



NATIONAL REPORT OF UKRAINE
ON
COMPLIANCE WITH THE OBLIGATIONS OF THE
CONVENTION ON NUCLEAR SAFETY

KYIV 2010

FOREWORD

On 20 September 1994 Ukraine had signed Convention on Nuclear Safety and put it into effect by the Law of Ukraine "On Ratification of the Convention on Nuclear Safety" on 17 December 1997.

Ukraine took an active part in reviewing National Reports of the Contracting Parties, exchanging of written questions and comments as well as in participating in discussions during four Review Meetings.

This Fifth National Report has been developed in full compliance with the requirements of the Convention on Nuclear Safety, "Guidelines Regarding National Reports under the Convention on Nuclear Safety" (International Atomic Energy Agency, Information circular, INFCIRC/572/Rev.3, 28 September 2009), and also taking into consideration the recommendations of the Summary Report of the Forth Review Meeting of the Contracting Parties (CNS-RM-2005/08), the Report of the IAEA Secretariat for the Fifth Review Meeting dated 15 September 2009 and the "Synopsis of the Relevant IAEA Requirement Statements Reflecting the Issues Addressed by Articles 6 to 19 of the Convention on Nuclear Safety" (hereinafter referred to as "Synopsis").

By submitting this National Report, Ukraine completely fulfils its obligations as set forth in Article 20 of the Convention on Nuclear Safety.

This Report like the previous ones, is the result of the joint efforts of the Ukrainian state authorities in charge of implementing the national policy in the field of nuclear energy use, and the state enterprises (the Operators), namely:

- The State Enterprise National Nuclear Energy Generating Company 'Energoatom' (SE NNEGC "Energoatom");
- The State Specialized Enterprise "Chornobyl Nuclear Power Plant" (SSE "Chornobyl NPP").

This Report is based upon the legislative and regulatory documents in force in Ukraine and official reports of the central executive bodies, which implement the national policy in the field of nuclear energy use.

The main purpose of this Report is providing objective and unbiased information on the safety of nuclear installations and on measures undertaken to enhance its level and to protect the public and the environment of Ukraine, as well as highlighting changes and progress in the development of legislative and regulatory framework, and in the nuclear energy branch of Ukraine over the last three years.

Based on the materials presented in this National Report and according to the authorities entrusted by the Cabinet of Ministers of Ukraine, the Chairperson of the SNRCU (SNRCU) declares:

The established priority of human safety and environmental protection is maintained in the field of nuclear energy use in Ukraine.

In this context, *Ukraine completely fulfils its obligations in accordance with the requirements of the Convention on Nuclear Safety as confirmed by:*

- Determination and development of the legislative and regulatory framework of safety assurance in the field of nuclear energy use;
- Availability of the duly authorized state regulatory body for nuclear and radiation safety, which establishes safety criteria and requirements, develops and approves codes, regulations and standards on nuclear and radiation safety, and performs licensing and state supervision independently of licensees and other state authorities;
- Independence of the state nuclear and radiation safety regulatory authority from any governmental bodies, institutions and officials, whose activities are related to nuclear energy use, by the independence from the local authorities and self-administrations, associations of citizens;
- Performance of comprehensive safety assessments of existing nuclear installations and by taking measures to improve safety level;
- Development of the emergency preparedness and response system;
- Entrustment of the licensee with full responsibility for ensuring the safety, and taking measures to protect the human and the environment;
- Development of safety culture and implementation of the safety self-assessment practice.

Actual data provided in this Report, except for those stipulated specially, are given as of August 2010. The changes that may take place till April 2011 will be reported in addition by the delegation of Ukraine at the Fifth Review Meeting.

Conclusions on implementing the obligations set forth by an appropriate article of the Convention are italicized hereinafter in the text.

Kyiv, September 2010

Olena Mykolaichuk
Chairperson
State Nuclear Regulatory Committee of Ukraine

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INTRODUCTION

Nuclear power remains the most important component of the fuel and energy branch in Ukraine.

As of 2010 there are 15 power units with water-cooled water-moderated reactors in operation at four nuclear power plants in Ukraine. Three power units of SSE "Chornobyl NPP" are being decommissioned. The Shelter Object of this NPP is in the process of its transformation into an environmentally safe system. A list of nuclear power units and their main characteristics are provided in Annex 1.

The installed capacity of running nuclear power units is 13 835 MW. Ukraine is ranked the eighth in the world and the fifth in Europe in terms of its installed nuclear capacity.

Based on the data for 2009, the nuclear power plants produced 47.9% of the total amount of electricity produced in Ukraine (in 2008 – 46.8%, in 2007 – 47.4%).

Over the last three years, implementation of safety enhancement measures, improvements of repairs and maintenance quality, replacements of equipment, training and advanced training have resulted in more stable operation of nuclear power plants, the number of operating events has decreased.

In order to define the areas of nuclear and energy branch development in future, Ukraine is taking part in the International project on innovative nuclear power reactors and fuel cycles (INPRO). Under the INPRO project, in 2008 Ukraine completed national studies on the assessment of alternative configurations of innovative nuclear power systems for the period till 2030 following the Energy Strategy and has submitted a report to the IAEA. National studies were carried out covering the following areas: safety, infrastructure, radwaste management, environment, economics and non-proliferation. Also, in 2007 Ukraine joined the project "Global Architecture of Innovative Nuclear Systems based on Thermal and Fast Reactors Including a Closed Fuel Cycle" (GAINS).

Under nuclear renaissance conditions and taking into account the fact that Ukraine has a plan to further develop nuclear power industry, special attention should be paid to positive conclusions of the comprehensive safety evaluation of Ukrainian NPPs made on the basis of implementation of the Joint Project EC-IAEA-Ukraine, which was launched under the "Memorandum of Understanding between Ukraine and the EC on Cooperation in the Field of Energy". The comprehensive safety review was conducted in the following areas: design safety, operational safety, radwaste management and decommissioning, regulatory issues. The main conclusions of the comprehensive evaluation of Ukrainian NPPs are as follows:

- at present, power units of Ukrainian NPPs fully complies with international requirements and standards on nuclear safety;
- no non-compliances with the IAEA standards were revealed at any of NPPs;
- work conducted under the Joint Project has not any analogues.
- such large-scale and comprehensive safety assessment of NPPs is unique in terms of the scope of the work conducted by Ukrainian and international experts at each

- power unit of the Ukrainian NPPs;
- such full-scale and comprehensive safety assessment of NPPs is unique in terms of the scope of the work conducted both

Currently, Ukraine makes a significant effort to resolve the country's topical issues:

- safety enhancement of nuclear power plants in operation;
- operating lifetime extension on the basis of safety re-assessment, determination of residual lifetime and implementation of measures on safety improvement; ageing management of safety important systems and equipment;
- spent nuclear fuel management;
- decommissioning of the three power units of SSE "Chornobyl NPP" and transformation of the Shelter Object into an ecologically safe system .

Safety enhancement of the nuclear power units in operation is one of the main tasks of the national policy in the sphere of nuclear energy use. During the reporting period safety enhancement measures have been implemented following the outcomes of the comprehensive analysis of the existing safety issues, which were identified and categorized in accordance with the IAEA recommendations, taking account of operating experience of Ukrainian and similar foreign nuclear power plants, and according to the established priorities.

Safety improvement measures are implemented in accordance with “The Concept of Safety Enhancement of NPPs in Operation” approved by the Cabinet of Ministers of Ukraine (CMU) in December 2005 and expected to be completed in 2010.

Several Ukrainian nuclear power units are approaching to the end of their designed operating lifetime. Taking into account the positive international experience in NPP lifetime extension, Ukraine undertakes measures according to "The Comprehensive Program on Lifetime Extension of NPPs in Operation" approved by the Cabinet of Ministers' resolution in April 2004. This program specifies necessary actions, prioritizes activities, provides estimates of the resources required for its implementation, and, in particular, scopes, sequence and time frames for implementing measures, which are needed to ensure NPP operation beyond the designed operating lifetime, sources of funding, and responsibilities of central executive authorities and other organizations concerned.

To elaborate a feasibility study for investments and design of Khmelnytsky NPP – 3,4, the CMU gave its approval for application of technical characteristics of WWER-1000/V-392 Reactor Facility. On June 9, 2010 the CMU and the Russian Federation Government entered into an agreement on cooperation in the construction of Khmelnytsky NPP Units 3 and 4.

In an area of spent nuclear fuel management an activity related to construction of spent nuclear fuel storage facilities and development of scientific & technical and R&D support in the spent fuel management is in progress.

At present, a wet spent nuclear fuel storage facility is operated at the SSE "Chornobyl NPP", a dry spent nuclear fuel storage facility is operated at Zaporizhzhya NPP,. Moreover, a dry spent fuel storage facility is under construction at the Chornobyl NPP site.

The NNEGC "Energoatom" proceeds with preparatory activities aimed at constructing a central dry storage facility for spent nuclear fuel from Rivne, Khmelnytsky and South Ukraine NPPs. Under the Law of Ukraine "On Decision-Making Procedure for Siting, Design and Construction of Nuclear Installations and Radwaste Management Facilities of National Importance", NNEGC "Energoatom" developed and CMU approved a feasibility study for investments in the construction of a central storage facility for spent nuclear fuel from domestic WWER plants.

For implementing the national policy in an area of radwaste management, the Verkhovna Rada of Ukraine approved the Purpose-oriented National Ecological Program on Radioactive Waste Management on September 17, 2008.

Chornobyl NPP Units 1 to 3 are at the final closure stage, Chornobyl NPP Unit 4 destroyed by the accident in April, 1986 has a status of the Shelter Object.

When ratifying the Convention on Nuclear Safety in 1997, the Verkhovna Rada made a statement warning that provisions of Convention Article 3 should not apply to the Shelter Object. However, general information on activities carried out at Chornobyl NPP Units 1 to 3 and the Shelter Object is provided in Annexes 5, 6 to this Report.

Ukraine submitted detailed information on Chornobyl NPP and the Shelter Object to the Third Review Meeting on the "Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management". The information was provided in Ukraine's National Report "On Compliance with Obligations of Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste".

PART I. BASIC CONCLUSIONS ON RESULTS OF THE FORTH REVIEW MEETING

Among the major issues, which were identified in the previous National Report of Ukraine, requiring further investigation, this Report covers the following:

- updating the system of norms and standards on nuclear and radiation safety (see Part III, it. 3.1.1);
- implementing activities related to continual training of the Nuclear and Radiation Safety Regulatory Authority's staff (see Part IV, it. 4.1.1);
- proceeding with activities related to NPP units safety improvement (see Part II, it. 2.1);
- updating Safety Analysis Reports to take into account the activities already implemented (see Part 2, it. 2.1; Part 5, it. 5.5.1);
- building an interim central storage facility for spent nuclear fuel of WWER plants (see Part 6, it. 6.1.4);
- proceeding with an in-depth safety analysis of NPPs (see Part 5, it. 5.5.1).

In addition, this Report provides information on the international comprehensive safety evaluation of Ukrainian NPPs, which was conducted in 2008-2009 covering the following areas: design safety, operational safety, radwaste management and decommissioning, regulatory issues (see Part IV, it. 4.1; Part V, it. 5.5).

This Report also takes into consideration the recommendations of the Forth Review Meeting of the Contracting Parties with regard to the further provision of the information on the issues of interest for all Parties to "The Convention on Nuclear Safety" taking into account the Report of the IAEA Secretariat to the Contracting Parties of the Convention on Nuclear Safety, "Synopsis of the Relevant IAEA Requirement Statements Reflecting the Issues Addressed by Articles 6 to 19 of the Convention on Nuclear Safety" (the "Synopsis").

This Report does not provide any information on the Synopsis-related matters, which was included in the previous Reports that Ukraine submitted to the attention of the Parties.

PART II. GENERAL PROVISIONS

2.1. Existing nuclear installations (Convention Article 6)

Each Contracting Party should 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 should 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 practically 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.

After shutdown of Chornobyl NPP, Ukraine now operates only WWER-type nuclear power plants.

The overwhelming majority of reactor installations in operation in Ukraine are WWER-1000 (V-320 design). Nowadays, there are 11 installations of this type in operation.

Besides, there are two power units with WWER-440 (V-213) at Rivne NPP, and one WWER-1000 Unit (V-338) and one WWER-1000 Unit (V-302) at South Ukraine NPP (a list of the nuclear installations is given in Annex 1).

SE NNEGC "Energoatom" as an operator, performed significant scope of work on NPP safety analysis which was carried out in the framework of the Safety Analysis Reports (hereinafter - SAR). SAR was completed for the following pilot units: ZNPP-5, RNPP-1, SUNPP-1, and for KhNPP-2 and RNPP-4. Adaptation of SAR for not-pilot Units is being finalized (more information is provided in it. 5.5 of this Report). The state-of-the-art safety analysis methods: probabilistic and deterministic methods were applied when developing the safety analysis report. The scope of SAR covered:

- probabilistic safety analysis (PSA);
- design basis accidents analysis (DBA)
- beyond design basis accidents analysis (BDBA).

