

**Republic of Croatia**

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

Zagreb, 1 September 2004

## INTRODUCTION

Safety of nuclear installations is not only of local interest, since consequences could have transboundary effects. Therefore, whole international community has to express its interest in this issue, and actively participate in various international instruments which are aimed to regulate or coordinate nuclear safety activities. In other words, it means that tasks regarding safety policies and their detailed implementation should obtain high priority in all states, especially Member States of the International Atomic Energy Agency.

Croatia attaches great importance to nuclear safety and commends the work of the International Atomic Energy Agency in this field. The legal regime on nuclear safety, which is comprised of internationally binding documents, was effectively established with the acceptance of the Convention on Nuclear Safety and the Joint Convention on Spent Fuel and Radioactive Waste Management. By the virtue of succession, Croatia became a party to the Convention on Physical Protection of Nuclear Material, Convention on Early Notification in Case of Nuclear Accident and the Convention on Assistance in Case of Nuclear Accident or Radiological Emergency.

The Republic of Croatia promotes a strong non-proliferation policy and is a party to the Non-Proliferation Treaty. Croatia is among those countries which strongly advocate the extensive application of this treaty because of its significance for international peace and stability. Therefore, Croatia has ratified the Comprehensive Safeguards Agreement and signed the Additional Protocol with the IAEA.

Croatia does not have nuclear power plants on its territory nor any other nuclear fuel cycle facility. However, state utilities of Croatia and Slovenia constructed the Nuclear Power Plant Krško on the territory of Slovenia, as joint investment of two republics of former Yugoslavia in the late seventies. Nowadays the two states, the Republic of Croatia and the Republic of Slovenia, share the ownership of that plant. On March 11, 2003 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 Relationships, Connected with Investments in the Krško Nuclear Power Plant, its Exploitation and Decommissioning* came into force. This Agreement gives solutions on disputes (from 1998 regarding exploitation conditions) and brings to the end years-long attempts to regulate the joint exploitation of Krško NPP, in the new circumstances of independence of two countries. By this, two countries expressed their awareness and responsibility and further contributed to the safety of the Krško NPP.

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

review operation and modifications as well as to carry out regulatory inspections.

Although the Republic of Croatia does not have a nuclear power plant on its territory, and consequently it is not obliged to report under each and every article of the Convention, in this report we shortly present, article-by-article, all the legislative and administrative measures which have been undertaken in connection with the safety of nuclear power plants. Long-term development plans of the Republic of Croatia include a nuclear power option and this is, among others, the reason that the modern nuclear infrastructure is in the process of setting up. However, as a state without a nuclear power plant, we have paid special attention to the provisions of the Convention dealing with legislation and emergency preparedness.

This National Report contains updated information on matters covered in the second report from 2001, especially regarding legislative and regulatory framework. Also, the answers to the questions mostly about legislative and regulatory framework and emergency preparedness, which were raised during the last Review Meeting, are adequately included in the report.

## **ARTICLE-BY-ARTICLE REPORT**

### **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.*

Comment:

The Republic of Croatia signed the Convention on Nuclear Safety in April 1995, and the instrument of ratification was deposited with the Depository on 18 April 1996.

According to the Constitution of the Republic of Croatia, Art. 134, "international treaties, signed and ratified in accordance with the Constitution... are part of the national legislation of the Republic of Croatia..." By this article of the Constitution, all legislative, regulatory and administrative measures which are requirements of the Convention will be implemented as part of the national laws. By further development of national nuclear safety legislation, the measures and obligations defined by the Convention will be directly included in new laws and corresponding regulations.

### **Article 5. Reporting**

*Each Contracting Party shall submit for review, prior to each meeting referred to in Article 20, a report on the measures it has taken to implement each of the obligations of this Convention.*

Comment:

Submission of this National Report fulfils the obligation from this article.

### **Article 6. Existing Nuclear Installations**

*Each Contracting Party shall take the appropriate steps to ensure that the safety of nuclear installations existing at the time the Convention enters into force for that Contracting Party is reviewed as soon as possible. When necessary, in the context of this Convention, the Contracting Party shall ensure that all reasonably practicable improvements are made as a matter of urgency to upgrade the safety of the nuclear installation. If such upgrading cannot be achieved, plans should be implemented to shut down the nuclear installation as soon as possible. The timing of the shut down may take into account the whole energy context and possible alternatives as well as the social, environmental and economic impact.*

Comment:

The Republic of Croatia presently does not have nuclear installations on its territory.

## **Article 7. Legislative and regulatory framework**

*Each Contracting Party shall establish and maintain the legislative and regulatory framework to govern the safety of nuclear installations.*

*The legislative and regulatory framework shall provide for:*

- (i) the establishment of applicable national safety requirements and regulations;*
- (ii) a system of licensing with regard to nuclear installations and the prohibition of the operation of a nuclear installation without a license;*
- (iii) a system of regulatory inspection and assessment of nuclear installations to ascertain compliance with applicable regulations and the terms of licenses;*
- (iv) the enforcement of applicable regulations and of the terms of licenses, including suspension, modification or revocation.*

Comment:

### **1) Introduction**

At the end of 2003 the Act on Nuclear Safety came into force (*Official Gazette No. 173/03*), which replaced articles dealing with nuclear safety matters from two Acts, both taken from the former Yugoslav legal system: Act on Ionizing Radiation Protection and the Safe Use of Nuclear Energy, issued in 1984, and the Act on Ionizing Radiation Protection and the Safety Measures for Nuclear Plants and Facilities, issued in 1981.

