation of the obligations under the Convention (1998, 2001, 2004, 2007). 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 Fifth Review Meeting to be held in April 2011.

The Report is divided into seven sections. The brief status of implementing measures is provided in section *Implementing Measures*. Legislative changes and description of new acts and regulations that entered into the force are presented in *Legislative and Regulatory Framework* section, with emphasis on the new law, ordinances and regulations in the filed of nuclear safety. The current and future functioning of the State Office for Nuclear Safety (SONS) is described in the section on regulatory body. There are also some new and relevant information described in the sections *Financial and human resources*, *Radiation Protection* and *Quality Assurance*. The emergency preparedness system in the Republic of Croatia is described in a separate section regarding the situation of Croatia which has several nuclear power reactors in close vicinity to its borders, and according to the Article 16 of the Convention.

The final chapter of this report is named *Challenges and Planned Measures*, where the most important future actions of the SONS are addressed. Also, the essential information on new national energy policy in respect to the potential built of the first nuclear power plant in Croatia is provided. The report is followed by two appendices (i.e. references, list of laws and regulations etc.).

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.

In 2003 a framework document governing all activities in the field of nuclear safety in the Republic of Croatia, Act on Nuclear Safety (O.G. 173/03), came into the force. The Act has established general nuclear safety principles and was the basis for further development of legislation and regulation in Croatia.

According to the Act the State Office for Nuclear Safety (SONS) was assigned to be an independent nuclear safety regulatory body in the Republic of Croatia. More on the regulatory body will be reported in a separate subsection under the Convention's Article 8.

Furthermore, in 2004 the Council for Nuclear Safety was established as an advisory body to the Croatian Parliament. Unfortunately, the adoption of implementing legislation according to the 2003 Act was delayed and finally in May 2005 the SONS began its work.

More comprehensive approach to the legislative regulatory framework will be reported in separate subsection under the Convention's Article 7. In addition to this, the various laws and regulations, building an initial legal framework, are listed in Appendix A of this report.

The new Act on Radiological and Nuclear Safety (O.G. 28/10) was adopted early this year. According to the new Act a single regulatory body, the State Office for Radiological and Nuclear Safety (SORNS), will replace the current State Office for Nuclear Safety and State Office for Radiation Protection (SORP), and will be operational by the end of 2010.

The approach taken in Croatia provides continuous and addicted fulfilment of the requirements presented in the articles of the Convention.

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.*

As mentioned in previous subsection, the new Act on Radiological and Nuclear Safety (O.G. 28/2010) ran into the force in February 2010. On the date of entry into force of this Act, two other acts, Act on Nuclear Safety (O.G. 173/2003) and the Act on Ionizing Radiation Protection and Safety of Ionising Radiation Sources from 2006 (O.G. 64/2006) ceased to have effect. The new regulatory body, the State Office for Radiological and Nuclear Safety (SORNS), will replace the current State Office for Nuclear Safety and State Office for Radiation Protection (SORP), and will be operational by the end of 2010.

The Act 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 effective ordinances and regulation supervened from two former acts still remain in force, until the new ones are promulgated. The ordinances which are to be issued by the director of the SORNS pursuant to the Act, shall be issued within six months from the day the Act entered into force.

As a part of its obligations defined in the Act on Nuclear Safety, the SORNS issued three regulations in 2006 as follows: Regulation on the control of nuclear material and special equipment (O.G. 74/2006), Regulation on performing nuclear activities (O.G. 74/2006) and Regulation on the special

conditions for authorisation of legal entities to perform specific expert practices in the field of nuclear safety (O.G. 74/2006).

In parallel, the Act on Ionizing Radiation Protection and Safety of Ionising Radiation Sources from 2006 (O.G. 64/2006) cancelled the former Law on Ionizing Radiation Protection from 1999 (O.G. 27/1999 amended in 2003 – O.G. 173/2003) which was dealing with radiation protection issues related to nuclear facilities. According to this Act, the development of the National Emergency Plan was under the jurisdiction of the Ministry of Health and Social Welfare. The National Emergency Plan was adopted in 2008.

Also, it is important to mention the new Act on Protection and Rescue (O.G. 174/2004 and amended 79/2007, 38/09). According to this Act in the case of large scale disasters (like nuclear accidents) the Croatian Government has appointed the Staff members of the Headquarter for Protection and Rescue Republic of Croatia on the NPRD director's proposal from among leading civil servants of the central governmental bodies.

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.