Based on the results of probabilistic safety assessments and the results of deterministic analysis, safety improvement measures were developed and then implemented in the frames of the safety improvement programs.

SAR review and assessment performed by SNRCU allowed making the following statements:

- power units are operated safely at an acceptable level of risk. The provided materials prove that the requirements for safety assurance of the reactor installations, which are imposed by the design, scientific and technical documentation and international practice, are fully met.
- revealed safety deficiencies and deviations from the norms' and standards' requirements allow to operate power units within design limits and do not require power units to be shut down for eliminating these deficiencies and deviations.
- planned safety improvements, when implemented, will result in lower values of basic safety criteria for core damage frequency (CDF) and emergency emission limit frequency (EELF).

Positive findings of SAR concerning the safety level of Ukrainian NPPs are consistent with the conclusions drawn by experts of international review missions on Ukrainian NPP safety evaluation.

For PSA to take account of the safety improvement measures so that PSA can actually correspond to the current status of nuclear power units, the Operator has started works on implementation of living PSA.

Safety improvement measures are carried out in accordance with the "Concept of Safety Improvement of NPP Units in Operation" approved by the Cabinet of Ministers of Ukraine under Resolution No. 515-r dated December 13, 2005; the Program on Post-commissioning Modernization of Unit 2 of Khmelnytsky NPP and Unit 4 of Rivne NPP along with several programs consolidated in the so-called Consolidated Program on the Safety Improvement of Ukrainian NPPs Units (Upgrade Package).

Implementing the safety improvement measures is a compulsory condition of continued operation of NPP Units, that is also considered one of the important strategic areas of the power industry of Ukraine. Nowadays, all the activities under the Program on Post-commissioning Modernization of Khmelnytsky NPP Unit 2 and Rivne NPP Unit 4 are being implemented. All measures envisaged by this Concept have been entirely completed concept at Rivne NPP Units 1 and 2.

Under the Memorandum of Understanding signed between the Government of Ukraine, Governments of "Great Seven" Countries and European Community Commission concerning the closure of Chernobyl NPP, safety improvements of Khmelnytsky NPP Unit 2 and Rivne NPP Unit 4 were implemented in line with individual Programs on Modernization, being financed out of the proceeds of international credits provided by EBRD/Euratom. Before putting KhNPP-2 and RNPP-4 into operation ("pre-start-up") 77 and 78 measures were implemented at KhNPP and RNPP, respectively.

After putting KhNPP-2 and RNPP-4 into operation, 80 and 81 measures were expected to be implemented at KhNPP and RNPP, respectively. Pursuant to the Law of Ukraine "On the Ratification of the Guarantee Agreement signed between Ukraine and the European Atomic Energy Community" (Ref. No. 2818-IV dated 07.09.2005), during the reporting period all measures envisaged by the "Program on Modernization" were entirely completed at both power units. In the framework of TACIS projects RISKAUDIT's experts assessed the status and completeness of Kh-2/R-4 upgrades implementation.

In 2010 SNRCU in cooperation with RISKAUDIT's experts conducted inspection surveys of Rivne NPP Unit 4 of and Khmelnytsky NPP Unit 2 to assess the level of completeness of implementation of all Modernization Program measures. Based on this assessment conclusion, the experts of RISKAUDIT confirmed that the Modernization Program measures were entirely completed at KhNPP-2 and RNPP-4.

For further safety improvements taking account of the experience acquired in implementing Modernization Program measures at KhNPP-2/RNPP-4, and following the Concept of Safety Improvement, an analysis was conducted and became a basis for including the measures of "Program on Modernization ..." and the Safety Improvement Concept, which,

for some sound reasons, were not fully implemented, have been included in the Upgrade Package. The Upgrade Package underwent the state expert examination of nuclear and radiation safety as well as the RISKAUDIT experts' assessment. The Upgrade Package Implementation is expected to start from the beginning of 2011.

Estimated values of the quantitative safety criteria based on the results of probabilistic safety analysis for the current and predicted state of pilot power units after implementation of safety improvement measures are specified in section 4.5.1 of the report.

Taking into account the potential for beyond designed life-term operation of NPP Units, a special attention is paid to their lifetime management measures. The most important tasks of lifetime management are associated with buildings, structures and equipment, replacement of which is impossible or extremely expensive. Among them, the major task is to ensure the lifetime of the reactor pressure vessels (RPV). Therefore, during the operation the following items are continuously monitored:

- Physical and mechanical properties of RPV materials - by periodically inspecting and testing surveillance specimens.
- Accumulation of fast neutron fluence to the RPV wall materials in front of the reactor core - by using computational and experimental methods;
- Impact of operating factors on the flaw occurrence rate in the most stressed areas of RPV - by conducting periodic (once in 4 years) non-destructive examination (NDE) of base metal, welds and corrosion-resisting cladding.

Based on the monitoring results, the predictive evaluation of RPV safe operation throughout their designed lifetime is carried out. Computations are made to substantiate the integrity and brittle fracture resistance with taking account of NDE results, testing results of surveillance specimens, fast neutron fluence accumulated by a RPV wall, as well as the IAEA recommendations on the thermal shock analysis for different accident situations. At present, the Experimental Design Bureau "Hydropress" (the Russian Federation) as Chief Designer has performed design substantiation of RPV brittle strength for Khmelnytsky NPP Unit 1. Having performed a similar work for RPVs of Khmelnytsky NPP-2 and Rivne NPP-4, now EDB "Hydropress" is implementing it for South Ukraine NPP-2. While making preparations for designed lifetime extension, the Nuclear Research Institute (Czech Republic) carries out works to assess the technical condition of the reactor of South-Ukrainian NPP Unit 1. Following the safety culture principles and taking into account certain design deficiencies of the surveillance specimens program for WWER-1000 RPVs, the Czech Nuclear Research Institute (Rez) contracted by the Ukrainian operator, is carrying out research and analysis of testing results of surveillance specimens, which were made of materials of Ukrainian RPVs of Khmelnytsky NPP-2, Rivne NPP-3,4 and Zaporizhzhya NPP-6, and then placed and irradiated in front of the reactor core at Temelin NPP. This will allow to conduct a comparative analysis and evaluate the change in properties of RPV materials depending on irradiation conditions according to the regular and "integral" programs.

Under the TACIS international regional project (TAREG) "Verification of Patterns of Radiation Embrittlement of WWER-1000 and WWER-440/213 RPVs Materials with the Purpose of the Integrity Assessment" in which foreign experts also participated, a significant scope of work was carried out to refine the fast neutron fluence accumulated by surveillance specimens during operation of Ukrainian and Russian power units.

Results obtained from such RPV monitoring, and the scheduled measures allow making reliable forecasts of their safe operation during the design lifetime, and enable the planning of beyond design lifetime extension of Ukrainian NPP RPVs.

Thus, the measures implemented by the Operator during the reporting period will assure complete implementation of the international obligations of Ukraine on safety improvements of Ukraine NPP Units in operation.

The implemented efforts inspire confidence that Ukrainian NPP units in operation can be operated safely during their designed lifetime and also allow planning activities aimed at their lifetime extension.

PART III. LEGISLATION AND REGULATION

In accordance with requirements of the Convention on Nuclear Safety, Ukraine has established and support the state nuclear and radiation safety regulatory system.

3.1. Legislative and Regulatory Framework (Convention Article 7)

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

The legislative and regulatory framework shall provide for:

3.1.1 Establishment of applicable national safety requirements and regulations.

Under Article 22 of the Law of Ukraine "On the Nuclear Power Utilization and Radiation Safety" SNRCU as an authority of the state regulation of the safety of nuclear energy utilization, establishes legislative criteria and requirements that define safety conditions for using nuclear installations and ionizing radiation sources in the state (norms setting-up). The same Law (Article 8) determines that national requirements and regulations relevant to safety are adopted taking into account the recommendations of international organizations in the field of nuclear power utilization. Procedures of development and approval of national requirements and regulations are specified by the Ukrainian Cabinet of Ministers' Resolution No.163 dated February 8, 1997 and the Directive on quality of the lawmaking activity of SNRCU.

As it was mentioned in the previous National Reports, the legislative basis and legislative and regulatory system in the field of nuclear power utilization covers all safety principles and provisions of Article 7 of the Convention on Nuclear Safety.

Under the "Memorandum of Understanding on Cooperation in the Energy Field between Ukraine and the European Union" in the frames of implementation of the joint project EC-IAEA-Ukraine on the comprehensive safety evaluation of nuclear power plants, 2008 saw a full-scale Integrated Regulatory Review Service mission (IRRS mission), which was conducted by IAEA in Ukraine. The overall conclusion of the mission is that there is an integrated legislative infrastructure established in Ukraine that regulates fulfilment of international requirements and includes all the corresponding international conventions.

During the reporting period a number of important legislative acts were developed and adopted. The list of main legislative acts applicable in the field of nuclear power utilization, which came into force during the period from 2008 to 2010 is given in Annex 2.

In particular, Law of Ukraine No. 1874-VI "On Amending the Law of Ukraine 'On Licensing Activity in the field of Nuclear Power Utilization' adopted by the Verkhovna Rada of Ukraine on February 11, 2010 became a significant milestone. This law is aimed at improving the legislative regulation of licensing activities in the field of nuclear power utilization with taking account of practice of its application, safety requirements and recommendations specified in international documents, norms of EU legislation (changes made by this Law are specified in paragraph 3.1.2 of this Report).

Adopted by the Verkhovna Rada of Ukraine, Law of Ukraine No. 1566-VI "On Amendments to the Law of Ukraine 'On the Decision Making Procedure for Siting, Designing, Construction of Nuclear Installations and Radioactive Waste Maintenance Facilities of National Importance', and Other Laws of Ukraine on Improvements in the Decision-Making Procedures" (dated June 25, 2009), determines that nuclear and radiation safety regulatory authorities make a decision on the lifetime extension of existing nuclear installations and radioactive waste management facilities of national importance, relying on the conclusion of the state nuclear and radiation safety expert examination, through amending the license for operation of a nuclear installation or a radioactive waste management facility.

The Verkhovna Rada of Ukraine adopted Law of Ukraine No. 516-VI "On the Purpose-oriented National Ecological Program for Radioactive Waste Management" on September 17, 2008. The purpose-oriented national ecological program on radioactive waste (RW) management is aimed at implementing the national policy and improving management systems for radioactive waste generated at Ukrainian nuclear power plants, enterprises, institutions and organizations of non-nuclear cycle and for those resulted from the Chernobyl disaster.

Law of Ukraine No. 515 - VI "On Amendments to Some Laws of Ukraine on Radioactive Waste Management" adopted on September 17, 2008 ensures that a state fund is established in Ukraine for management of radioactive waste from Ukrainian nuclear power plants, other enterprises and organizations of Ukraine.

During the reporting period the regulatory and legal framework in the field of nuclear power utilization continuously improved taking account of the state regulatory experience and practice in the area of nuclear and radiation safety assurance in Ukraine, as well as the experience of advanced countries, and taking into consideration achievements in science and technology, international standards, including documents of the European Commission, documents and recommendations issued by the IAEA, WENRA and other international safety organizations.

During the reporting period the normative regulatory system was supplemented with important safety normative documents, which were put into force taking account of the recommendations and standards of the IAEA (INSAG-12, etc.):

- "General Provisions of Nuclear Power Plants Safety" (NP 306.2.141-2008);
- "Nuclear Safety Rules for Reactor Installations of Nuclear Power Plants with PWR" (NP 306.2.145-2008);
- "Safety Requirements for Siting of a Nuclear Power Plant" (NP 306.2.144-2008).

The list of regulatory acts applicable in the field of nuclear power utilization, which became effective during in the period from 2008 to 2010, is provided in Annex 2.

3.1.2 Nuclear Installation Licensing System and Prohibition of Nuclear Installation Operation without a License.

At the legislative level the system of licensing of activities related to nuclear installations is governed by the Law of Ukraine "On the Nuclear Power Utilization and Radiation Safety" and the Law "On Licensing Activity in the Field of Nuclear Power Utilization" throughout the stages of the life cycle of nuclear installations and was shown in previous reports.

Article 26 of the Law of Ukraine "On the Nuclear Power Utilization and Radiation Safety" prohibits legal or natural persons who have no permission (license) issued in due course, to fulfil any activity related to the use of nuclear installations and ionizing radiation sources.

In order to improve licensing activity, On February 11, 2010 the Verkhovna Rada of Ukraine adopted Law of Ukraine No. 1874-VI "On Amendments to the Law of Ukraine 'On Licensing Activity in the Field of Nuclear Power Utilization' .

The Law introduced several significant changes to the licensing of activity, namely: was excluded the licensing of Operator's activity at one of the stages of the nuclear installations life cycle, specifically, at the designing stage. However, conducting a mandatory state expert evaluation of a nuclear installation design remains particularly important. Also, the Law amended the licensing of the Operator's activity at the stages of nuclear installation construction and commissioning and provided for issuing a single licence covering all stages of the life cycle of a nuclear installation. Moreover, this Law established an additional licensing of activity of the Operator's officials who are entrusted with the following organizational and administrative functions:

- making decision on operating modes of nuclear installations or radioactive waste storage;
- making decision on implementation of emergency response plans
- making decision on implementation of modernization and modifications to the systems;
- granting the personnel a permit to directly control a reactor installation of NPP
- checking compliance with nuclear and radiation safety requirements (internal supervision).