The Law on Ionizing Radiation Protection from 1999 (*Official Gazette No. 27/99*) replaced articles from two aforementioned laws dealing with radiation protection matters. This Law was changed and amended in 2003 (*Official Gazette No. 173/03*).

### **2) Nuclear safety**

The Act on Nuclear Safety (Act of 2003) regulates safety and protective measures for using nuclear materials and specified equipment and performing nuclear activities, and establishes the State Office for Nuclear Safety.

Details of the implementation of each of these measures are given in the subsequent articles of this report.

On the basis of the Act on Ionizing Radiation Protection and the Safe Use of Nuclear Energy, issued in 1984, several regulations are still in force:

- ◆ Regulation on siting, construction, commissioning, start up and operation of nuclear facilities (with appendix on quality assurance), (*Off. Gaz. SFRY No. 52/88*), - Regulation E-1;
- ◆ Regulation on preparation and content of safety analysis report and other documentation relevant to the assessment of the safety of nuclear facilities (*Off. Gaz. SFRY No. 68/88*), Regulation E-2;
- ◆ Regulation on education, experience, examination and certification of personnel conducting specific work at the nuclear installation (*Off. Gaz. SFRY No. 86/87*), Regulation E-3;

- ◆ Regulation on material balance areas and the mode of keeping records accounting for nuclear raw materials and nuclear materials as well as to the submission of data contained in such records (*Off. Gaz. SFRY No. 9/88*), Regulation E-4;

The licensing system is generally defined in the Art. 5 of the Act of 2003. A legal entity may perform a nuclear activity only if, based on an application for the issue of a licence to perform a nuclear activity, the state administration body with jurisdiction over nuclear safety has issued a decision in favour of granting a licence to perform a nuclear activity. According to the Art. 2 nuclear activities are: the production, processing, use, storage, disposal, transport, import, export, possession or other handling of nuclear material or specified equipment.

Licensing requirements are more precisely defined in Regulation E-1 in the following parts:

- ◆ Conditions for the siting of a nuclear facility,
- ◆ Conditions for the construction of a nuclear facility,
- ◆ Conditions for the commissioning of a nuclear facility,
- ◆ Conditions for the commencement of operation and the operation of a nuclear facility,
- ◆ Methodology for the preparation of a Quality Assurance program (Appendix).

It is important to point out that, of course, all safety related modifications in a nuclear facility during construction or operation require amendment of the license. With regard to the licensing of the NPP design modifications and consequently the Safety Analysis Report (SAR) changes, the following laws and regulations are applicable:

1. Act of 2003

Art. 8 requires that in the process of determining the siting, planning, construction, operation and decommissioning of a facility in which a nuclear activity is to be performed, the conditions for nuclear safety and protection set forth in this Act and in conventions and other international agreements ratified by the Republic of Croatia, as well as international recommendations and standards in the area of nuclear safety, must be met.

2. Regulation E-2

This regulation provides that the SAR is the basic licensing document for nuclear installation with respect to nuclear safety. The SAR shall be supplemented during the lifetime of the plant with data and analysis of all the changes which will be done at the nuclear plant. This regulation defines three categories of changes to the SAR. For the first category a notification to the regulatory authority is required after the completion of modifications. For the second category a notification to the regulatory authority is required before implementation. For the third category an approval by the regulatory authority is required before implementation.

### 3. Regulation E-1

This regulation requires that a licensee monitors and analyses the level of nuclear safety, whereby he must take into account the experience of other nuclear facilities and new technological developments. Any changes of Technical Specification (TS) should be subject to independent evaluation, and approved by a regulatory authority.

The Act of 2003 contains a chapter on supervision. Administrative supervision of the implementation of this Act and regulations adopted on the basis of this Act shall be carried out by the State Office for Nuclear Safety. Inspections based on this Act shall be carried out by inspectors from the State Office for Nuclear Safety (hereinafter: nuclear safety inspectors).

The Act of 2003 gives specific authority to the inspectors: Should it be ascertained during an inspection that this Act or another regulation adopted on the basis of this Act has been violated, a nuclear safety inspector shall, by means of a decision:

1. temporarily or permanently prohibit the performance of a nuclear activity in connection with nuclear material or specified equipment,
2. prohibit workers who do not meet the conditions for working with nuclear material from performing their duties,
3. prohibit the handling of nuclear material or specified equipment if this is not in accordance with the regulations.

### **3) Radiation protection**

The Law on Ionizing Radiation Protection was adopted by the Croatian Parliament in 1999 (Act of 99). It was changed and amended in 2003.

The Law consists of 54 articles in ten chapters: general provisions, principles of radiation protection, requirements for the practices, exposures, sources, emergencies, radioactive waste, supervision and authorities including the establishment of the Croatian Institute for Radiation Protection and the Commission for Radiation Protection, penalties for offences of the provisions, transitional and final provisions.

The basic principles of the Law are adopted from the international recommendations (ICRP Publication No. 60 and International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources, 1996 Edition): justification of practices, optimization of protection and safety and limitation of individual doses and they are explicitly formulated as the provisions of the Law. According to the Law, authorization for all practices with ionizing radiation is obligatory except for excluded or exempted sources of ionizing radiation. The conditions and procedure for authorization are formulated as the provisions of the Law, as well as the principles for exemption.

Primary responsibility for implementation of prescribed measures has the user, the person or legal entity who obtained the authorization for conducting certain practice.

The import of radioactive waste in the Republic of Croatia is explicitly forbidden.