The following legislation shall remain in force until the ordinances based on the 2010. Act enter into force:

1. Ordinance on medical requirements to be fulfilled by exposed workers, frequency of examinations and the content, manner and deadlines for keeping data on such examinations (O.G. 117/2007),

2. Ordinance on conditions, deadlines and methods for acquiring the required professional training and renewal of knowledge on the application of measures for protection against ionising radiation (O.G. 30/2008),

3. Ordinance on methods, scope and time limits for measuring personal irradiation of exposed workers and persons exposed to medical radiation, inspection of sources of ionising radiation and working conditions and

measurement of required elements and quality verification, testing the working order of personal protection devices and equipment, testing the working order of measuring instruments, quality assurance measures, assessment of radioactive contamination of persons, objects, the environment, premises and air inside premises in which radioactive activities are performed or radioactive sources are located, content of surveillance and measurement reports, reporting procedure and requirement to keep records, content, methods and time limits for keeping records (O.G. 127/2007),

4. Ordinance on the limits of exposure to ionising radiation, and on the conditions of exposure in special circumstances and in emergency situations (Official Gazette 125/2006),

5. 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),

6. 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),

7. Ordinance on performing nuclear activities (O.G. 74/2006),

8. Ordinance on the control of nuclear material and special equipment (O.G. 15/2008),

9. Ordinance on special requirements which expert organisations must fulfil in order to perform certain activities in the field of nuclear safety (O.G. 74/2006),

10. Ordinance on conditions for nuclear safety and protection with regard to the siting, design, construction, use and decommissioning of a facility in which a nuclear activity is performed (O.G. 71/2008),

11. Ordinance on the list of professional ionising radiation protection activities, requirements to be fulfilled by authorised technical services and the method of granting authorisation (O.G. 127/2007),

12. Ordinance on confidentiality of data from the State Office for Nuclear Safety (O.G. 15/2009),

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.

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.*

Croatia has reached a decision to merge the State Office for Radiation Protection and the State Office for Nuclear Safety into a single institution which would take over all obligations and activities of the two existing bodies. To achieve this goal, the new Act on Radiological and Nuclear Safety was drawn up and ran into force in April 2010. This Act replaced the aforementioned Act on Ionising Radiation Protection and Safety of Ionising Radiation Sources and the Nuclear Safety Act so as to give all necessary legal powers to the newly-founded institution. The new regulatory body should be fully operational by the end of 2010. Until then, SONS and SORP will continue their work.

The SONS reports directly to the Government of the Republic of Croatia and the Director of SONS has been appointed by the Government. The SONS is funded from the state budget only. If needed, the SONS could charge the costs of any special/additional independent safety analyses from the legal entities/applicants.

The SONS 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 Director's cabinet, the SONS is divided into two sectors: Nuclear Activities and Nuclear Materials. Today, the SONS has 13 employees and according to the systematisation, it is planned to have 18 employees.

According to the Act on Nuclear Safety the SONS is in charge of the operation and development of the Technical Support Center (TSC), the leading technical organisation in the case of nuclear emergency.

Furthermore, the competent institution to be created by merging the two State Offices falls under the jurisdiction of the Ministry of Health and Social Welfare.

The process of merging the two State Offices has just started at the time this report is being written. Preparations for the merger, including some technical adaptations of the above said acts, have been initiated in June 2009.

For the purpose of implementing measures for nuclear safety and protection against ionising radiation, the new regulatory body, SORNS, shall perform 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,

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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.

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

The Republic of Croatia is addressing the issues relating to the financing of decommissioning and management of radioactive waste 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.

Human resources (Administrative capacity)

Croatia has been actively strengthening its administrative capacities in line with the closing benchmark requirements in the Chapter 15 – Energy within the framework of EU accession negotiations.

In 2008 the administrative capacities of the State Office for Radiation Protection have been strengthened as a result of recruiting three civil servants, one person with a university degree and two persons with secondary school qualifications, so that the current number of employees in the State Office for Radiation Protection is 12 of the total figure of 14 posts envisaged in the human resources planning document.

In 2008 and 2009 the administrative capacities of the State Office for Nuclear Safety were strengthened as a result of recruiting two employees with a university degree. Accordingly, the State Office for Nuclear Safety has a staff of 14 employees of the total of 18 posts envisaged.

In order to be able to fulfil its tasks and activities, a new State Office for Radiological and Nuclear Safety (SORNS) will have at its disposal all the budgetary and human resources currently available to the State Office for Radiation Protection and State Office for Nuclear Safety.

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.

The State Office for Nuclear Safety has successfully implemented the quality management system in accordance with the requirements of the ISO 9001:2000 Standard and the environment management system in accordance with the requirements of the ISO 14001:2004 Standard.