Very important amendment to the Law of Ukraine "On Licensing Activity in the Field of Nuclear Power Utilization" is establishing penalties to be imposed on entities, which are engaged in activities in the filed of nuclear power utilization, in case of their failure to fulfil or improper fulfilment of conditions of licenses and other authorization documents and in case they conduct their activity without obtaining licenses.

Pursuant to the Law of Ukraine "On Licensing Activity in Nuclear Power Utilization" the Operators have licenses covering all necessary stages of the life cycle of their nuclear installations.

3.1.3 System of the regulatory inspection and assessment of nuclear installations to ascertain compliance with applicable regulations and licensing conditions.

Legislative principles of the system of regulatory control and assessment of nuclear installations remained unchanged over the reporting period.

Under Article 5 of the Law of Ukraine "On Nuclear Power Utilization and Radiation Safety" the supervisory activity in the field of nuclear power utilization is considered among the fundamental cornerstones of the national policy in the field of nuclear power utilization and radiation protection.

Under Articles 22, 24, 25 of the Law of Ukraine "On Nuclear Power Utilization and Radiation Safety" the state regulation of safety of nuclear power utilization provides for supervision over compliance with regulatory requirements and conditions of permits granted to organizations, enterprises and individuals deploying nuclear installations,

including enforcement measures (supervision).

Under Article 15 of the Law of Ukraine "On Licensing Activity in the Field of Nuclear Power Utilization" the nuclear safety regulatory authorities supervise over compliance with license conditions by conducting regulatory inspections and review of the nuclear and radiation safety status on the basis of reporting documents submitted by the Operator.

The state supervision-related activities of SNRCU are exercised by its field-oriented subdivisions, by the state nuclear safety inspectorates located at NPPs and the state inspectorates on nuclear and radiation safety established on an area basis in June 2006 (SNRCU territorial bodies).

3.1.4 Enforcement of applicable regulations and the licensing conditions, including suspension, modification or revocation.

Under Article 24 of the Law of Ukraine "On Nuclear Power Utilization and Radiation Safety" the state nuclear and radiation safety regulatory authority is empowered to conduct the state supervision of observance of norms, codes and standards on nuclear and radiation safety as well as licensing conditions, and it is empowered to apply, in case of violations, administrative sanctions to the staff, officials of enterprises, institutions and organizations. Article 25 of the Law determines the rights of inspectors regarding to their responsibilities and application of enforcement measures to individuals who fail to comply with applicable legislation, rules, regulations and standards on nuclear and radiation safety and licensing conditions. Article 81 of the Law determines the types of infringements for which the staff and officials of nuclear installation, sources of ionizing radiation; the staff and officials of enterprises, institutions and organizations carrying out any other activity in the field of nuclear energy utilization, as well as members of the public, are brought to the disciplinary, civil (except for civil liability for nuclear damage), criminal and administrative responsibility. Article 17¹ of the Law of Ukraine "On Licensing Activity in the Field of Nuclear Power Utilization" set penalties that may be imposed on entities engaged in activities in the field of nuclear power utilization, in case their failure to fulfil or improper fulfilment of the license conditions and other authorization documents and in case they conduct activities without obtaining licenses. The Code of Ukraine on Administrative Violations defines penalties that can be applied to officials and staff personnel who are guilty of violating the nuclear and radiation safety law.

Article 16 of the Law of Ukraine "On Licensing Activity in Nuclear Power Utilization" (as amended by the Law of Ukraine "On Amendments to the Law of Ukraine 'On Licensing Activity in the Field of Nuclear Power Utilization'" adopted by Verkhovna Rada of Ukraine on February 11, 2010) considers a violation of the license conditions as one of the reasons for suspending and cancelling the Operator's license, depending on the stage of the nuclear installation life cycle.

The State Nuclear Safety Inspectorates on NPP sites supervises the nuclear and radiation safety directly on the NPP sites.

For the reporting period:

- *development of the national nuclear legislation is in progress;*
- *Verkhovna Rada and the Government of Ukraine pay attention and take important decisions on pursuing the state policy in the field of nuclear power utilization, in*

particular, improving the safety of nuclear installations, ensuring the state safety regulation and developing the nuclear power sector of the national economy.

PART IV. REGULATORY BODY

4.1. Regulatory Body (Convention Article 8)

4.1.1. Each Contracting Party shall establish or designate a regulatory body for nuclear safety entrusted with the implementation of the legislative and regulatory framework and provided with adequate authority, competence and financial and human resources to fulfil its assigned responsibilities.

The main functions of SNRCU in the field of nuclear and radiation safety regulation are as follows:

- Establishing safety criteria, requirements and conditions for the nuclear power utilization;
- issuing permissions and licenses for activities in this field;
- exercise state supervision over observance of laws, norms, codes and standards;
- fulfilling other functions of the national nuclear and radiation safety regulatory authority set forth in the Convention on Nuclear Safety and the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management.

On December 5, 2000 SNRCU was established according to Decree No. 1303/2000 by the President of Ukraine.

Tasks, functions and powers of the Regulatory Body are set forth in the Regulation on the State Nuclear Regulatory Committee of Ukraine approved by Resolution No.1830 issued by CMU on December 27, 2006.

In accordance with this Regulation, the SNRCU was assigned other functions in addition to those mentioned above.

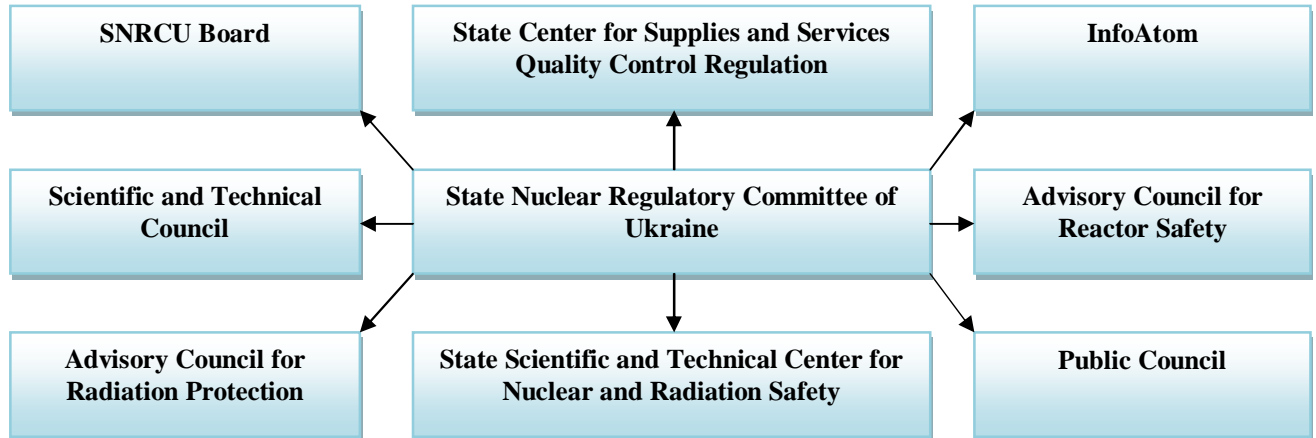
To develop recommendations on topical issues and the most essential areas of activities in the field of nuclear and radiation safety supervision, there is the SNRCU Board working on a permanent basis.

The Scientific & Technical Council, the Public Council and the Advisory Council for Radiation Protection as well as the Advisory Council for Reactor Safety established in 2008, fulfil advisory and consultative functions when SNRCU is making decisions in the area of nuclear power utilization.

There are three state scientific and technical support centres within the SNRCU system:

- the State Scientific and Technical Centre for Nuclear and Radiation Safety that provides analytical, scientific, expert, technical, engineering, information, consultative and methodological support to the State Regulatory Body;
- the State Enterprise “State Centre for Supplies and Services Quality Control Regulation” (State Quality Centre “DerzhCentrYakosti”) that provides technical support to the State Regulatory Body as well as methodological and consultative support while updating regulatory requirements for quality of equipment and services intended for nuclear power facilities;
- the State Enterprise “Information Technologies Centre for Nuclear Power Utilisation” (InfoAtom) that provides information and analytical support to the State

Regulatory Body, participates in informing the public of the nuclear and radiation safety status and takes part in designing, establishing, implementing and maintaining information networks and computer-based information data bases which refer to the nuclear and radiation safety status and are necessary for supporting the SNRCU' s activity.

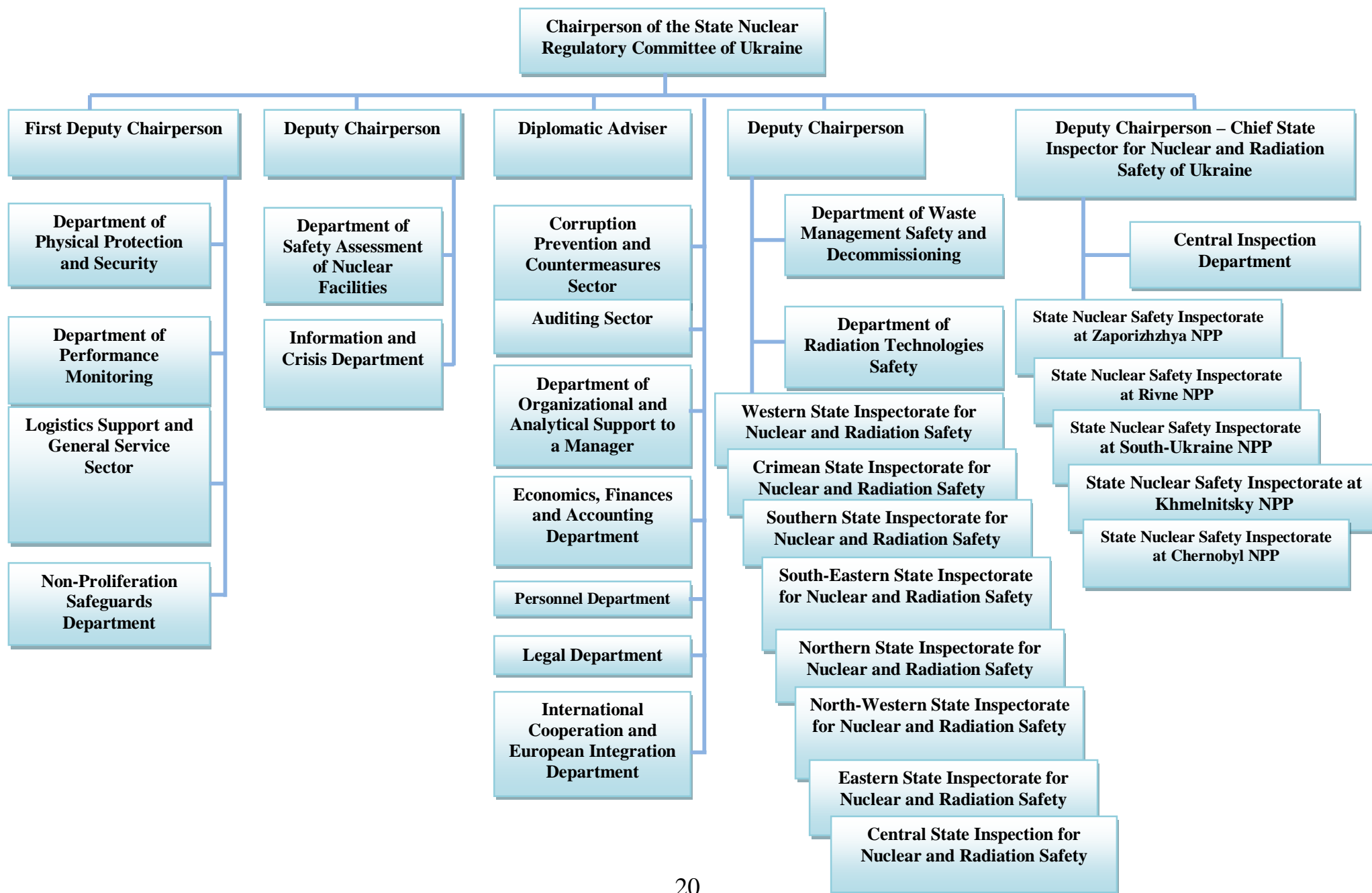


The organizational structure of the State nuclear Regulatory Committee of Ukraine is given below.