In order to ensure more effective implementation of radiation protection, pursuant to the Law on Health Care, the Croatian Institute for Radiation Protection (CRPI) has been founded, a medical institute for providing expert assessment and other expertise in the field of radiation protection, and for keeping and maintaining records on the sources, source users and radiation workers.

According to changes of the Act of 99 from 2003, on 1<sup>st</sup> of July 2004 CRPI became State Office for Radiation Protection with the function of the regulatory body for radiation protection, except for inspection for which the Ministry of Health and Social Welfare stayed responsible.

On the basis of the Act on Ionizing Radiation Protection and the Safe Use of Nuclear Energy, issued in 1984, one regulation is still in force:

- ◆ Regulation on mode of collecting, accounting, processing, storing, final disposal and release of radioactive waste into the environment (*Off. Gaz. SFRY No. 40/86*), Regulation Z-3. New regulation is in preparation.

On the basis of the Act of 99, several regulations were adopted:

- ◆ Regulation on the exposure limits, on the conditions of exposure for special purposes and on the intervention levels (*Official Gazette No. 108/99*);
- ◆ Regulation on the conditions and measures for the protection against ionizing radiation for conducting practices involving x-ray units, accelerators and other devices generating ionizing radiation (*Official Gazette No. 84/00*);
- ◆ Regulation on the conditions and measures for the protection against ionizing radiation for conducting practices involving radioactive substances (*Official Gazette No. 84/00*);
- ◆ Regulation on the conditions and manner of obtaining the professional qualifications as a precondition for work with the sources of ionizing radiation (*Official Gazette No. 67/00*);
- ◆ Regulation on the health conditions, criteria, content, methods and intervals of maintaining of the records about medical surveillance of persons who operate sources of ionizing radiation (*Official Gazette No. 76/00*);
- ◆ Regulation on the conditions, methods, premises and intervals of systematic environmental radiological monitoring (*Official Gazette No. 86/00*);
- ◆ Regulation on the patients ionizing radiation protection in medicine and stomatology (*Official Gazette No. 113/99*);
- ◆ Regulation on the methods and time intervals of the surveillance of the sources of ionizing radiations, personnel monitoring, monitoring of exposure of the patients, on maintaining records and registers and on reporting (*Official Gazette No. 63/00*);
- ◆ Regulation on the conditions for authorization of legal entities to perform specific expert practices in the field of ionizing radiation protection (*Official Gazette No. 108/99*)

#### **4) Other relevant legislation**

There are several other legislative acts related to nuclear safety areas in broader sense:

- ◆ Act on Third Party Liability for Nuclear Damage (from 1998)
- ◆ Act on Sanitary Inspection (from 1999)
- ◆ Act on Protection from Natural Disasters (from 1997),
- ◆ Act on Organization and Field of Activities of the Ministries and Other Governmental Bodies (from 2003 and 2004),
- ◆ Act on General Administrative Procedures (from 1991),
- ◆ Act on Criminal Procedure (from 1997, 1998, 2000 and 2003),
- ◆ Act on Transport of Hazardous Material (from 1993 and 2003)
- ◆ Act on Internal Affairs (from 1991, 1992, 1994, 1998 and 2000).

Furthermore, based on the Croatian Constitution, all announced and ratified international treaties also constitute an integral part of 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:

- ◆ Statute of the International Atomic Energy Agency,
- ◆ Agreement on the Privileges and Immunities of the International Atomic Energy Agency,
- ◆ 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.

#### **5) Bilateral agreements**

- ◆ Agreement Between the Republic of Croatia and the International Atomic Energy Agency for the Application of Safeguards in Connection with the Treaty on the Non-proliferation of Nuclear Weapons,
- ◆ The Protocol Additional to the Agreement Between the Republic of Croatia and the International Atomic Energy Agency for the Application of Safeguards in Connection with the Treaty on the Non-proliferation of Nuclear Weapons.
- ◆ Agreement Between the Republic of Croatia and the Republic of Slovenia on the Early Exchange of Information in the Event of a Radiological Emergency,
- ◆ Agreement Between the Government of the Republic of Croatia and the Government of the Republic of Hungary on the Early Exchange of Information in the Event of a Radiological Emergency.

Bilateral agreements between Croatia and Slovenia/Hungary on the early exchange of information in the event of a radiological emergency prescribe that both parties are obliged to support each other in protective measure implementation. In the case of nuclear emergency, 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 appropriate national authorities without any delay.

The text of the Agreement Between the Republic of Croatia and the Republic of Italy on the Early Exchange of Information in the Event of a Radiological Emergency was agreed in 2002. Croatian party is still waiting that Italian party finishes internal procedure for signing the Agreement.

#### **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 organization concerned with the promotion or utilization of nuclear energy.*

Comment:

Based on the provision of the Act of 2003 and the provisions of the Act on Organization on Field of Activities of Ministries and Other Governmental Bodies, the State Office for Nuclear Safety is the designated regulatory authority entrusted with the implementation of nuclear safety legislative and regulatory framework and provided with authority to fulfil its assigned responsibility. Until such time as the State Office for Nuclear Safety begins its work (determined by the Act of 2003 for January 2005), activities relating to nuclear safety shall be carried out by the Ministry of the Economy, Labour and Entrepreneurship, which is also responsible for energy. With the establishment of the State Office for Nuclear Safety, complete and effective separation between the functions of the regulatory body and this body concerned with the promotion of nuclear energy will be fully achieved.