In addition, according to the new 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 performed this self-assessment shall be available to the public.

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 mentioned in the previous subsections, the new Act on Radiological and Nuclear Safety (O.G. 28/2010) ran into the force in February 2010 and the radiation protection is now regulated by this Act. Before that, the radiation protection in Croatia was regulated by the Act on ionising radiation protection and safety of ionising radiation sources (O.G. 64/2006) and its subordinate ordinances.

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

Radiation protection of the environment is regulated by the Regulation 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).

The new regulatory body SORNS should be fully operational by the end of 2010, and until then, the SORP continues its work.

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 almost 90 power reactors inside these nuclear power plants (1 to 6 reactor units per facility). Nearest to the territory of the Republic of Croatia are Krško NPP (PWR, 707 MW_e, Slovenia) and Paks NPP (VVER, 4x440 MW_e, 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.

Organisational structure

National nuclear emergency preparedness system is based on the “State Plan and Programme for the Ionizing Radiation Countermeasures and Interventions in Case of an Emergency” (Official Gazette 49/08) adopted in April 2008. According to the Plan, organizational scheme of the nuclear emergency preparedness system includes the following key players (Figure 1):

- National Center 112 (NC112)
- Technical Support Center of the State Office for Nuclear Safety (TSC)
- Crisis Headquarters of the State Office for Radiation Protection (CH)
- National Protection and Rescue Directorate (NPRD)
- Operational forces and special teams (OF/ST)

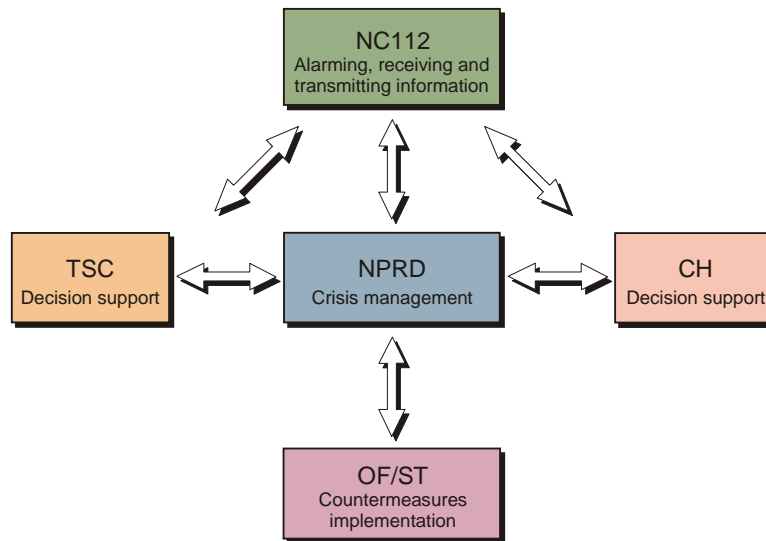


Figure 1. Organisational structure of Croatian emergency preparedness system

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.

Technical Support Center is the lead technical agency for the case of nuclear accident. Its main duty is to prepare all expert bases necessary for the decision making process related to countermeasures implementation. TSC also has the obligation to prepare the bases for timely and accurate public informing.

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 addition to support provided by the TSC, NPRD receives expert support also from the Crisis Headquarters of the State Office for Radiation Protection.

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.

The new Act on Radiological and Nuclear Safety foresees a new ordinance that will revise the currently effective Plan.

Technical Support Center

Technical Support Center (TSC) operates within the State Office for Nuclear Safety. TSC is the lead technical agency for all types of nuclear accidents, with the following main duties:

- collecting information about a nuclear accident,
- performing analysis and consequence assessment,
- preparing expert bases related to the countermeasures implementation,
- preparing expert bases for accurate and timely informing of the public.

TSC is formed of seven members, one of them acting as a leader. Each member has a substitute, which enables TSC to stay operational as long as it is needed. Members and their substitutes are being appointed by the State Office Director. The present structure of the TSC is made up of experts from the National Protection and Rescue Directorate, the Meteorological and Hydrological Service, the Ruder Bošković Institute, the Faculty of Electrical Engineering and Computing and the Faculty of Science of the University of Zagreb, the Enconet firm and the State Office for Nuclear Safety itself.

Most of the TSC's tasks are performed with a help of specialized computer tools. Software package InterRAS is an example of relatively simple tool, while on-line system RODOS represents very sophisticated applications. The main sources for all necessary input data are the following:

- Croatian Early Warning System for nuclear accidents (CEWS);
- notification and data exchange systems for nuclear and radiological accidents ECURIE and ENATOM;
- supporting institutions from Croatia, most important being the Meteorological and Hydrological Service;
- institutions from the neighbouring countries (cooperation regulated by the bilateral agreements);
- radiological data exchange system EURDEP.