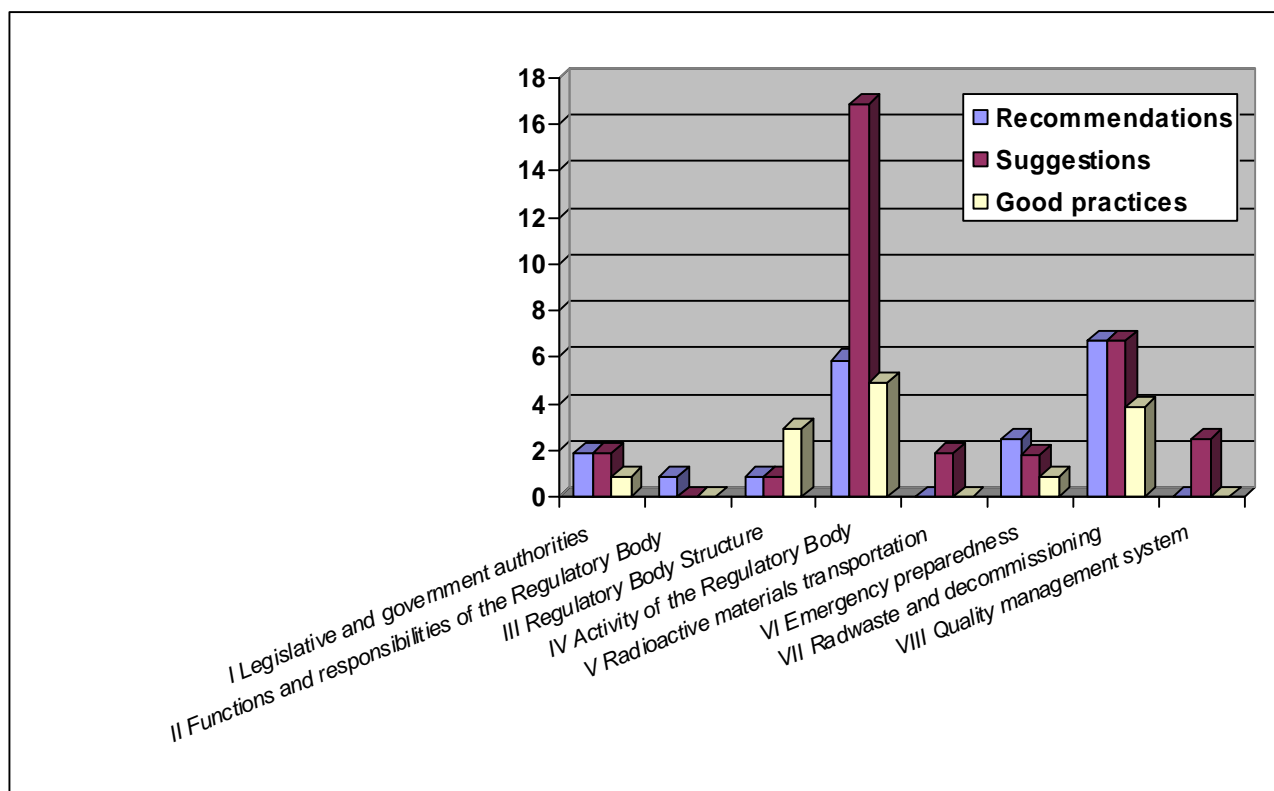
Annually, SNRCU issues a report on the nuclear and radiation safety status in Ukraine. This document highlights results of implementation of the national policy in the area of peaceful use of nuclear energy and fulfilment of nuclear and radiation safety requirements in Ukraine. The annual report published in Ukrainian, Russian and English can be found on the Regulatory Body's official site at www.snrc.gov.ua.

In order to make SNRCU activity more effective, during the reporting period the quality management system (QMS) was being implemented on the basis of DSTU ISO 9001-2001. The SNRCU Policy in the Field of the Activity Quality Management was adopted. In 2008 SNRCU was granted an International Quality Certificate that proves the compliance of the quality management system with ISO 9001-2001 requirements for regulatory services in the area of nuclear and radiation safety.

For implementing one of the fundamental principles of safety assurance in the nuclear industry, specifically, a safety culture principle, SNRCU Body adopted the "Statement on the SNRCU Policy in the Field of Safety of Nuclear Power Utilization and Safety Culture Development" that can be found on the SNRCU site at www.snrc.gov.ua.



Under the Memorandum of Understanding on Cooperation in the Field of Energy between Ukraine and the EC, in the framework of the Joint Project EC- IAEA-Ukraine on the Safety Evaluation of Ukrainian Nuclear Power Plants the Integrated Regulatory Review Services Mission (IRRS mission) to Ukraine took place in 2008. During this IRRS Mission the IAEA's experts conducted a comprehensive assessment of the nuclear and radiation safety regulatory system in Ukraine, checking its compliance with the current IAEA standards. The IAEA's experts issued 20 recommendations and 34 suggestions aimed at improving the regulatory activity. The experts also identified 14 Good Practices.



The IRRS Mission made a general conclusion stating that SNRCU regulates nuclear and radiation safety in an effective way within the area of its responsibility; a comprehensive legislative infrastructure was established taking account of international requirements and including all relevant international conventions; an official staff training programme is being implemented the SNRCU. This staff training programme is well structured and based on the principles of a systematic approach to the training (SAT) taking into account planning for appointing the staff to hold key technical positions, manpower ageing and knowledge management. It also enables the effectiveness of the staff training at the international level.

To ensure that the results of the IRRS Mission will be taken into account, Resolution No. 1307 adopted by the CMU on October 8, 2008, approved the “Action Plan for Implementation of the Recommendations and Suggestions made by the IAEA’s IRRS Mission” (Action Plan). This Action Plan covers 17 comprehensive actions that generalize the IRRS Mission recommendations and suggestions.

To check the status of implementation, effectiveness and sufficiency of the corrective actions developed on the basis of the full-scale IRRS Mission recommendations and suggestions and in order to assess an impact of these actions upon the regulatory activity the IAEA's follow-up IRRS mission is expected to take place in Ukraine on November 22-30, 2010.

4.1.2. 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 use of nuclear energy.

The national legislation of Ukraine clearly specifies and distinguishes the functions of the state nuclear and radiation safety regulatory authority and functions of any other bodies or institutions carrying out their activity in the field of nuclear power utilization. On the legislative level they are governed by Articles 23 and 24 of the Ukrainian Law "On the Nuclear Power Utilization and Radiation Safety". At the subordinate legislative level this issue is governed in accordance with the Regulations of these bodies in which their powers are specified by the Cabinet of Ministers..

Law of Ukraine No. 1874-VI "On Amendments to the Law of Ukraine 'On Licensing Activity in the Field of Nuclear Power Utilization' dated February 11, 2010) reads that it is unacceptable for any bodies, officers and officials, members of the public and their associations to interfere in the process of resolving of the issues that are under authorities of the SNRCU, except as otherwise is provided in the law.

During the reporting period:

- *Formation of the Advisory Council for Reactor Safety made it possible to extend a system of advisory and consultative bodies designated to develop independent and competent recommendations in terms of implementation of the state safety regulatory policy;*
- *Significant contribution to improvement of the regulatory activity in Ukraine was made by the IAEA by undertaking the independent review of the national regulatory system and compliance with the international requirements for NPP safety;*
- *Quality management system of the regulatory activity is certified;*
- *The Regulatory Body adopted a statement on the Policy in the field of Safety of Nuclear Power Utilization and Safety Culture Development.*

4.2. Responsibility of the License Holder (Convention Article 9)

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 such license holder meets its responsibility.

For allocating responsibility for safety of a nuclear installation, a legal framework is established at the legislative level in Ukraine.

Under Article 26 of the Law of Ukraine “On Nuclear Power Utilization and Radiation Safety”, utilization of nuclear installation in Ukraine shall be subject to licensing. An Operating organization (an Operator) gets a license for carrying out activities at individual stages of the nuclear installation life cycle. Under Article 32 of the Law a licensee is fully responsible for radiation protection and safety of a nuclear installation. Article 33 of this Law determines specific obligations of an Operator.

There are two Operators in the nuclear power sector of Ukraine, namely: the State Enterprise “National Nuclear Energy Generating Company ‘NNEGC “Energoatom” (SE NNEGC “Energoatom) and the State Specialized Enterprise “Chornobyl NPP” (SSE “Chornobyl NPP”).

SE “NNEGC “Energoatom” has the licenses granted by SNRCU for operation of South Ukraine NPP Units 1 to 3; Rivne NPP Units 1, 2, 3 and 4; Khmelnytsky NPP Units 1 and 2, and Zaporizhzhya NPP Units 1 to 6 (including operation of a Dry Spent Nuclear Fuel Storage Facility on ZNPP site).

Under these licenses for operating NPP power units, the SE NNEGC “Energoatom” obtains individual permits to start up nuclear power units after the scheduled refueling outages.

SSE “Chornobyl NPP” has licenses granted by SNRCU for:

- Decommissioning of Chornobyl NPP;
- operation of the Shelter Object;
- construction of Spent Nuclear Fuel Storage Facility ISF-2.

The license for decommissioning of Chornobyl NPP enables the operator to implement a package of works and operations, which are related to the nuclear installation decommissioning, including activities envisaged for the stage of closure of nuclear installation operation.

Under the license for decommissioning of Chornobyl NPP, the SSE “Chornobyl NPP” should obtain individual permits when proceeding to the next decommissioning stage of an individual nuclear installation and when carrying out certain activities or operations at the decommissioning stages, which are related to designing, construction, commissioning and operation of radioactive waste management facilities as well as to implementation of a set of measures to remove spent and fresh nuclear fuel, solid and liquid radioactive waste accumulated during ChNPP operation, from the existing facilities.

As license holders, SE NNEGC “Energoatom” and SSE “Chornobyl NPP” are fully responsible for the safety and radiation protection of nuclear installations.

Meeting the obligations the Ukrainian legislation placed on the Operator, SE NNEGC “Energoatom” and SSE “Chornobyl NPP”:

- assure the nuclear and radiation safety (see it. 2.1 and 4.2 for description);
- develop and implement safety upgrades of nuclear installations (see it. 2.1 for more information);
- inform, in a timely and exhaustive manner, about operational events occurred at nuclear installations (see it. 5.3 for more information),
- provide financial coverage of civil liability for nuclear damage as required by the legislation of Ukraine (see it. 5.2 for more information);
- impose requirements for skills and qualification of the staff, depending on their responsibilities for nuclear installation operational safety, and arrange for their training (see it. 5.2 for more information).
- assure the radiation protection of the staff, public and the environment (see 5.6 for more information).

Starting with a review of the licensee's application, SNRCU verifies compliance of the licensee's activity with the imposed requirements, in particular, determining that the safety level of a nuclear installation conforms with the established requirements; there are financial, material and other resources in place; organizational structure and the training system as well as the qualified staff are available. All these conditions are compulsory conditions of licensing and, moreover, refer to the conditions of the Operator's license covering a certain stage of the nuclear installation lifecycle. SNRCU strictly controls compliance with all these conditions.

During the reporting period the Ukrainian Operators ensured that all obligations imposed by the legislation as related to the safety of nuclear power utilization were fully met.

In accordance with the applicable legislation, the Operators ensure that the imposed obligations and conditions of licenses (individual permits) as related to the safety of licensing activities in the field of nuclear power utilization, are fully met.

Fulfillment of the imposed obligations and conditions of licenses (individual permits) concerning the safety of licensing activities is under continuous regulatory supervision.

SECTION V. GENERAL SAFETY CONSIDERATIONS

5.1. Priority to Safety (Convention Article 10)

Each Contracting Party shall take 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.

The priority given to safety in designing and operating nuclear installations facilities, which is determined in the Law of Ukraine “On Nuclear Power Utilization and Radiation Safety”, is the basic principle of the state policy in the field of nuclear energy use.

During the reporting period all the entities of legal relations in the area of nuclear power utilization ensured, within their assigned authorities, that legislative principles set forth in the national policy were met. This and previous report of Ukraine describe how the national policy principles, which are regulating the issues covered by the Convention on Nuclear Safety, are implemented.

Ensuring of the safety and reliability of nuclear power industry functioning, as well as fulfillment by Ukraine of respective international obligations are the priorities for executive authorities' activity. Continuous attention paid by the top national authorities to safety assurance issues is a confirmation hereto. The status of nuclear and radiation safety was regularly addressed and reviewed at meetings of the Cabinet of Ministers and the National Security and Defense Council of Ukraine. Issues of NPP safety are addressed at the meetings of the SNRCU' Boards and Boards of the Ministries concerned, and also at the inter-departmental commissions' meetings.

“The SE NNEGC “Energoatom” Statement on Nuclear Safety Policy” was approved and published. It reads:

- SE NNEGC “Energoatom” takes overall responsibility for safety of the nuclear power plants throughout all stages of their life cycle and establishes its overriding priority over other tasks;
- SE NNEGC “Energoatom” activities are aimed at establishing and fostering an environment of the staff's adherence to the safety objectives, their individual responsibility, at forming their fundamental safety culture principles.
- Safety culture principles set forth in the IAEA's summary documents became an integral part of the operation organization and safety assessment of Ukrainian NPP.

In Ukraine the requirements for assurance of safety culture at NPP as a fundamental principle of the safety assurance, are set forth in the normative document, namely: “General Provisions on Safety of Nuclear Power Plants”, taking account of the IAEA's recommendation as well as national and international experience of NPP operation.

For the last few years, the International Conference “Safety Culture at Ukrainian NPP” has been put into practice and regularly held by SE NNEGC “Energoatom”, specifically, in 2002, 2004, 2006 and 2008.