Other relevant governmental bodies are the State Office for Radiation Protection (for general radiation protection matters), the Ministry of Health and Social Welfare – Sanitary Inspectorate (for inspection related to radiation protection matters) and the Ministry of Internal Affairs – Civil Protection (for emergency preparedness).

#### **Article 9. Responsibility of the license holder**

*Each Contracting Party shall ensure that prime responsibility for the safety of a nuclear installation rests with the holder of the relevant license and*

*shall take the appropriate steps to ensure that each such license holder meets its responsibility.*

Comment:

Based on legislation (Act of 2003: Articles 3, 11-16 and 18) the nuclear material or specified equipment user shall be solely responsible for safety and protection in performing a nuclear activity. He is also responsible for emergency preparedness, environmental monitoring, education of personnel and record-keeping. All these requirements are specified in more detail in the regulations.

The holder of the license is also liable for any nuclear damage according to the Act on Third Party Liability for Nuclear Damage.

It is the responsibility of the regulatory body to control that the licensee fulfils these regulations.

#### **Article 10. Priority to safety**

*Each Contracting Party shall take the appropriate steps to ensure that all organizations engaged in activities directly related to nuclear installations shall establish policies that give due priority to nuclear safety.*

Comment:

Based on legislation (Act of 2003: Art. 3) a nuclear material or specified equipment user must grant due priority to safety and protective measures in performing a nuclear activity.

#### **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.*

Comment:

Based on legislation (Act of 2003: Art. 3) the nuclear material or specified equipment user must secure the appropriate financial resources and a sufficient number of qualified staff.

This requirement is worked out in detail in the Regulation E-3. The regulation defines the requirements on professional education, working experience and obligatory training for nuclear power plant personnel whose task and duties are safety related (Art. 1).

*Regulation on the conditions and manner of obtaining the professional qualifications as a precondition for work with the sources of ionizing radiation*

and *Regulation on the health conditions, criteria, content, methods and intervals of maintaining of the records about medical surveillance of persons who operate sources of ionizing radiation* (listed under the Act of 99 regulations) deal with the requirements on education, health conditions and medical examinations for the personnel working with ionizing radiation sources.

## **Article 12. Human factors**

*Each Contracting Party shall take the appropriate steps to ensure that the capabilities and limitations of human performance are taken into account throughout the life of a nuclear installation.*

Comment:

Although there is no direct provision dealing with the human factor, the Croatian legislation, in general, enables ensuring human performance to be taken into account throughout the life of the nuclear installation.

## **Article 13. Quality assurance**

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

Comment:

Act of 2003 in Art. 10 specifies that in determining the siting, planning, construction, operation and decommissioning of a facility in which a nuclear activity is to be performed, work having an impact on nuclear safety must be carried out in accordance with quality assurance (QA) requirements. The aforementioned requirements are defined by international recommendations and standards in the area of quality assurance for nuclear activities.

Regulation E-1 in Article 5 determines that:

“Works that have an impact on the safety of a nuclear facility and which are being used to prove that the conditions for the siting, construction, commissioning, commencement of operation and operation of a nuclear facility are met, shall be performed according to the system of quality assurance”.

Regulation E-1 requires that: “planned and systematic measures and actions are undertaken, and that they are adequate to assure and prove the required quality by which the prescribed safety of a nuclear facility or its components will be achieved”.

Article 6 of Regulation E-1 requires that a system of quality assurance be established based on the classification of products and services according to their importance for the safety. Quality assurance system has to be adopted by the owner or the operating organization of the nuclear facility on the basis of Regulation E-1 and other regulations.

Methodology for the development of such a program, given in the appendix of Regulation E-1, is in full compliance with 50-C-QA Safety Standard of IAEA.

#### **Article 14. Assessment and verification of safety**

*Each Contracting Party shall take the appropriate steps to ensure that:*

*(i) comprehensive and systematic safety assessments are carried out before the construction and commissioning of a nuclear installation and throughout its life. Such assessments shall be well documented, subsequently updated in the light of operating experience and significant new safety information, and reviewed under the authority of the regulatory body;*

*(ii) verification by analysis, surveillance, testing and inspection is carried out to ensure that the physical state and the operation of a nuclear installation continue to be in accordance with its design, applicable national safety requirements, and operational limits and conditions.*

Comment:

Requirements for the safety assessment and the verification of the physical state of nuclear installations are covered by the existing nuclear safety legislation as follows:

Article 8 of the Act of 2003 requires the following:

In the process of determining the siting, planning, construction, operation and decommissioning of a facility in which a nuclear activity is to be performed, the conditions for nuclear safety and protection set forth in this Act and in conventions and other international agreements ratified by the Republic of Croatia, as well as international recommendations and standards in the area of nuclear safety, must be met.

Article 9 of the Act of 2003 requires the following:

The state administration body with jurisdiction over nuclear safety shall establish special conditions for nuclear safety and protection during the procedure for issuing siting permits, building permits, and permits for decommissioning facilities in which a nuclear activity is performed.

Article 36 of Regulation E-1 requires the following:

During the operational phase, the licensee has to review and assess the safety of the nuclear power plant taking into account the operational experience of other nuclear industries and of technology development.

The design of the facility is described in the Preliminary Safety Analysis Report (PSAR) and in the Final Safety Analysis Report (FSAR). Reports are submitted to the regulatory authority for approval in connection with the applications for construction and for operational licenses. Transient and accident analyses and assessments are a part of PSAR and FSAR.