The TSC operates according to the procedures brought together in the TSC operating manual. The manual is based on Croatian regulations and on the best international practice. In development of the manual, special attention has been paid to the recommendations from the European Commission and the International Atomic Energy Agency in Vienna. The procedures described in the manual are continuously exercised during the internal drills, as well as during the international exercises.

In order to be able to fulfil all the quoted duties, the TSC has been organized into three expert groups. Each of them is supported in its work by outside expert institutions. The names of the expert groups are:

- Expert group for environmental monitoring (SG1);

- Expert group for analysis of emergency and estimate of consequences (SG2);
- Expert group for preparation of technical bases (SG3).

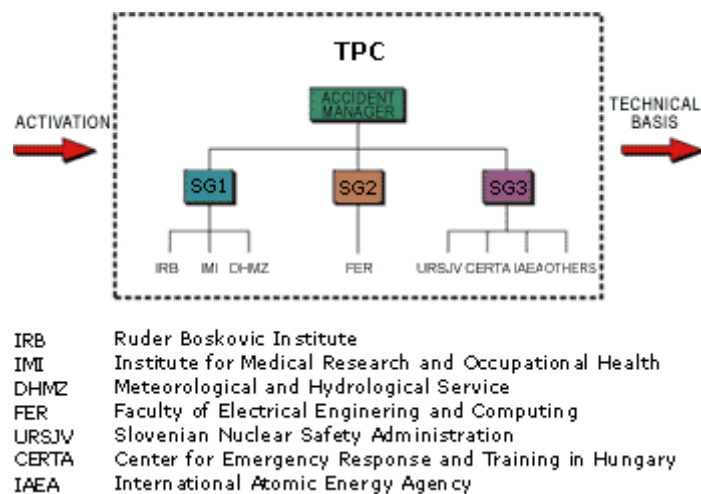


Figure 2 TSC organisational scheme

There are six members and the monitor in the TSC, all of them appointed by the director of the State Office for Nuclear Safety. The present structure is made up of experts from the National Protection and Rescue Directorate, the Meteorological and Hydrological Service, the Ruđer Bošković Institute, the Faculty of Electrical Engineering and Computing of the University of Zagreb, the APO d.o.o. and the firm Enconet. The headquarters of the TSC are located on the premises of the State Office for Nuclear Safety, Ulica grada Vukovara 284/10.

Croatian Early Warning System

The State Office for Nuclear Safety 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. In case of an accident, the data gathered with CEWS would be primarily used by the members of the TSC.

CEWS is a system that should be able to fulfil two major tasks: (1) alarming in case of significant increase of the radioactivity in the environment, and (2) providing the input for preliminary assessment of doses for the exposed population.

CEWS is important component of the Croatian emergency response system related to nuclear accidents. The SONS is responsible for the maintenance and development of the CEWS as a significant tool for the TSC

functions. In case of an accident, the data from CEWS would be used by the members of the TSC, which is the leading technical organization in case of the nuclear emergency.

The PHARE project entitled "Support to the SONS in Upgrading and Modernization of the Croatian Early Warning System" was finished in 2009. The final outcomes of this projects are as follows:

- unification of measuring equipment and putting under single control (of the SONS),
- introduction of automatic alarming/alerting and remote maintenance features,
- a wider network of measuring stations, including aerosol monitoring stations (Figure 3 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 SONS 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.