Meeting the requirements of the fundamental national document on safety, recommendations of the IAEA and also fulfilling the decisions of the Safety Culture Conferences, SE NNEGC "Energoatom" has been continuously improving it. These efforts are focused on creating an environment of the staff's dedication to the safety objectives, the staff's individual responsibility and adherence to the safety culture principles.

For the last two years SE NNEGC put into force "the Program on Safety Culture Improvement at SE NNEGC "Energoatom" for 2009-2010". The Company also worked out the methodology and criteria of assessment of the safety culture status at SE NNEGC "Energoatom" and the program on self-assessment of the safety culture in the Company's subdivisions. A series of the planned safety culture reviews were expected to start in 2010, and they have already began at Separate Entities NPP (SE NPP) in accordance with the finalized program on review of the safety culture status at Separate Entities of SE NNEGC "Energoatom".

The ultimate objective of the above stated efforts is continuously improving the safety culture level, systematizing and expending long-standing experience of works aimed at establishing and developing the safety culture in the nuclear power industry of Ukraine and gradually upgrading its level.

Programs on Production Culture Assurance and Improvement as well as the Labor Protection and Fire Safety Programs were elaborated and put into force at NPPs; long-term planning of safety culture-related activities is also envisaged.

Job descriptions for all-rank managers, who are in charge of nuclear safety, specify obligations, specifically, those related to the development of the staff's safety culture. Days of Safety Culture are organized across at all SE NPPs of NNEGC "Energoatom".

The "Safety Culture" course is a compulsory element of programs for position-specific training and proficiency support program for all industrial & operational personnel of NPPs. 100 % of industrial & operational personnel of all categories are involved in the training.

The training centers developed complete sets of methodological training materials covering the following topics:

- "Basic Principles and Characteristics of Safety Culture";
- "Role of the Human Factor in Safety Culture Assurance";
- "Quality Assurance";
- "Safety Management".

Elements of the safety culture have been incorporated into the hands-on training courses conducted at a full-scope simulator, in laboratories and shops.

For implementing the principles of transparency and accessibility of information on nuclear power utilization, specific public-relations departments and information centers were established at all SE NPPs and Head Office of NNEGC "Energoatom" to spread and deliver explicit information on environmental radiation situation to the public. SE NPP and their information centers arrange the conducted tours for the people to get them acquainted with NPP operation. Each NPP issues a plant newspaper, has radio broadcasting and telecasting offices and its website.

SE NPPs prepare annual reports on the assessment of operational safety level and technical condition of NPP power units and reports on the status of radiation safety and radiation protection of NPP. SE NNEGC “Energoatom” summarizes the NPPs’ reports to take them as a basis for developing a Summary Report on the Evaluation of Operational Safety and Technical Condition of NPP Power Units and a Report on the Status of Radiation Safety and Radiation Protection at NPP, which are subsequently submitted to the regulatory and governing state bodies of Ukraine.

Overriding priority of nuclear and radiation safety established by the Ukrainian Law as well as requirements for observing this priority fostered the adherence to the safety principles as a lifestyle.

5.2. Financial and Human Resources (Convention Article 11)

5.2.1. Financial resources

Each Contracting Party shall take appropriate steps to ensure that adequate financial resources are available to support the safety of each nuclear installation throughout its life.

In 2007 the share of cash payment for the produced electric power accounted for 99.57% of the total electricity cost, 98.63 % and 98.08% in 2008 and 2009, respectively. A slight variation of payments in 2007- 2008 is due to the amounts of payments made with using tools specified by Law of Ukraine No. 2711 “On Measures Aimed at Ensuring Sustainable Operation of Enterprises of the Fuel and Power Complex of Ukraine” dated June 23, 2005, and other payments made in accordance with the Cabinet of Ministers’ Resolution No. 193 dated March 5, 2009; Resolution No.440 dated April 25, 2008 and Resolution No. 664 dated July 29, 2008.

A fixed tariff is imposed on electricity that NNEGC “Energoatom” NPPs are delivering to the “Energorynok” /Energy Market/. Decisions on the tariff amount, as well as breakdown of costs for electricity production, are approved by the National Electricity Regulatory Commission of Ukraine (NERC).

For the purpose of continuously improving nuclear safety, ensuring effective and reliable operation of the power industry and raising the safety of Ukrainian NPP up to the level, which meets recognized international standards on nuclear safety and environmental protection, SE NNEGC “Energoatom” prepared and now is implementing the “Integrated Program on Safety Improvement of Ukrainian NPPs Power Units”, the implementation of which is tentatively valued at, approximately, EUR 1 448 M. The activities covered by this Program are expected to be implemented across all 15 power units of Ukrainian NPPs within approximately 8 years (from 2010 to 2017).

Under the Memorandum of Understanding on Cooperation in the Field of Energy between Ukraine and the European Commission, the EBRD/Euroatom, on the one side, and Ministry of Fuel and Energy of Ukraine and SE NNEGC “Energaotom”, on the other side, made a decision on financing the Program out of proceeds of the EBRD/Euroatom Loan. Law of Ukraine No. 1868-IV “On Settling the Issues Related to Nuclear Safety Assurance” dated June 24, 2004 and the Cabinet of Ministers’ Resolution No. 594 dated April 27, 2006 provided for establishing a financial reserve for nuclear installation decommissioning, including this reserve accumulation and utilization.

Ukraine is a Contracting Party to the Vienna Convention on Civil Liability for Nuclear Damage dated 1963 (pursuant to the Law of Ukraine “On Accession of Ukraine to the Vienna Convention on Civil Liability for Nuclear Damage” dated July 12, 1996).

Since 2005 an insurance coverage of SE NNEGC “Energoatom’s civil liabilities for nuclear damage has been provided. Annually, SE NNEGC “Energoatom” enters into an agreement

with an insurance company, which is fully authorized by insurance companies-members of the Nuclear Insurance Pool of Ukraine.

5.2.2. Human Resources

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.

During the reporting period the national system for nuclear sector staff training and refresher training as described in it. 4.2.2 of the Fourth Report, was further improved. The System is based on the IAEA-recommended systematic approach to training and generalized experience acquired in staff training of the leading IAEA member states.

SNRCU is licensing the training of NPP staff in accordance with requirements of the normative document “Rules for Licensing of Personnel Training for Operation of a Nuclear Installation”.

SE NNEGC “Energoatom” developed and put into effect the standard “Regulation on Organization of Activities with the Staff of the State Enterprise “National Nuclear Energy Generating Company ‘Energoatom’ incorporating the state-of-the-art international experience acquired in NPP staff management.

Coaching and instruction of the staff are conducted on a regular basis, addressing their professional duties, safety culture and high skill & qualification level.

The effectiveness of the staff training system is clearly demonstrated by a steady and continuous trend towards reducing the number of events in NPP operation and improving other performance indicators.

SE NNEGC “Energoatom” has training centers in place at each nuclear power plant and at the Enterprise “AtomRemontService”, that were granted appropriate State Regulatory Bodies’ authorization documents (licensing and permits) to train the staff of different categories.

At present, the NPP Training Centers deploy eight full-scope simulators for all WWER-1000 and WWER-440 units. In addition, there are multi-functional and local simulators as well as computer training systems, which are extensively used for the staff training.

The staff training is delivered on the basis of the training programs and methods developed in accordance with the Company’s standards. One of the conditions for getting a license to train the staff is making all these materials available and ready for use.

The NPP training centers have been staffed with skilled and knowledgeable instructors. The technical training aids are continuously improved.

A National Center for Maintenance Personnel and Managers Training is being established now.

A trend in the number of the licensed experts of NPP as well as the data on NPP staff training are given in Annex 3.

During the reporting period the Ukrainian system of training and refresher training of the nuclear power plant staff has been continuously improved, providing occupational training of employees for conducting activities throughout the nuclear installation life cycle.

All Ukrainian NPPs are fully provided with well-trained knowledgeable staff.

The effective system of NPP personnel training contributes to upgrading nuclear installation safety and improving performance indicators.

5.3. Human Factor (Convention Article 12)

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

To prevent and eliminate the influence of the human factor on NPP deviations and failures, NNEGC “Energoatom” employs the operation experience feedback system in personnel training at NPP training centers.

A structure of the efficiency assessment as applied to the NPP personnel training system in Ukraine with due regard to the human factor could be pictured as follows:

- analysis of deviation reports with abnormal events, pre-conditioned by personnel erroneous actions, being described;
- internal audits of NPP training centers and their audit by SNRCU experts;
- analysis of accident reports pre-conditioned by training gaps.

To assess operating personnel technical proficiency to perform power unit operation under different operation modes an operating personnel availability factor is calculated. Erroneous actions or omissions of the operating personnel entailing deviation in transients are taken into account.

The licensed personnel (shift supervisors and control room operators) are certified by NPP commissions headed by the NPP Chief Engineer with state inspector being present – a representative of the State Nuclear Safety Inspectorate at NPP.

The rest of the operating personnel is certified by commissions headed by the deputy (deputies) Chief Engineer or engineers in charge. The knowledge assessment is conducted as prescribed in respective provisions.

Training is carried out by individual programs with ongoing, intermediary and final progress evaluation being made by instructors.

Upon training completion an exit test is to be performed at NPP training centers. The trainee gradually reviews the majors of the individual training programme through self-

training and instructor's coaching. Provided that the test results are positive, the trained specialist shall be examined by the commission for knowledge assessment.

The following additional certification procedures are applied to personnel, whose training is subjected to licensing:

- preparation for knowledge assessment by NPP central commission, during which the previously gained knowledge are recovered and reinforced, primarily, requirements, rules and standards as for NPP safety and operation;
- final training on a full-scale simulator.

The final testing is administered by one of the Chief Engineer deputies. The examination tests trainee's technical skills to manage the process from the unit control room under the following modes:

- normal operation;
- abnormal operation;
- emergency operation.

Besides, fitness for team-working is tested.

The summary final test is administered by the Deputy Chief Engineer. It tests if the knowledge obtained is sufficient for non-supervised work and preparedness for knowledge assessment.

The test results being negative, additional time is provided for preparation.

The test results are incorporated into reports and along with other documents are handed over to the central knowledge assessment commission.

Upon training completion and successful knowledge assessment SNRCU issues a license for operating a reactor installation with the NPP power units being specified.

The personnel training activities and other measures aimed at safety culture improvement allowed substantial decrease in personnel-error-based NPP events.

Personnel preparedness for accident response, accident management and recurrence prevention is assured through conducting:

- emergency drills as incorporated into the individual training program;
- emergency drills for operating personnel as part of shift;
- training for operating personnel on a full-scale simulator within proficiency
- Maintaining program;
- full-scale training in beyond-design-basis accident liquidation.

To minimize the human factor effect, there is a set of administrative measures being implemented, namely:

- physical persons are allowed performing activities at a nuclear installation or with nuclear materials only following a special training and examination;
- the psychophysical state of operating personnel is tested annually;
- health of all the staff is monitored annually and health of operating personnel is

- monitored each day before entry into shift work;
- the staffing, personnel training and safety culture improvement are controlled at the interdepartmental level;
- there are station, power unit emergency response and fire protection trainings for operating personnel, which are held annually as prescribed in the Staff Development Plan; these include individual training with administrative and technical staff;
- instructions on accident elimination have been developed to enhance personnel reliability when operating a power unit during accident elimination.

Thus, Ukraine takes all comprehensive measures to ensure that the human factor is taken into account throughout the life of a nuclear installation.

5.4. Quality Assurance (Convention Article 13)

Each Contracting Party shall take appropriate steps to ensure that quality assurance programmes 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.

Since the previous Report the QA system of NNEGC “Energoatom” has been developed and improved.

In 2009 international certification authority TUV NORD has carried out the following recertification audits:

- quality management systems of SE “South Ukraine NPP” and SE “AtomRemontService” were recertified for their compliance with international ISO 9001:2008;
- the separated entity “Rivne NPP” integrated management system was recertified for its correspondence to the international ISO 9001 and 14001 standards.

To implement the integrated management system (IMS) in the Company and pursuant to the requirements of the IAEA's Safety Standards Series No. GS-R-3 “The Management System for Facilities and Activities” and ISO 9001 and 14001, a project management group for preparation to the IMS certification was established. For this purpose a working group was also established involving representatives of the Head Office's departments and separated entities of SE NNEGC “Energoatom”.

Being aware of the safety culture role in achievement of safety objectives, SE NNEGC “Energoatom” kept working, for many years, on its development and enhancement.

To optimize works on implementation of the safety culture concept during NPP operation, experience exchange, evaluation of current safety culture at NPPs operated by the Company and to fulfill the requirements of NP 306.2.141-2008 “General Provisions of Nuclear Power Plants Safety” and pursuant to the IAEA recommendations, the following measures have been implemented:

- Safety Culture Council has been established within NNEGC “Energoatom”;

- Program PM-D.0.03.483-09 on the safety culture improvement at SE NEGC “Energoatom” for 2009-2010 was launched;
- Program on self-assessment of the safety culture in structural subdivisions and separated entities of SE NNEG “Energoatom” was initiated;
- NPPs of Ukraine developed the Program on specific actions aimed at development of NPP safety culture.