Separate probabilistic safety analyses (PSA) are also subject to approval by the regulatory authority. Transient and accident analyses as well as the PSA should be updated according to Article 7 of Regulation E-2. The review of these safety assessments by the regulatory authority requires independent exercise.

## **Article 15. Radiation protection**

*Each Contracting Party shall take the appropriate steps to ensure that in all operational states the radiation exposure to 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.*

Comment:

As described previously in this report, in the Republic of Croatia one law concerning radiation protection is in force: Act of 99, amended in 2003.

The regulations which were issued on the basis of this Act are listed in the comment on the Article 7. on legislative and regulatory framework in the part dealing with radiation protection.

*Regulation on the exposure limits, on the conditions of exposure for special purposes and on the intervention levels* states a system of dose limits which is based on ICRP Publication No. 60 and International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources, 1996 Edition. The exposure limits provided within this Regulation are the basis for planning and deduction of all organizational, technical, medical and other measures, which are necessary for the radiation protection of occupationally exposed persons and members of the general public. The doses to workers and members of the general public from a single radiation source or from all regulated sources, shall be restricted by a system of dose limitation which shall include justification of the practice and optimization of radiation protection.

The occupational exposure of persons operating ionizing radiation sources shall not exceed an average individual effective dose of 20 mSv per year over a consecutive five-year period, on the condition that exposure to radiation does not exceed 50 mSv in any single year. Taking into consideration the upper limits of effective dose, the equivalent dose to eye lens shall not exceed 150 mSv per year, while the skin, hands and feet shall not be exposed to radiation exceeding 500 mSv per year.

Exposure of persons who do not work with ionizing radiation sources shall not exceed 1 mSv per year. In the special circumstances, the limit for the annual effective dose for a member of the public can be 5 mSv, if the average dose does not exceed 1 mSv per year in the period of 5 consecutive years.

## **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.*

Comment:

### **1) Introduction**

Croatia has no nuclear installations on its territory, but two nuclear power plants are located in the vicinity. These are Krško NPP in Slovenia (10 km from the border) and Pakš NPP in Hungary (75 km from the border). Therefore, paragraph 3 of Article 16 is applicable.

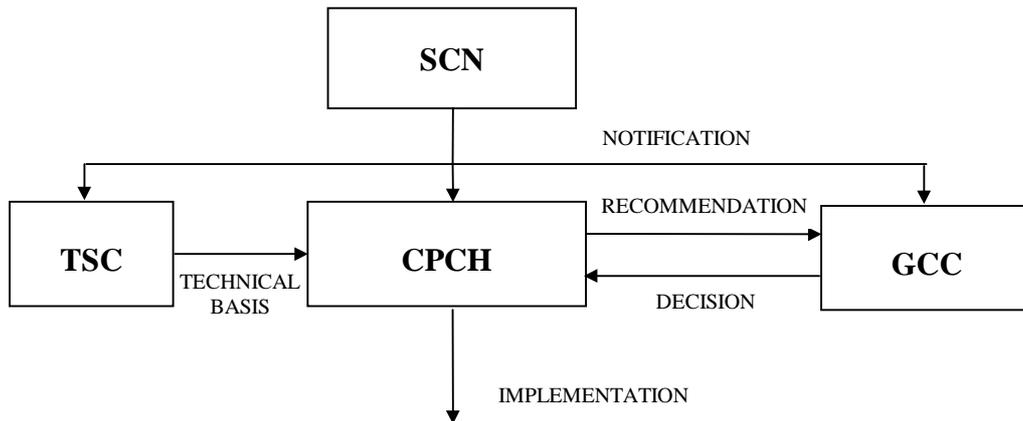
The Ministry of Economy, Labour and Entrepreneurship, Department of Nuclear Safety has therefore implemented several activities in order to improve the existing off-site emergency response plan (OERP) in the case of a nuclear accident, which was established during the early 80s.

Development and improvement of the OERP has been based on the following general requirements:

- ◆ set up the new organization structure in such a way as to introduce a Technical Support Center (TSC), as the lead technical institution in the case of a nuclear accident, with clearly defined roles, obligations and responsibilities,
- ◆ upgrade OERP so that it includes all the necessary specific elements of preparedness in the event of a nuclear accident at the Krško NPP and at the Pakš NPP,
- ◆ adapt OERP to the existing structure and level of the organization of Civil Protection, but also define additional requirements which Civil Protection should meet,
- ◆ make a plan and operational procedures that will, to the greatest possible extent, be compatible with the plans and procedures in Slovenia and Hungary.

### **2) Organization Structure**

The organization structure (Figure 1) based on the introduction of the TSC, recognizes the four major participants in the new OERP. These are: State Center for Notification (SCN), Technical Support Center (TSC), Civil Protection Crisis Headquarters (CPCH) and Governmental Crisis Center (GCC).



**Figure 1 - Organization Structure**

#### State Center for Notification

The major obligation of the SCN as the national contact point is to collect the first information about the nuclear accident and immediately inform and summon the members of TSC, CPCH and GCC according to a certain procedure. Also, during the accident, the SCN is obliged to pass on, in the same way, all the relevant information and data which have in the meantime been submitted by the different parties involved.

#### Technical Support Center (Art. 19-21 of the Act of 2003)

TSC as an important element in the structure deserves a more detailed explanation. Its responsibility includes collecting data and information on the nuclear accident, analyzing the data, estimating the possible consequences and preparing technical basis for decisions on protective actions to be taken. In order to satisfy these obligations TSC is organized into the following three expert groups:

- ◆ expert group for environmental monitoring (National early warning system with the center in Zagreb, collector stations, thermoluminescent dosimeters measuring stations, Central Laboratory in Zagreb, mobile units, monitoring and weather forecasts),
- ◆ expert group for analysis of emergency and estimate of consequences, and
- ◆ expert group for preparation of technical basis.