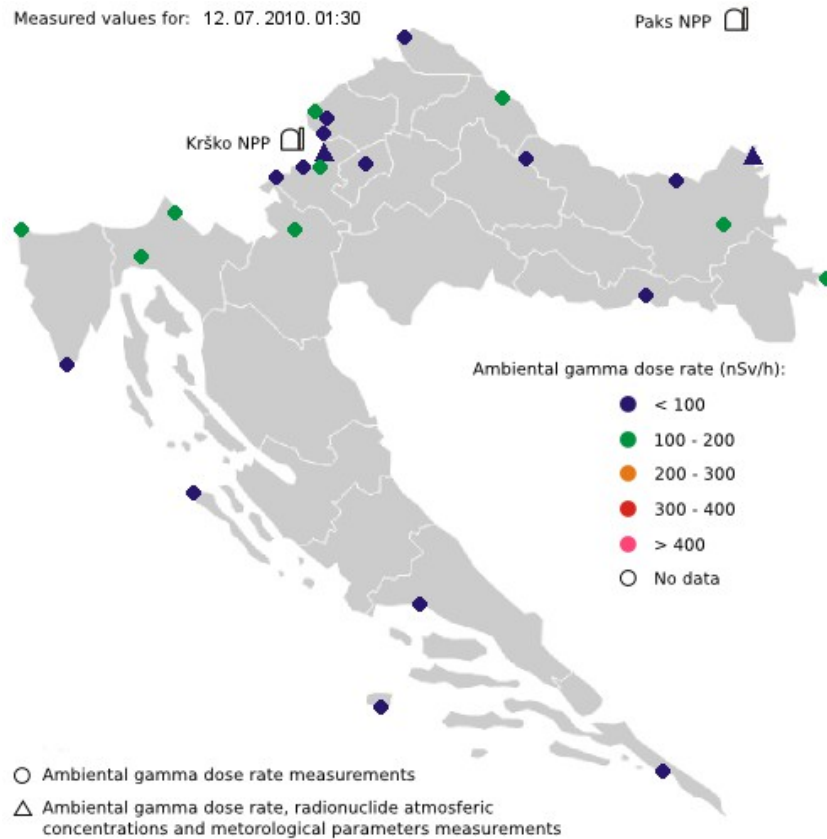


Figure 3 Locations of all measuring stations belonging to the CEWS

Within this PHARE project the [CEWS public web portal](#) was also developed. It 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. The web portal consist of the following main parts:

- introductory texts and figures providing the basic information about the ionizing radiation and it's effects (the terms such as nuclear emergency/nuclear accident, radioactivity, dose, dose rate and background radiation should be explained), as well as basic information about the principles of dose rate measurement and aerosol monitoring,
- text and figures presenting all measurement locations and describing the measurement equipment used and
- measurement data (results) presentations (gamma dose rates, selected results of aerosol monitoring and meteorological parameters) in three forms: as data tables, as time diagrams and on geographical maps.

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.

By co-ordinating this project in 2009, the SONS contributed to the reliability of the early warning system within the framework of the preparedness for a nuclear accident.

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 SONS is sent three times a day to the central EURDEP system database. Even though Croatia is not a member of the European Union it has been invited to join the ECURIE system. Currently, Croatia is in the process of integration into 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 EMERCON system coordinated by the IAEA.

In 2005 the PHARE project entitled "Installation of the RODOS System in the Republic of Croatia" was approved. The establishment of the modern decision support system and inclusion into the real-time international measured radiological data exchange is a major improvement of the nuclear emergency response preparedness system in the Republic of Croatia.

The project was completed in 2008. This will strengthen the professional and technical planning base as well as improve readiness in the case of a nuclear accident in the Republic of Croatia or other countries.

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 (Figure 4). The UPZ of the Croatian territory covers a 550 km² area and it has about 66.000 inhabitants, so that the average

population density is quite high (120 inhabitants/km²). The LPZ includes big population centres such as Zagreb, Karlovac, etc.

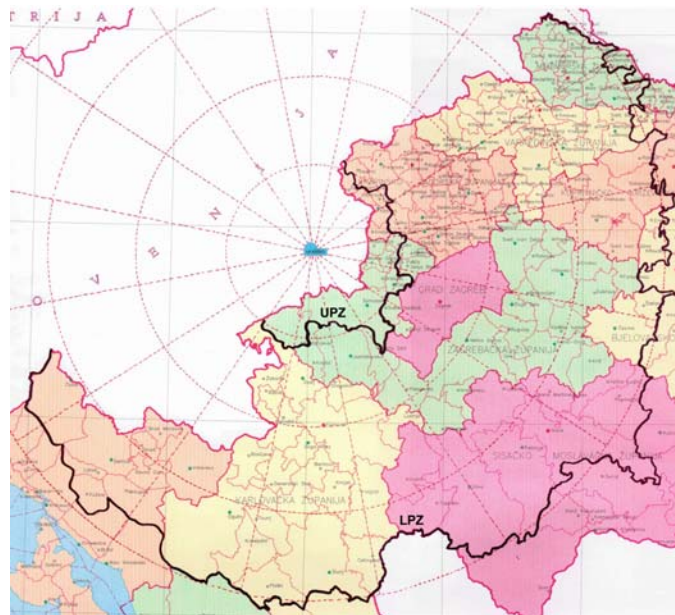


Figure 4 UPZ and LPZ in the Croatian territory regarding Krško NPP

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 (Figure 5), which is a well-known corn-producing region and agriculturally one of the most outstanding parts of Croatia.