In order to identify the areas for improvement, SE NNEG “Energoatom” performs internal audits on a regular basis in the areas as follows: safety management, manufacturing process management, regulating and manufacturing documentation management, arrangement and implementation of maintenance activities, procurement and product delivery management, the effectiveness of internal reviews in departments, and etc.

SE NPPs carry out regular self-assessment as related to departmental activities and QA Days related to self-assessment of safety culture, using operational experience, meeting requirements for NPP modifications, personnel training system performance and etc.

Based on the results of quality management system reviews (assessments) the corrective and preventive measures are developed for improvement of manufacturing activities.

Much attention is paid to providing NPPs with highly-skilled personnel to ensure a high safety level during nuclear installation operation. Skill development and personnel training are carried out on a regular basis. Training is supported by differentiated approach with respect to the role and functions of employees: managerial staff, quality assurance officers and other specialists.

The Operator carries out evaluation of the product and services suppliers in order to ensure that products and services are delivered to NPP by suppliers capable of ensuring the product compliance with prescribed requirements being evaluated, impartially substantiated, documented and under control. The evaluation of suppliers of the products important to NPP safety is carried out according to the company procedures.

In accordance with the effective law on procurement of goods, works and services for public funds, suppliers are selected during the tendering procedure. The SSE “Chernobyl NPP” employs a quality management system that complies with requirements of DSTU ISO 9001:2009. The current system serves as instrument for implementation of SSE “Chernobyl NPP” management policy and is, primarily, aimed at ensuring safety during nuclear fuel management, decommissioning of Chernobyl NPP units and Shelter object transformation into an ecologically safe system.

Current quality management system ensures planning, allocation of financial and human resources, as well as quality of works carried throughout the lifetime of Chernobyl NPP. In particular, appropriate regulatory procedures have been developed and implemented to ensure nuclear safety.

To ensure monitoring of these procedures, key performance indicators, as well as their calculation and evaluation techniques have been developed. Key performance indicators ensure efficient management – i.e. perform procedure implementation analysis, register deviations and make decisions regarding necessity and suitability of developing corrective

and preventive measures. To improve quality management system and ensure implementation of regulatory procedures, internal audits are carried and corrective measures taken at SSE ChNPP.

To ensure interaction and decision making as related to quality assurance when complying with safety requirements (including nuclear safety), SSE ChNPP:

- established a Quality Assurance Council;
- developed and implemented methodology on safety self-assessment with due regard to the IAEA's recommendations that envisages regular analysis of the current safety level and implementation of corrective measures to remove the discovered shortcomings.
- developed managerial statements on quality and safety policy, informational policy and human resources management, which declare the commitment of management to safety principles and that management shall address all activities related to ChNPP safety.

When implementing technical projects and works at ChNPP site, quality assurance program are developed specifying requirements for activities important to nuclear safety. To select suppliers of works, goods and services, who have appropriate experience and proved to be professional and highly qualified contractors, a lot of attention is paid by SSE ChNPP to evaluation of these suppliers.

SSE ChNPP ensures audit of Supplier's quality management system, the detailed incoming inspection of product and equipment quality. Furthermore, a unified work order access system has been developed to provide site access for contractor personnel.

Bringing QA system into line with requirements of ISO 9001 allowed to:

- *increase operation safety level of nuclear installations;*
- *improve safety culture;*
- *improve production activities.*

5.5. Assessment and Verification of Safety (Convention Article 14)

5.5.1. Each Contracting Party shall take appropriate steps to ensure that 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.

The Operator's safety assessment of running power units is aimed at developing a basic safety substantiation document - Safety Analysis Report (SAR), which presents a

comprehensive safety assessment and a system of technical and administrative measures intended for safety assurance.

In 2007-2009, the SAR has been fully developed for Khmelnytsky NPP-2, Rivne NPP-4 and for pilot power units, namely RNPP-1, SU NPP-1, ZNPP-5.

SARs for non-pilot units are scheduled to be completed in 2010 in the scope accepted for pilot unit by the end of 2009.

The Operator has planned to introduce operating PSA at NPPs that would allow evaluating the changes in safety level and implementing risk-informed programs. Probabilistic assessment performed within SAR shall be subject to amendments as safety improving measures are carried out.

It is also planned to increase the scope of probabilistic and deterministic analyses in order to have integrated probabilistic assessments taking into account the full range of initiating events, at power and in reactor shutdown mode, as well as full range of initiating events for the design basis deterministic analysis. The abovementioned increase in analysis scope is planned to be performed at all operating power units.

SAR also envisages the scope increase in terms of severe accident analysis. In 2009 a Program on Severe Accident Analysis and Development of Severe Accident Management Guidelines (SAMGs) was developed and approved by the State Nuclear Regulatory Commission of Ukraine. The three-year program is designed to support implementation of all stated stages for each RI type (V-213, V-302/338 and V-320). The program also covers management strategy, principles, deadlines and scope of works, as well as distribution of responsibilities (among control room, technical support centre, emergency response centre and EOP interlink). The results will be used to develop SAMGs and review PSA-2, as well as to evaluate radiation consequences caused by a beyond design basis accident.

Table 1 includes results of the probabilistic safety assessment for the actual and anticipated pilot unit status.

Table 1 – Actual and anticipated severe core damage frequency (SCDF) and large early release frequency (LERF) for pilot units of Ukrainian NPPs.

Item		Value, 1/year		Safety criteria as per NP 306.2.141-2008, 1/year
		Estimate with regard to current unit state	Anticipated estimate with regard to implementation of safety increasing measures	
South Ukraine NPP, Unit No.1				
SCDF	Integral value (obtained by summarizing the results upon separate initiating events)	6.97* 10 ⁻⁵ (as of 01.10.06)	1.51* 10 ⁻⁵	1* 10 ⁻⁴
LERF	Values based on PSA-2 results at rate power	3.77* 10 ⁻⁶ (as of 31.12.08)	—	1* 10 ⁻⁵
Zaporizhzhya NPP, Unit No.5				
SCDF	Integral value (obtained by summarizing the results)	7,038* 10 ⁻⁵ (as of 01.01.06)	3,38* 10 ⁻⁵	1* 10 ⁻⁴
LERF	Values based on PSA-2 results at rate power	3,77* 10 ⁻⁵ (as of 16.10.06)	6,81* 10 ⁻⁶ (1 measure)	1* 10 ⁻⁵
Rivne NPP, Unit No. 1				
SCDF	Integral value (obtained using the integrated model)	4,805* 10 ⁻⁵ (as of 31.12.09)	4,21* 10 ⁻⁵ (as of 31.12.10)	1* 10 ⁻⁴
LERF	Values based on PSA-2 results at rate power	3,7* 10 ⁻⁶ (as of 31.12.09)	3,41* 10 ⁻⁶ (as of 31.12.10)	1* 10 ⁻⁵

Based on the results of quantitative evaluations, the following conclusion can be made: safety level of Ukrainian power units corresponds to requirements of NP 306.2.141-2008 “General Provisions of Nuclear Power Plants Safety” as related to the safety criterion for severe core damage frequency.

As prescribed by nuclear legislation and national safety requirements and regulations, the operator is committed to periodically – as prescribed by the state nuclear and radiation safety regulatory authority, at least once per 10 years – perform NPP power units’ safety review and report on it to the regulatory authority. To enable safety reviews, the Ministry of Fuel and Energy of Ukraine approved the regulation “Requirement to the Structure and Content of Safety Review Report” that referred to the IAEA’s Safety Standard NS-G-2.10 and incorporated the IAEA experts’ recommendations. As prescribed by the abovementioned regulation the reports on power units’ periodic safety review shall be

issued in order to decide on amending existing licenses for nuclear installation operation and permitting their beyond-design basis operation.

Periodic safety review reports (PSRR) were issued for RNPP-1 & 2 within activities on their lifetime extension. The activities have been commenced on development of PSRR for SU NPP-1.

In 2005, a Memorandum of Understanding on Cooperation in the Field of Energy was signed between the European Union and Ukraine (MOU) to intensify energy cooperation between Ukraine and EC in terms of rapprochement of the energy markets.

In the framework of MOU a decision was taken on cooperation according to the action plans covering four specific areas, so-called roadmaps. "Nuclear Safety" is one of the roadmaps.

To ensure implementation of "Nuclear Safety" roadmap, a Joint Steering Committee and Joint Working Group enrolling Ukraine and EC were established in 2006, as well as the Joint Project EC-IAEA-Ukraine on the comprehensive safety evaluation of Ukrainian NPPs was started in 2007 and lasted from November 9, 2007 till February 9, 2010, under the agreement between EC and IAEA.

In the framework of Joint Project EC-IAEA-Ukraine an assessment was carried out regarding safety compliance of Ukrainian power units with existing IAEA standards in four areas:

1. Design safety of NPPs;
2. Operational safety of NPPs;
3. RAW management & decommissioning;
4. Regulatory issues.

Under the Project 15 expert missions were carried out that cover four NPP sites and SNRCU. 62 experts from 23 countries and international organizations, 52 Ukrainian specialists and 32 representatives of the IAEA took part in these expert missions.

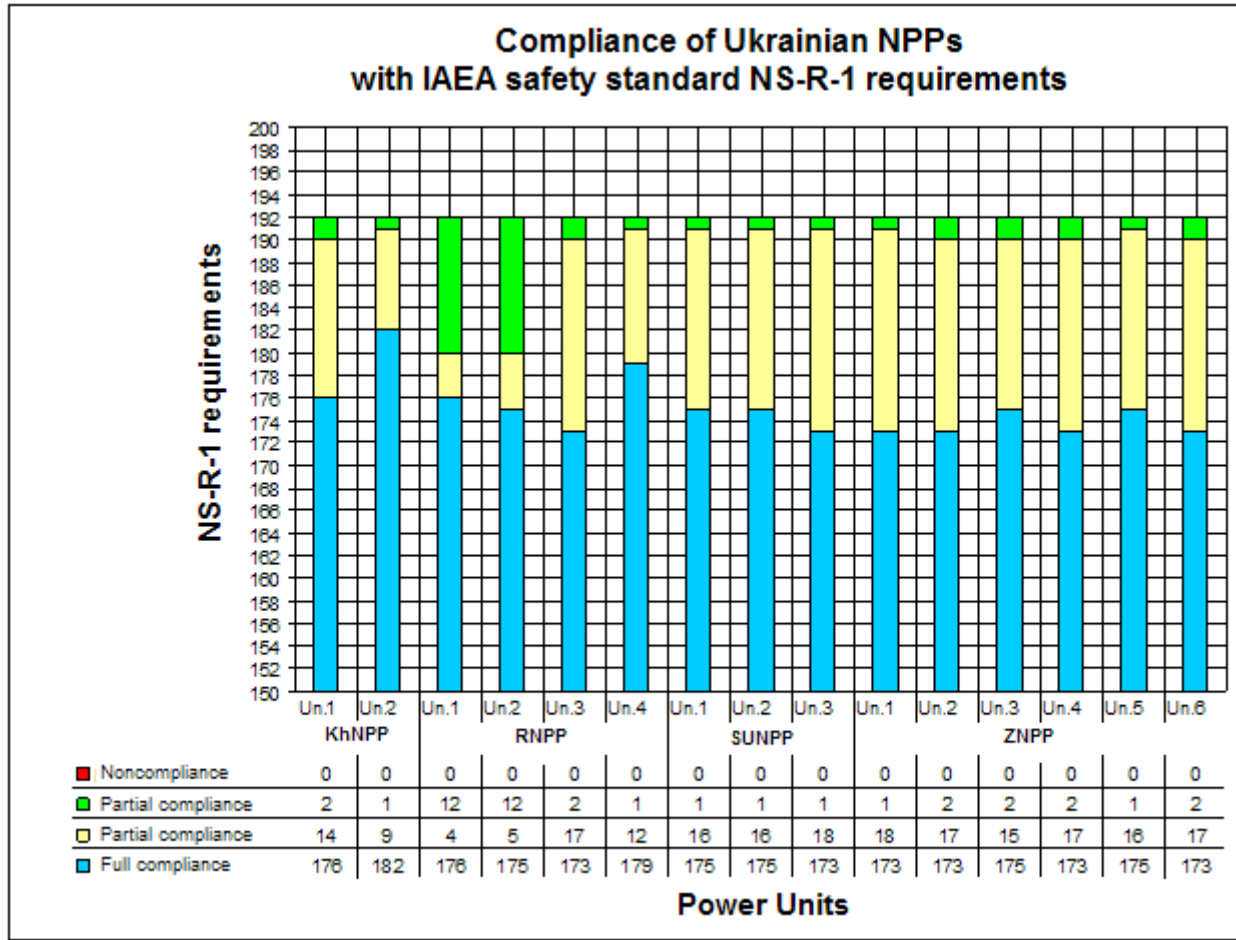
The major results of the project are:

- the compliance with most IAEA safety standards has been confirmed in all three review areas;
- measures on solving outstanding issues in the areas with partial compliance are currently being successfully implemented by Ukrainian NPPs and SNRCU.
- Pursuant to the conclusions of IAEA experts, the operational safety level of Ukrainian power units is acceptable for key areas corresponding to international practice.
- all areas of assessment have a significant positive trend as compared to the situation during previous similar missions;
- SE NNEGC "Energoatom" extensively uses the existing international experience as related to defining and solving safety issues;
- much attention is paid to safety culture of SE NNEGC "Energoatom";
- significant progress can be observed in personnel training with full-scale simulators being efficiently used;
- state-of-the-art technologies and techniques are successfully implemented for detailed assessment of Ukrainian NPPs safety. In particular, PSA methodology used in detailed assessment of Ukrainian NPPs safety has been recognized as appropriate according to conclusions of IAEA expert;

- NPP staff is involved in safety assessment.