For now, TSC is located in the Ministry of Economy, Labour and Entrepreneurship. It is equipped with the automatic monitoring system for early notification, which is one of the most important links in the chain of requirements for the sound functioning of the TSC. Data from this system are daily sent to the neighboring Slovenia and Hungary, according to the bilateral agreements.

Operation of the TSC requires a number of documents which are defining in detail the obligations and responsibilities of the TSC as a whole and of the teams it is comprised of. The manual and operational procedures for the members of the TSC are developed in accordance with the IAEA document TECDOC-955. The basic philosophy introduced within these

documents is based on the idea to keep the process simple and effective. This approach allows data to be collected and evaluated quickly, and recommendations for decisions on protective measures to be made promptly.

The TSC is comprised of 7 experts including a manager. All staff members have alternates, meaning that 14 experts are engaged, who, besides their regular duties and jobs in their respective institutions, are trained to work in the TSC. Outside expert support is assured especially from the Faculty of Electrical Engineering and Computing (for sophisticated computer programs), Institute Ruđer Bošković (for laboratory work), Institute for Medical Research and Occupational Health (for mobile measuring unit) and Meteorological and Hydrological Service of Croatia (for meteorological evaluation).

#### Civil Protection Crisis Headquarters

The role of the CPCH is to recommend the protective actions which should be implemented, based on the information provided by the TSC and on its own emergency response plans. CPCH is responsible for the protective actions implementation as well. In respect to protective action implementation, the CPCH has at its disposal personnel and equipment from local Civil Protection organizations, police, special brigades and other resources which are commonly engaged in the case of any kind of natural disasters. Within its scope of activities, the CPCH is also responsible to inform the general public about the accident by keeping links with the television, radio, newspapers, teletext, internet, and to organize press conferences as well.

#### Governmental Crisis Center

The structure of the GCC is taken from the Act on Protection from Natural Disasters (Official Gazette 73/97). According to this Law, if a natural disaster affects two or more counties the GCC must be convened. In Croatia's case it is very likely that a nuclear accident may affect two or more counties, therefore the convening of the GCC is obligatory. When it is convened the responsibility of the GCC is to make decisions on the protective actions which must be implemented, based on the recommendations provided by the CPCH.

### **3) 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 Croatian territory is within the UPZ and the LPZ with regard to the Krško NPP. The Krško NPP is located 10 km northwest of the Slovenian-Croatian border on the left bank of the Sava river. The UPZ of Croatian territory covers a 550 km<sup>2</sup> area and it has about 66.000 inhabitants, so that the average population density is quite high (120 inhabitants/km<sup>2</sup>). The LPZ includes big population centers such as Zagreb, Karlovac, etc.

The eastern part of Croatian territory is within the LPZ with regard to the Pakš NPP. The Pakš 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, which is a well-known corn-producing region and agriculturally one of the most outstanding parts of Croatia.

Based on the way the Emergency Planning Zones are defined, the national OERP in Croatia, according to IAEA document TECDOC-953 (July 1997), belongs to Emergency Planning Category I, which is the most demanding category. Actually, in this case it means that the national OERP should be developed in the same manner as it is developed in the countries which have nuclear facilities on their territory.

#### **4) Emergency Classification**

Emergency classification is based on an assessment of plant conditions, and according to IAEA document TECDOC-955, three possible levels of emergency are defined. These are:

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

The Croatian OERP 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 SCN (national contact point for this purpose), immediately after an alert is declared in their NPPs. Only this approach will save time to start nuclear emergency response system properly. This point will be especially underlined from the Croatian side during meetings on bilateral agreements between parties in the field.

Regarding notification of emergency events from neighboring Krško NPP (10 km from Croatian border), we still have the problem of prompt sending of the information (within 15 minutes) to Croatian State Center for Notification. In national emergency plan of Slovenia time for sending the information to Croatia is allowed to be up to 90 minutes, and in the last joined exercise, it was done after 300 minutes. The National Competent Authority of Slovenia is informed about the problem and we expect them to help solving this problem as soon as possible.

#### **5) Intervention Levels**

The Croatian approach related to the Generic Intervention Levels (GILs), Generic Action Levels (GALs) and Operational Intervention Levels (OILs) presently is as follows:

- ◆ Adoption of GILs and GALs values recommended by IAEA (BSS, 1996), incorporated in the *Regulation on the exposure limits, on the conditions of exposure for special purposes and on the intervention levels*,
- ◆ Adoption of OILs default values recommended by IAEA (TECDOC-955), and
- ◆ Updated values during an accident will be calculated in accordance with IAEA recommendations (TECDOC-955 by using procedures F1-F5).

It is clear that ILs, ALs and OILs should be developed into the values country specific. Among others, these values depend upon the UPZ and LPZ

definitions, land shapes, roads, vicinity of settlements and towns, economic conditions in the area, etc. In order to establish specific national and local values for ILs, ALs and OILs as well, a separate project on a longer-term basis will be implemented.