Figure 5 LPZ on the Croatian territory regarding the Paks NPP

Based on the definition of the Emergency Planning Zones, the National Emergency Plan in Croatia, according to the IAEA document TECDOC-953 (July 1997), belongs to the Emergency Planning Category I, which is the most

demanding category. In this case it means that the National Emergency Plan in Croatia should be developed in the same manner as it is developed in the countries which have nuclear facilities in their territory.

Emergency Classification

The emergency classification is based on an assessment of plant conditions, and according to the IAEA document TECDOC-955, 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. Protective measures are divided into three groups: Preventive protective Measures (PM), Urgent protective Measures (UM) and Longer-term protective Measures (LM). The PM include activities such as checking communication and other equipment, controlling of iodine pills distribution, checking facilities for sheltering, informing and education of the public about the accident, etc. The UM include evacuation, iodine pills administration and sheltering, while the LM includes relocation, food restriction and other measures such as decontamination, etc. In respect to the protective measures, the Croatian Emergency Preparedness System is based on the assumption that all of the mentioned protective measures are supposed to be implemented within the UPZ area, whereas the evacuation and iodine pills administration are not expected to be implemented within the LPZ area.

The type of protective measures which should be implemented depends on the emergency level declared. The emergency level which will be declared in Croatia depends on our own projection about the development of the accident (responsibility of TSC), but also on the emergency level declared in the

neighbouring countries, particularly in Slovenia and Hungary. The interface between the emergency level declared in a neighbouring country with an NPP and actions to be taken associated with the protective measures which should be implemented in Croatia is given in Table 1.

Table 1 Interface between emergency level declared in a neighbouring country with NPP and actions to be taken in Croatia

Neighbouring NPP country	Actions to be taken in Croatia
ALERT	<ul style="list-style-type: none"> ▪ Summon members of the TSC ▪ Inform NPRD/head of NPRD
SITE AREA EMERGENCY	<ul style="list-style-type: none"> ▪ Convene members of the Headquarter for Protection and Rescue Republic of Croatia ▪ Possible PM implementation
GENERAL EMERGENCY	<ul style="list-style-type: none"> ▪ UM and LM implementation

With the finalisation of the National Emergency Plan it is expected that protective measures implementation plans for the previously defined emergency planning zones are going to be updated and improved.

Public Information

There are two important subjects related to this issue and both are very sensitive. The first one is related to public education and the second one is related to public information during an accident.

The population living in the UPZ and LPZ are informed about the nuclear emergency response system in Croatia and potential countermeasures which should be taken in case of nuclear emergency. Nevertheless, many assessments (governmental and non-governmental) showed that the public knowledge on this issue was not on the satisfactory level. That was the reason why the SONS and the National Protection and Rescue Directorate – Civil Protection Sector decided to continue mutually with previously initiated specific program of public education. The main idea which is behind this action is to organise publicly oriented seminars in towns and villages located in the UPZ and LPZ. Seminars were organised and held in high-schools and municipality buildings. According to the Croatian laws, the National Protection and Rescue Directorate is a responsible body for providing information to the

public about all kinds of accidents and for recommending activities which should be taken.

For general public information, beside its own website, the SONS also maintains the website dedicated to the emergency planning and preparedness with the emphasis to the Technical Support Center and daily measurements from the automatic radiological measuring stations (www.dzns.hr/tpc).

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 SONS' 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

There are various kinds of national workshops which are organised periodically. The first kind is the workshop for the TSC members and its objective is to train the TSC staff. The second kind of workshop is dedicated to the National Protection and Rescue Directorate – Civil Protection Sector and its objective is to train the Civil Protection staff. The third kind of the workshop is also called Information seminar and has the aim to inform the specific target public groups (experts, media, general public, etc.) about the emergency preparedness, especially with the purpose of the TSC.

Exercises are also organised periodically. They are designed with the aim to train the NC 112, TSC and Headquarter for Protection and Rescue Republic of Croatia, their communication and co-ordination. Among exercises it is important to mention the so-called TSC table top exercises with accident scenario developed by external support organisation. Also, it is noted that participation in international exercises is very important and highly recommended. The SONS and the TCS as its part, are actively involved in the international exercises organised by the International Atomic Energy Agency (CONVEX) and European Commission (ECURIE). In the year 2008 Croatia is planning to participate in the national exercises which will be organised in Slovenia and Hungary.

CHALLENGES AND PLANNED ACTIVITIES AND MEASURES

Nuclear option in new National Energy Strategy

In October 2009 Croatian Government adopted new 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.