It was also confirmed that the overall management of operational safety has been carried out with appropriate skills and efficiency.

As for NPP design safety, IAEA experts came to a conclusion that all power unit are in full compliance with most of 192 existing IAEA safety requirements determined for NPP designs (NS-R-1) and all 15 power units conform, at least, to 172 NS-R-1 requirements.



Compliance of Ukrainian NPPs with requirements of IAEA safety standard NS-R-1

All power units had five common issues with partial compliance and different noncompliance level for each unit. These issues include equipment qualification, consideration of severe accident, seismic margin confirmation, scope of PSA and additional safety analyses, I&C equipment for post-accident monitoring. Some units had specific issues (in addition to the abovementioned) with partial compliance related to displaying plant performance, protection from external events, common-cause failures, and RAW storage. The level of incompliance depended, primarily, on power unit age and different stage of the progress of the safety improvement and modernization program implementation at each nuclear power plant.

The IAEA experts confirmed that successful work is carried out at all power units to remove partial noncompliance in the framework of existing safety improvement programs.

5.5.2. Verification by analyses, 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.

Since the previous Report, the nuclear installations were verified for their compliance with requirements, standards, criteria and rules on nuclear and radiation safety as described in it. 4.5.2 of the previous Report.

Regulatory inspection is carried out by the State Nuclear Safety Inspectorates, and state inspectors of the SNRCU Headquarters. Inspectors' activity is governed by applicable regulations, special programs and inspection schedules. In comprehensive inspections, both the experts of SNRCU relevant divisions and Residence State Nuclear Safety Inspectorate are involved.

Pursuant to requirements of NP 306.2.141-2008 "General Provisions on Safety Assurance of Nuclear Power Plant" the Operator ensures that the NPP safety is permanently monitored.

For this purpose, a Departmental Control Service has been established and operates at SE NNEGC "Energoatom".

The main task of the Service is monitoring company's structural department activities in respect to observing requirements, standards, criteria and rules on nuclear and radiation safety, environmental protection, operator's licensing requirements and operational documents.

Each NPP has plant department control services the main task of which is regular (daily) control of operating modes, conditions of safety important equipment and systems in terms of their compliance with requirements of operational documentation, regulations and rules on nuclear and radiation safety.

Pursuant to requirements of NP 306.2.145-2008 "Nuclear Safety Rules for WWER Reactor Installations" each NPP conducts internal nuclear safety inspections and submits appropriate certificates to the regulatory authority.

According to the approved program, internal inspections are carried out by the Operator once per two years. Radiation protection and environmental conditions are also inspected on a regular basis.

Based on inspection results, the measures are developed to remove the revealed shortcomings, as required.

According to the requirements of NP 306.2.141-2008, systems and items important to safety usually undergo direct and full inspection for compliance with design specifications during commissioning, after maintenance and repairs, as well as throughout NPP life on a regular basis.

The project envisages diagnostics (testing) of conditions of systems and elements important to safety and referred to class 1 and 2. In-service inspection is carried out with adhering to the requirements and limits of safe operation as prescribed by process regulation.

Specific measures on control and inspection, their scope and frequency are determined in process regulations, ad-hoc programs and procedures applied at NPPs. As prescribed by the regulations, the Operator performs:

- a range of equipment and process systems inspections and testing;
- control of design life of major equipment;
- regular NDT of equipment and pipelines metal and welds;
- assessment of fuel rod cladding;
- primary and secondary chemistry control;
- control of reactor cooling circuit leak tightness;
- control of release and discharge of radioactive materials and radiation situation around NPP site
- and other control measures as prescribed by special programs and procedures.

Upon maintenance and repair works, systems and equipment are checked for their operability and compliance with design specification, with inspection results being recorded.

To provide support in the permissible limits of degradation for safety-important structures, systems and components (as result of aging, depreciation, corrosion, erosion, wearing and etc.) and to support their operability and reliability in operation, SE NNEGC “Energoatom” developed and employs programs on equipment aging management, equipment qualification, lifetime extension of operating units. Development and implementation of the integrated program on improvement of operating NPPs units and integrated program on improving reliability and efficiency of NPP operation are almost completed.

In the framework of technical cooperation with IAEA, peer reviews of the operational safety are performed by the OSART expert missions. The reports on these missions, as good practice, point out to state surveillance through inspections, examinations, and qualification of NPP personnel and management, as well as analysis of administrative, operational and reporting documentation.

To ensure that all information on the technical and radiation state of ChNPP units will be fully available, SSE ChNPP developed a set of administrative and technical measures on inspection of equipment, premises, civil structures, and etc (CERS). CERS data updating has been fully completed for Unit No.1 and launched for Unit o. 2.

To determine the nuclear safety level, SSE ChNPP carries out nuclear safety inspections at power units 1 to 3, SNFSF-1 and Shelter object. Adherence to rules, regulations and procedures on nuclear safety is checked during NF handling, maintenance of safety-important systems and physical protection of nuclear materials. Based on inspection results, the measures aimed at safety improvement are developed.

Ukraine has created the legislative and regulatory framework for a comprehensive and systematic safety assessment throughout the life stages of nuclear installations.

The imposed assessment requirements are strictly met by the Operator as confirmed by integrated activities on safety assessment and safety review for power units in operation, by adherence to the established schedule and introduction of corrective measures based on the safety assessment results.

5.6. Radiation Protection (Convention Article 15)

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.

The Law of Ukraine “On Human Protection Against Ionizing Radiation” aimed at protecting an individual, his life, health and property against negative effect of ionizing radiation, prescribes practical steps to implement the underlying Law “On Nuclear Power Utilization and Radiation Safety” and establishes permissible irradiation dose rates for personnel and population. The Law also outlines the scope of authority and obligations of the state bodies responsible for radiation protection.

In 2001 the Law of Ukraine “On Human Protection Against Ionizing Radiation” was amended to bring the requirements of the Law in full compliance with recommendations of the International Commission on Radiological Protection (ICRP).

Radiation Safety Standards of Ukraine (NRBU-97) that take into account recommendations of the international organizations, such as: the IAEA and ICRP, determine basic principles of radiation protection as applied to practical activities and intervention situations, introduce a system of radiation and sanitary regulations to ensure established irradiation levels both for an individual and for the public. Specifically, they prescribe effective dose limits for A-Class personnel (20 mSv/year) and for population (1 mSv/year), as well as external dose equivalent for lens, skin, wrist and foot that comply with ICRP recommendations Publication 60.

Radiation Protection from the Potential Irradiation Sources (NRBU-97/D-2000) extends the NRBU-97 application, incorporating sources of potential irradiation into the system of radiation and sanitary regulation. The document introduces a series of new provisions, namely:

- the concept of potential exposure;
- groups of potential irradiation sources;
- system of regulations specifying reference levels and potential irradiation risks as well as reference probability of critical events;
- general requirements for classification of radioactive waste complying with the Law of Ukraine “On Radioactive Waste Management”.

The basic principles of radiation protection and the ALARA principle in particular (optimization principle), are implemented in Ukraine through development and

introduction of regulatory standards, norms and rules and proper operational procedures. Among the activities introducing the ALARA principle, a series of organizational and technical measures are to be listed. These are actions implemented at Ukrainian NPPs with the purpose of reducing individual and collective doses of personnel, minimizing releases and discharges and advancing the radiological monitoring systems.

Adherence to the radiation protection standards and sanitary regulations at nuclear energy enterprises is monitored by the State Sanitary-Hygienic Service of Ukraine under the Ministry of Health of Ukraine.

Efficiency of measures on radiation protection is assessed directly through collective and individual dose rates, their dynamics and release/discharge rates of a nuclear installation.

Figure 1 (Annex 4) shows the dynamics in collective dose to Ukrainian NPP staff for the period from 2000 to 2009.

Figure 2 (Annex 4), respectively, reflects the dynamics in average annual individual dose to NPP staff over the same period of time. As one can see from the diagrams, over the recent few years the dose rate to the staff of Ukrainian NPPs tends to reduce. The increased annual dose rates are recorded in years, which saw a significant scope of radiation-hazardous operations performed during NPP outages.

Figure 3 (Annex 4) shows individual dose distribution for the staff of Ukrainian NPPs over the period from 2007 to 2009. It can be concluded from the bar charts that individual doses to the majority of those monitored at all Ukrainian NPPs (more than 80 % of the staff) are below 2 mSv. In 2007-2009 there were no individuals at Ukrainian NPPs registered to have the irradiation dose exceeding 20 mSv/year.

Figure 4 (Annex 4) shows the percentage ratio of individuals among the NPP staff whose annual effective dose exceeds 15 mSv. The analysis testifies that the number of such individuals is decreasing every year as far as the staff exposure doses are decreasing at Ukrainian NPPs.

Figure 5 (Annex 4) shows the percentage ratio of NPP personnel collective dose to the amount of the electric power produced, per.c.Sv/MW.year. The figure shows a steady trend in power generation increase for the last few years with the total collective dose to NPP staff decreasing. High collective doses to SUNPP's and RNPP's staff in 2007 and 2009 resulted from increase in radiation-dangerous operations performed during NPP outages.

Figures 6, 7 and 8 (Annex 5) show the dynamics in airborne radioactive releases at Ukrainian NPPs for the last ten years.

Values of actual releases as recorded by the regular radiation monitoring systems at Ukrainian NPPs are much below the permissible levels, established taking into account appropriate dose limit quotas for Class B individuals (public).

Total indices (percentage ratio of actual release to the permissible one) of airborne releases to the environment in terms of main nuclides (noble radioactive gases, iodine radionuclides and long-lived radioactive nuclides: ^{137}Cs , ^{134}Cs , ^{60}Co , ^{54}Mn , ^{90}Sr) in 2009 accounted for

0.125 % at ZNPP, 0.519 % at RNPP, 0.224 % at SUNPP, 0.081 % at KhNPP. Figure 9 shows dynamics in total indices of airborne releases of radioactive substances into the environment at NPPs operated by the Company for the period from 2000 to 2009.

As one can see from Figure 9, over the recent years discharge and emission indices tend to stably reduce that consequentially reduces population irradiation on the territories adjacent to NPP sites. As for the last period starting from 2007, a high release index at RNPP is connected with the technique being introduced at RNPP and measurement and control activities related to tritium airborne releases through NPP ventilation stacks. The contribution of tritium into a total index of releases at RNPP accounts for 70 % (in 2007).

Total indices (percentage ratio of actual discharges to the permissible one) of registered water discharges to the environment in terms of main nuclides (^{137}Cs , ^{134}Cs , ^{60}Co , ^{54}Mn , ^{90}Sr , ^3H) in 2009 accounted for 1.16% at ZNPP, 0.92% at RNPP, 0.86% at SU NPP, 7.58 % at KhNPP. Figure 10 shows the dynamics in total indices of radioactive substance discharges into the environment at NNEGEC "Energoatom" NPPs for the period from 2000 to 2009.

As one can see from Figure 10, over the recent years discharge and emission indices tend to stably reduce that consequentially reduces population irradiation on the territories adjacent to NPP sites.

The state of the environment on the territory where nuclear installations are located is monitored by means of standard radiation monitoring systems in accordance with current regulations on radiation monitoring applicable at each NPP. The scope and methods of monitoring are prescribed in regulations.

There are several thousands of samples in the radiation control and sanitary-protective areas, which are selected annually for further inspection and control. They can give the irradiation picture as related to the surface air, surface water and components of terrestrial and aquatic ecosystems. Sample analysis of surface air in the area of NPP location shows the radionuclide composition to be predominantly presented by ^{137}Cs , ^{60}Co and ^{90}Sr nuclides.

In 2009 the radioactive substances content in the air of ZNPP boundaries constituted for ^{137}Cs – 0.9-2.3 mBq/m³, for ^{90}Sr – < 0.1 – 0.47 mBq/m³. At RNPP the content of ^{137}Cs radionuclide in atmospheric air varied from 2.4 to 20.8 mBq/m³. At SU NPP the content of radioactive materials in atmospheric air constituted for ^{137}Cs < 4,1 mBq/m³, and varied for ^{90}Sr – from 0.4 to 2.4 mBq/m³. At KhNPP the content of radioactive materials in atmospheric air varied for ^{137}Cs - from 1.5 to 4.3 mBq/m³, for ^{90}Sr – from 0/2 to 2.6 mBq/m³.

For all NPPs, the concentrations of radionuclides in the surface layers of atmosphere are essentially lower than the permitted values for these radionuclides and are at the "zero background" level.