## 6) 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 educating 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 OERP is based on the assumptions that all of the mentioned protective measures are supposed to be implemented within the UPZ area, whereas 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 class declared. The emergency class which will be declared in Croatia depends on our own projection about further accident development (this is what the TSC is responsible for), but also on the emergency class declared in the neighboring countries, particularly in Slovenia and Hungary. The following table explains interface between the emergency class declared in a neighboring country, the emergency class in Croatia (1-3) and the actions to be taken associated with the protective measures which should be implemented according to the Croatian OERP.

**Table 1 - Interface between emergency class and actions to be taken**

<b>NEIGHBORING NPP COUNTRY</b>	<b>CROATIA</b>	<b>ACTIONS TO BE TAKEN</b>
<b>ALERT</b>	<b>Emergency class 1</b>	◆ Summon members of the TSC
<b>SITE AREA EMERGENCY</b>	<b>Emergency class 2</b>	◆ Convene members of the CPCH and GCC ◆ Possible PM implementation
<b>GENERAL EMERGENCY</b>	<b>Emergency class 3</b>	◆ UM and LM implementation

For example, criterion for the iodine pills consumption is based on Operation Intervention Level default value (OIL2 value), which is calculated on the basis of ambient dose rate in the plume. According to the TECDOC-955, if OIL2 is equal to 0.1 mSv/h, consumption of iodine pills should be recommended as the protective measure in emergency planning zones. Part of the Croatian off-site emergency response plan which deals with responsibilities regarding the iodine pills keeping and distribution is not developed in all details yet. It is predicted that the Ministry of Health and

Social Welfare will be in charge of keeping iodine pills within medical institutions and Civil Protection will be in charge of distributing them.

Improvement of the protective measures implementation plans for the previously defined emergency planning zones is within the responsibility of the CPCH as the national co-ordinator in the field, Ministry of Internal Affairs, Ministry of Health and Social Welfare, Ministry of Agriculture, Ministry of Defense and other supporting institutions. The Ministry of Economy, Labour and Entrepreneurship will be involved in this activity as well.

## **7) Public Information**

As is previously mentioned, the Croatian OERP anticipates public relations. 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 nuclear emergency response system in Croatia and potential counter measures which should be taken in case of nuclear emergency. Nevertheless, an assessment, which has been made by the Ministry of Economy, Labour and Entrepreneurship shows that the public knowledge on this issue is not on satisfactory level. This is the reason why the Ministry of Economy, Labour and Entrepreneurship and Civil Protection decided to initiate mutually a specific program on public education. The main idea is to organize publicly oriented seminars in towns and villages located in the UPZ and LPZ. The training activities for general public should follow public education program.

According to the Croatian OERP, the CPCH is responsible for providing information to the public about the accident and for recommending activities which should be taken.

For general public information, Ministry of Economy, Labour and Entrepreneurship initiated establishment of web page 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.mingo.hr/tpc](http://www.mingo.hr/tpc)).

## **8) Workshops and Exercises**

There are three kinds of national workshops which should be organized every year. The main objective of the first workshop is to introduce experts involved in the OERP and a wide range of others (including the media), to the organization structure, the purpose of the TSC and to elaborate further potential improvements. This type of workshop or seminar will be organized at the beginning of every year with the main idea being to introduce as many different participants as possible to the OERP.

The National Workshop on Nuclear Emergency Response, as a second workshop, should be organized by the Department of Nuclear Safety. Participants will be the members of the Technical Support Center (7 experts and their replacements) and additional experts from the Ministry of Health and Social Welfare, Civil Protection and other supporting institutions. The workshop program will be focused on introduction, understanding and

application of IAEA document TECDOC-955 procedures and tabletop exercises. So, the main workshop objective is to train the TSC staff.

The third workshop should be on the implementation of protective measures. The target groups will be from the Civil Protection structure and supporting institutions. The workshop program is not yet developed in detail.

Regarding the exercises, they should be organized periodically. In the first stage the exercises should be designed in such a way as to train the SCN, TSC and CPCH staff, their communication and co-ordination. Exercises related to the implementation of particular protective measures would be more appropriate to organize in the next stage of OERP validation. It is noted that participation in international exercises is very important and highly recommended. Joint exercises of Croatia with Slovenia and other countries are currently based on the initiatives supported by the International Atomic Energy Agency and other international organizations.

### **Article 17. Siting**

*Each Contracting Party shall take the appropriate steps to ensure that appropriate procedures are established and implemented:*

- (i) for evaluating all relevant site-related factors likely to affect the safety of a nuclear installation for its projected lifetime;*
- (ii) for evaluating the likely safety impact of a proposed nuclear installation on individuals, society and the environment;*
- (iii) for re-evaluating, as necessary, all relevant factors referred to in subparagraphs (i) and (ii) so as to ensure the continued safety acceptability of the nuclear installation;*
- (iv) for consulting Contracting Parties in the vicinity of a proposed nuclear installation, insofar as they are likely to be affected by that installation and, upon request providing the necessary information to such Contracting Parties, in order to enable them to evaluate and make their own assessment of the likely safety impact on their own territory of the nuclear installation.*

Comment:

As per Article 8 of the Act of 2003, in the process of determining the siting, planning, construction, operation and decommissioning of a facility in which a nuclear activity is to be performed, the conditions for nuclear safety and protection set forth in this Act and in conventions and other international agreements ratified by the Republic of Croatia, as well as international recommendations and standards in the area of nuclear safety, must be met.

As per Article 9 of the Act of 2003, the state administration body with jurisdiction over nuclear safety shall establish special conditions for nuclear safety and protection during the procedure for issuing siting permits, building permits, and permits for decommissioning facilities in which a nuclear activity is performed.