The Energy Strategy shall deal with: ensuring the secure and reliable supply of energy and its efficient generation and use, specifically the use of different renewable energy resources, care for the environment in performing all energy activities; promotion of competition in the energy sector on the principles of non-discrimination and transparency; protection of energy consumers; the connection of the Croatian energy system or its parts with the European energy systems or the systems of other countries by taking into account economic development trends and energy needs; drawing up National Energy Programmes, capital investments, incentives for investments in renewable energy resources and energy efficiency programs and implementation of measures for environmental protection.

In line with the Energy Strategy and the Strategy Implementation Programme, the Croatian Government shall initiate implementation of national energy programmes that are to ensure meeting long-term development goals and provide 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 shall be presented in the second half of year 2010.

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.

Activities for preparation of construction, the construction itself, and operation of NPP are divided into the three phases. The first phase is State's obligation, and it encompasses creation of national infrastructure necessary for making a decision on construction of NPP. The aspects to be considered in all

three phases of development of the national infrastructure for introduction of nuclear option are: national position, nuclear safety, nuclear programme management, financing programme, legal framework, guarantee measures for the purpose of non-proliferation of nuclear weapons, regulatory framework, environmental protection, radiation protection, sites and infrastructure, electrical power transmission network, human resources development, public communication, emergency planning, security and physical protection, nuclear fuel cycle, radioactive waste, domestic industry involvement, policy on provision of goods and services. The Republic of Croatia has already developed some of the above-mentioned aspects. Time for implementation of activities in the first phase is estimated to be 2-3 years.

It will be possible to support decision making on construction of NPP after preparatory activities. The decision on construction of nuclear power plant will be made by the Croatian Parliament.

The first formal statement/decision in Strategy says: *Republic of Croatia is starting the Croatian nuclear energy programme.*

Nuclear option was supported in the public hearings, but the certain concerns still exists in terms of nuclear safety and impact to the environment. The public shall get a clear and acceptable resolution for all questions causing these concerns. Hence, the public will also be involved during the preparatory activities and the decision making on construction of NPP on the Croatian territory.

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.*

Preparatory activities for the nuclear energy programme is a demanding, comprehensive and long lasting task, and therefore, the role of Croatian Government is crucial for its successful finalisation. No matter if it's about national or international projects, like Krško NPP, the introduction or maintenance of nuclear energy programme in the way required by IAEA is faced with continued process of confirming of quality of work on safety, efficiency in infrastructure construction, and fulfilment of all regulated international obligations. The Government of the Republic of Croatia will elaborate the programme of preparatory activities, as a part of the Strategy Implementation Programme, in order to come up to the decision making on the construction of NPP.

National Strategy for Management of RAW and SF

The Government of the Republic of Croatia passed the Regulation on Conditions and Methods of Disposal of Radioactive Waste, Used Sealed Radioactive Sources and Sources of Ionising Radiation that are no Longer Going to be Used (O.G. 44/2008), prescribing the conditions required for the management of radioactive waste, used sealed radioactive sources and sources of ionising radiation that are no longer to be used.

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 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 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 low- and intermediate-level radioactive waste from the Krško NPP be achieved by

permanent disposal in a suitable repository. However, taking present circumstances into account, it would be optimal to agree on the long-term storage of such waste in modular storage in the vicinity of the Krško NPP, along with adequate compensation to the local community, in order to be able to select and investigate a suitable repository site and develop without haste a repository project in compliance with the best world practice.

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 or by export to a third country for processing or disposal in an international or regional 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 and on arrangements within the European Union. For that purpose it would be optimal to set up a dry repository of spent fuel as a module in the long-term storage of low- and intermediate-level active waste in the vicinity of the Krško NPP.

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 and export to a third country;
- 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 and export to a third country;
- in the meantime continue with activities related to site exploration for a potential LILW and SF storage and repository on Croatian territory in case all other options should fail.

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

Decision of the Government of Croatia on new national radioactive waste storage facility

The Government of the Republic of Croatia, at its session on 30 December 2009, adopted the decree on the location of storage facility for radioactive waste, spent sealed radioactive sources and ionising radiation sources which are not intended for further use (central storage). By the decree a location of storage facility is established on the premises of Ruđer Bošković Institute in Zagreb, where the radioactive waste storage already exists.

New 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 assess the prospects for joint Slovenian-Croatian plant decommissioning and its RW and SF management.

Decommissioning Programme Rev. 2 is in the final stage. It is intended to substantially improve technological detail and reliability of Decommissioning Programme projects, based on dedicated new supporting studies, and to incorporate new developments since Rev. 1 (such as the Slovenian repository project). Using these new data, Rev. 2 updates costs estimates and financing requirements, taking also into account all administrative costs as well as current discounting parameters trends.