During 1991 Croatian government issued guidelines for site selection for thermal and nuclear power plants as well as for repository of radioactive waste. The guidelines specified criteria for the site selection (such as lithology, tectonics, seismicity, hydrogeology, geomorphology, demography criteria

etc.), and the site selection procedure, which consists of two stages: the first stage (site survey stage), terminating with inclusion of candidate sites into the Land use plan of Croatia, and the second stage (site evaluation stage), aiming to define the final sites through field investigations and other necessary activities. In April 1996 the first stage of site selection process has been done and a few sites for nuclear power plants have been proposed for inclusion into Land use plan of Croatia. The new Land use plan of Croatia issued in 1999 does not contain any proposed site for nuclear installations.

The local authorities as well as the public are supposed to be involved in the process of issuing the site as well as construction license. The obligations of the regulatory body and potential owner of the facility is to make available complete applications (especially Environmental Impact Assessment) for both permits and to organize appropriate public debate. Objections and suggestions made by the local authorities and public have to be considered with respect and used as a basis in related decision making process.

### **Article 18. Design and construction**

*Each Contracting Party shall take the appropriate steps to ensure that:*

- (i) the design and construction of a nuclear installation provides for several reliable levels and methods of protection (defense in depth) against the release of radioactive materials, with a view to preventing the occurrence of accidents and to mitigating their radiological consequences should they occur;*
- (ii) the technologies incorporated in the design and construction of a nuclear installation are proven by experience or qualified by testing or analysis;*
- (iii) the design of a nuclear installation allows for reliable, stable and easily manageable operation, with specific consideration of human factors and the man-machine interface.*

Comment:

Croatia did not developed specific standards and regulations for the design and construction of nuclear installations. The Act of 2003 (Article 22) requires that for the purpose of implementing measures for nuclear safety and protection, the state administration body with jurisdiction over nuclear safety shall issue instructions for implementing international recommendations and standards in the area of nuclear safety and protection. A building permit for the construction of a facility in which a nuclear activity is to be performed or a permit for decommissioning this facility cannot be issued without confirmation from the state administration body with jurisdiction over nuclear safety that the principal project or preliminary design is in accordance with the special conditions under Article 9 and with the provisions of Article 8 of this Act.

### **Article 19. Operation**

*Each Contracting Party shall take the appropriate steps to ensure that:*

- (i) the initial authorization to operate a nuclear installation is based upon an appropriate safety analysis and a commissioning program demonstrating*

- that the installation, as constructed, is consistent with design and safety requirements;*
- (ii) operational limits and conditions derived from the safety analysis, tests and operational experience are defined and revised as necessary for identifying safe boundaries for operation;*
  - (iii) operation, maintenance, inspection and testing of a nuclear installation are conducted in accordance with approved procedures;*
  - (iv) procedures are established for responding to anticipated operational occurrences and to accidents;*
  - (v) necessary engineering and technical support in all safety-related fields is available throughout the lifetime of a nuclear installation;*
  - (vi) incidents significant to safety are reported in a timely manner by the holder of the relevant license to the regulatory body;*
  - (vii) programs to collect and analyze operating experience are established, the results obtained and the conclusions drawn are acted upon and that existing mechanisms are used to share important experience with international bodies and with other operating organizations and regulatory bodies;*
  - (viii) the generation of radioactive waste resulting from the operation of a nuclear installation is kept to the minimum practicable for the process concerned, both in activity and in volume, and any necessary treatment and storage of spent fuel and waste directly related to the operation and on the same site as that of the nuclear installation take into consideration conditioning and disposal.*

Comment:

As per Article 8 of the Act of 2003, in the process of determining the siting, planning, construction, operation and decommissioning of a facility in which a nuclear activity is to be performed, the conditions for nuclear safety and protection set forth in this Act and in conventions and other international agreements ratified by the Republic of Croatia, as well as international recommendations and standards in the area of nuclear safety, must be met.

In accordance with Regulation E-1, and Regulation E-2 PSAR and FSAR have to be submitted to the Regulatory Body when applying for constructing and operating licenses. In the same documents the requirements for the commissioning program as well as for testing and operating procedures are defined.

Regulation E-1 in Art. 29 defines the steps of the commissioning: fuel load, first criticality, synchronization, testing on different power, full power testing.

In accordance with Art. 34 of Regulation E-1, the technical specifications have to be submitted to regulatory body as a part of the application for test operation and for start-up and normal operation.

In Art. 35 of Regulation E-1 and in Appendix 1 of Regulation E-2, the content of technical specification is defined.

Regulation E-1, Art. 43, states that the Operating License includes the limiting conditions for operation.

In Art. 7 of Regulation E-2, the procedure for change or modification of SAR is described and defines the three categories of SAR change.

In accordance with Art. 16 of Regulation E-2 and Art. 34 of Regulation E-1, the other documentation necessary for nuclear safety assessment is defined and part of that documentation are the operating procedures.

In accordance with Art. 37 of Regulation E-1, the nuclear facility has to be operated in accordance to this Regulation and to procedures related to plant operation. In Art. 38 of Regulation E-1, the types of procedures are defined.

In accordance with Art. 38 of Regulation E-1, the nuclear facility has to prepare procedures for all operational and accidental modes.

In accordance with Art. 36 of Regulation E-1, the operator of a nuclear facility has to continuously follow and analyze the safety status of the nuclear facility.

In Regulation Z-3, the waste categories are defined, giving for each category the description and main characteristics with respect to the safety of waste disposal.