Finally, with the prospects for the Krško NPP life extension becoming ever more realistic, and with preliminary calculations indicating dramatic annuity increase without the life extension, Rev. 2 boundary conditions have been modified to require equivalent cost analysis of the 2023 and 2043 Krško NPP shutdown scenarios.

For this revision, five integral scenarios of Krško NPP dismantling and waste management have been considered based on boundary conditions (in Module 7) and all of them present baseline scenarios. They include a set of possible situations and corresponding activities which result in spectrum of nominal costs from EUR 2.507 million up to EUR 3.271 million. The costs include all technical costs, compensations to local communities and VAT. The discounted costs are adequately lower, using 3.06 % discount rate.

Calculated annuities are rather high for scenarios without Krško NPP lifetime extension, about EUR 90 to 100 million, scenarios with prolongation of

Krško NPP operation until 2043 have less than half of total annuity, in the range from EUR 30-40 million. In each of the Krško NPP lifetime operation options, separate LILW management is more expensive. The joint LILW management in S5 has the lowest total annuity.

The only equivalent comparison between S1 scenario in Rev. 2 and SID-45 scenario in Rev.1 indicate drastically increase of nominal costs for factor 2.18 (118%). The increase in technical costs could partly be justified as a normal/expected development. But almost two thirds of increased costs are due to higher compensations to local community and inclusion of VAT on costs.

Rev. 2 is currently being scrutinised by Croatian, Slovenian and IAEA reviewers. Following their expected recommendations, final document might have slightly different conclusions than previously mentioned. Its approval in both countries is expected in the year 2011.

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 will include 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 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) and other activities laid down by the Fund's Statute.

According to the Act, the Fund's assets shall be used for:

- preparation and review of the Decommissioning Programme
- decommissioning of the Krško NPP in accordance with the Decommissioning Programme,
- disposal and landfill of the radioactive waste and spent nuclear fuel from the Krško NPP in accordance with the Decommissioning Programme,
- covering the expenses of the Fund's operation.

Furthermore, resources for the financing of the decommissioning of the Krško NPP and the disposal of radioactive waste and spent nuclear fuel from Krško NPP shall be contributed to Fund every three months until the Krško NPP has ceased operation in accordance with the Agreement, or until the planned amount fixed by the Decommissioning Programme in force has been reached. These resources shall be paid into the account of the Fund by Hrvatska elektroprivreda d.d. (HEP), Zagreb.

The director shall report every three months to the Management Board on the financial operations of the Fund. Exceptionally, the director shall submit a report on the financial operations of the Fund to the Management Board on other occasions upon the request of the Management Board. Conditions for the Fund's acquisition of securities, shares and types of property which the Fund's assets may be invested in, as well as the limitations on the investment of the Fund's assets shall be laid down by the Fund's Statute.

In February 2008 the Fund was registered at Commercial Court and in April 2008 Statute of Fund was adopted. After that the interim manager and Administrative committee were nominated, and the Fund became operational.

As of June 2010 the Fund already has an amount of approximately EUR 100 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)
- Nuclear Safety Act (Official Gazette 173/03)
- Act on ionising radiation protection and safety of ionising radiation sources (Official Gazette 64/06)
- 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)
- Act on Sanitary Inspections (Official Gazette 113/08)
- Act on Liability for Nuclear Damage (Official Gazette 143/99)
- Joint Convention on the safety of spent fuel management and on the safety of radioactive waste management (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)

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)

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- Ordinance on the conditions and procedure for issuing and withdrawing the approval for packaging used for transport of nuclear materials (Official Gazette 93/08)
 - 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)

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)
- State plan and programme of ionising radiation protection measures and emergency interventions (Official Gazette 49/08)

Plans and programmes

- State plan and programme of ionising radiation protection measures and emergency interventions (Official Gazette 49/08); in Croatian: Državni plan i program mjera zaštite od ionizirajućeg zračenja te intervencija u slučaju izvanrednog događaja (NN RH br. 49/08)

Policy (Strategy)

- Strategy for Management of Radioactive Waste and Spent Nuclear Fuels, July 2009

A.1.3. Other legislation

- Dangerous Goods Transport Act (Official Gazette 79/07)
- Ordinance on Conditions and Methods for the Procedure of Issuing and Revoking Licences for Packages for the Transportation of Nuclear Materials (Official Gazette 83/08)


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 or Radiological Emergency (Official Gazette 01/06)

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- 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)
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Appendix B - References

- Convention on Nuclear Safety, IAEA, 1994
- Guidelines regarding National Reports under the Convention on Nuclear Safety, IAEA, 1999
- 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.