Radiation Safety Standards of Ukraine (NRBU-97) that take into account recommendations of the international organizations, such as: as IAEA and ICRP, determine basic principles of radiation protection as applied to practical activities and intervention situations,

introduce a system of radiation and sanitary regulations to ensure established irradiation levels both for an individual and for the public. Specifically, they prescribe effective dose limits for A-class personnel (20 mSv/year) and for population (1 mSv/year), as well as external dose equivalent for lens, skin, wrist and foot that comply with ICRP recommendations Publication 60

The acceptable irradiation levels for individuals, public and environmental impact that do not exceed national dose limits are assured in Ukraine through legal framework developed according to recommendations of the IAEA and ICRP, system of radiation and hygienic regulations and effective organization and technical measures of the Operator.

5.7. Emergency Preparedness (Convention Article 16)

5.7.1. 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.

In the framework of the Unified State System of Prevention and Response to Man-made and Natural Emergencies (USSE) SNRCU is responsible for the functional subsystem “Safety of Nuclear Power Facilities” that is operating at national, regional and installation levels.

At the installation level, the subsystem is regulated by State Nuclear Safety Inspectorate at NPP, at the regional level – by State Regional Nuclear and Radiation Safety Inspectorate.

As for the national level, a key element of the subsystem is the Information and Emergency Centre (IEC) of SNRCU, whose activity was presented in the previous Reports. In 2009 the IEC of SNRCU installed and put into operation a Unit Data Transfer and Display System developed by SE NNEGC “Energoatom” according to NP 306.2.02/3.077-2003 “Requirements for NPP On-site and Off-site ERCs”. The Data Transfer and Display System provides real-time transmission of process and radiation data via landlines and space links.

To ensure legal framework for the USSE functional subsystem “Safety of Nuclear Power Installation” several important documents have been revised during the reporting period: Radiation Accident Response Plan (NP-306.5.01/3.083-2004), Agreement on Cooperation between SNRCU and Ukrainian Hydrometeorological Centre of the Ministry for Emergencies of Ukraine in the Field of Emergency Response, as well as Provision on the USSE functional subsystem “Safety of Nuclear Power Installation”. In 2009 was put into force a new Procedure for coordinating activities between SNRCU and Security Service of Ukraine in the Field of Information Exchange in Case of Emergency.

In the USSE framework the Ministry of Fuel and Energy of Ukraine is responsible for the functional subsystem “Nuclear Power and Fuel & Energy Complex”. Emergency Preparedness and Response System (EPRS) of SE NNEGC “Energoatom” is an integral part of this functional subsystem and interacts at all levels with government bodies by means of power and resources of USSE in all operating modes.

SE NNEGC “Energoatom” interacts with government authorities in the field of nuclear energy use, special authorized government authority on civil defense and State Regulatory Body for Nuclear and Radiation Safety of Ukraine, and in some cases – with other central government authorities through information exchange and direct involvement of their representatives in the activities of Commission on Emergencies of NNEGC “Energoatom”. This ensures that overall coordination of EPRS actions will be provided in case of a nuclear or radiation accident.

With the purpose of providing reliable communication in case of emergency, SE NNEGC “Energoatom” established satellite emergency communication and videoconferencing systems. A system of data storing, transfer, acquisition and processing for NPP process and radiation data was developed and implemented. Internal (on-site) and external (within an observation area) ERCs connected to the state communication systems was established at each NPP according to NP 306.202/3.077-2003 “Requirements to NPP internal and external ERCs”.

The list of effective fundamental documents on emergency preparedness and response of Energoatom’s EPRS was presented in the previous Report. During the reporting period SE NNEGC “Energoatom” developed and put into force STP 0.03.079-2009 “Methodology on measuring radiation criteria for NPP accident classification”, PL-D.0.03.480-09 “Provision on preparation, conduct and assessment of common plant emergency response exercises” and RG-D.0.03.454-08 “Standards procedure for information exchange between ERCs of NPP and IEC of SNRCU”.

Radiation Safety Standards of Ukraine (NRBU-97) set a requirement to carry out emergency exercises for the staff of the operating organization involved in emergency measures.

The full-scale plant emergency exercises are carried out one time for three year period at each NPP according to the “Schedule of Plant Emergency Exercises and Drills with SE NNEGC ‘Energoatom’ attended by representative of ministries and authorities, as well as by representatives of local government bodies” developed by SE NNEGC “Energoatom” and approved by SNRCU.

In 2008 exercise drills were conducted at KhNPP and RNPP; in 2009 a regional plant emergency exercises were conducted at SUNPP (as per MEU schedule) and plant emergency exercises at ZNPP. Such exercise drills are aimed at training and testing communication procedures between emergency response units of the operating organization and external organizations involved in emergency response. SNRCU takes part in such drills to assess the level of EPRS preparedness and supports the emergency preparedness level of its own EPRS.

5.7.2. Each Contracting Party shall use the appropriate steps to ensure that its own population and competent authorities of the States in the vicinity of the nuclear installation are provided with appropriate information for the emergency planning and response.

Taking into account recommendations of IAEA document EPR-ENATOM-2000 in regard to allocation of functions between national competent authorities and points of contact in

terms of the Convention on Early Notification of a Nuclear Accident and the Convention on Assistance in case of a Nuclear Accident or Radiological Emergency, the Cabinet of Ministers of Ukraine issued the Decree No. 1570 of 2 Octobers 2003 "On Appointment of Competent National Authorities for implementation of International Conventions in the field of nuclear energy use". Pursuant to this decree, SNRCU performs functions both of the single national point of contact maintaining twenty-four-hour duty service and functions of the national competent organization authorized to send and receive requests and proposals for assistance, as well as to accept proposals on assistance in case of nuclear and radiation accident.

In addition to the above mentioned international conventions, SNRCU is responsible for implementation of intergovernmental agreements with other countries, which envisage prompt mutual notification and follow up information exchange in case of nuclear accident or radiological emergencies. By 1 January 2010, Ukraine concluded 13 intergovernmental agreements with other countries, which envisage prompt mutual notification and follow up information exchange in case of a nuclear accident or radiological emergencies. Such agreements are concluded with Sweden, Turkey, Byelorussia, Slovakia, Hungary, Finland, Norway, Poland, Germany, Austria, Bulgaria, Latvia and Romania.

To implement these agreements, the ICC staff systematically are testing communications with competent authorities of the abovementioned countries. Additional communication testing is also performed during joint plant exercises at Ukrainian NPPs.

SNRCU also took part in such IAEA exercise drills like ConvEx-1a, ConvEx-2a and in ConvEx-2b intended for testing the communication with Emergency Response Centre of IAEA, as well as ConvEx-3 based on scenario of a simulated accident at Laguna-Verde NPP in Mexico.

According to the requirements of "Provision on Organizing Notification and Communication in Emergency Cases" approved by the Decree No. 192 issued by the Cabinet of Ministers of Ukraine on 15 July 1999, the Ukrainian Notification System is integrated into the Unified National Communication System, whose organizational chart was presented in the previous Report.

The Operator - SE NNEGC "Energoatom" ensures that population living in the vicinity of NPP will be provided with appropriate information on radiation risks entailed by NPP operation, by implementing regular measures through:

- distributing information materials and publications of relevant content to government authorities of different level, mass media and public organizations, as well as on official Internet resources and printed publications of Ukrainian NPPs;
- replying to requests of public society, mass media, government authorities of different level and etc.;
- holding lectures followed by visits to NPP facilities for population of 30-km area around NPP, including schoolchildren;
- TV and radio broadcasting of topical programs, statements by NPP management and

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specialists, as well as through development and distribution of special printed publications and information materials (posters, booklets, leaflets and etc.) among population of the surveillance area.

The emergency response and preparedness system is being developed and continuously improved in Ukraine.

The emergency planning system foresees verifications of emergency preparedness at the state and installation levels by conducting emergency drills and exercises.

Measures are provided on informing population, public institutions and international organizations.

SECTION VI. SAFETY OF INSTALLATION

6.1. Siting (Convention Article 17)

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

6.1.1. Evaluating all relevant site-related factors likely to affect the safety of a nuclear installation for its projected lifetime.

The requirements for siting are established by Ukrainian legislative and regulatory documents. The decision-making procedure and requirements for materials which justify a need for building a nuclear installation are determined in Article 37 of Law of Ukraine “On Nuclear Power Utilization and Radiation Safety”.

The submittals must necessarily include the following:

- characteristics of the environment in the area of possible location of an installation;
- assessment of impact on the public and the environment (EIA) resulted from the planned civil works, commissioning, operation and decommissioning;
- designed measures to prevent an adverse impact on the environment and to mitigate this impact.

Criteria for evaluating factors that can affect safety of nuclear installation are determined in regulations on nuclear and radiation safety, as well as, by the state civil engineering standards. These documents identify indexes, which characterize natural, economic and demographic conditions in the site area, data of the pre-operational monitoring of the environment, and meteorological, whether, geological, seismological, hydrological, hydro geological, engineering-geological and geochemical characteristics.

SNRCU has elaborated and implemented the regulatory document “Safety Requirements for Siting of NPP” that sets up safety requirements for siting of a nuclear power plant and takes into account the IAEA’s recommendations (NS-R-3).

6.1.2. Evaluating the likely safety impact of the proposed nuclear installation on individuals, society and the environment.

The legislative and regulatory documents of Ukraine regulate the evaluation of potential safety impact of the nuclear installation on individuals, society and the environment.

In accordance with the legislation of Ukraine, the potential safety impact of a nuclear installation is evaluated through a state ecological review.

In accordance with Article 13 of the Law of Ukraine “On Ecological Review”, the state ecological review is organized and conducted by ecological expert departments, specialized institutions, organizations or specially established committees of the authorized central executive authorities of the Ministry for Environment and Natural Resources of Ukraine.

Under Article 36 of the Law of Ukraine “On Ecological Review” the environmental impact assessment of the planned or on-going activity shall justify its usefulness and ways of implementation, possible alternative solutions, characteristics of the environment, types and levels of environmental impact under normal and extreme conditions, possible changes in its qualitative state, ecological and economic consequences of activity, measures to reduce ecological risk and meet ecological safety requirements.

As a rule, the state ecological review is carried out either as an integral part of the state comprehensive review or as an individual review when it is not aimed at evaluating the construction design but EIA materials developed as individual document are not included in the design documentation.

SNRCU grants a license provided that there is a positive conclusion of the state ecological review and other reviews required by the legislation.

The most recent ecological review carried out in Ukraine was performed within feasibility study for KhNPP-2 and RNPP-4 completion.

6.1.3. Re-evaluating as necessary all the above relevant factors to ensure the continued safety acceptability of a nuclear installation.

Under Article 33 of the Law of Ukraine “On Nuclear Power Utilization and Radiation Safety”, an Operator must, following the rules, standards and norms on nuclear and radiation safety, periodically re-assess the safety of a nuclear installation or radioactive waste storage facility and report on its results to SNRCU.

The safety reassessment is also carried upon SNRCU's request in case of substantial changes in the design of storage facility, and if operating experience clearly shows deficiencies of the previous assessment.

In order to keep the acceptable safety level and to ensure timely corrective measures, re-assessments of appropriate factors and characteristics of the area where the nuclear installation site is located can be carried out as necessary. Such re-assessment is required in the following cases:

- decision made on location of an additional nuclear installation on site (in Ukraine such re-assessment was carried out through state ecological review at ZNPP connected with construction of a spent nuclear fuel storage facility and at KhNPP and RNPP in connection with construction of power units);
- new scientific data that indicate the need to revise the input data of natural factors incorporated in the design (research was carried out at RNPP to predict possible development of internal erosion and karst processes; additional seismic investigations were carried out at ChNPP and SUNPP – detailed information is provided in it. 5.1.3 of the Fourth Report);
- negative trends in monitoring data (hydro geological, engineering-geological, etc.), for example, subsidence or sloping of buildings.

In order to prevent negative impacts, which can result from the combination of man-made and natural factors with equipment failures, SNRCU, while establishing requirements for

the content of safety analysis reports on nuclear installations, emphasized the need for in-depth analysis of the factors.

6.1.4. 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.

Under the State Civil Engineering Standards of Ukraine, if there is a likely impact of the planned activity on the territory of neighboring states, transboundary EIA is to be developed according to the “Convention on Environmental Impact Assessment in a Transboundary Context” ratified on March 19, 1999 by Law of Ukraine No. 534-XIV “On Ratification of the Convention on Environmental Impact Assessment in a Transboundary Context”.

In 2008 a declaration of intent was issued in mass media regarding construction of Khmelnytsky NPP Unit 3 and 4.

A feasibility study is now carried out for construction of KhNPP Unit 3 and 4. The Section titled “Environmental Impact Assessment” envisages evaluation of transboundary transfer consequences under normal and emergency conditions.

In 2008 a report was elaborated concerning measures aimed at notification of neighboring states of a potential transboundary impact of a Central Storage Facility for Spent Nuclear Fuel from WWER reactor of Ukrainian NPPs. In 2009 the Cabinet of Minister of Ukraine approved the feasibility study for investments into construction of the Central Spent Nuclear Fuel Storage Facility for Ukrainian NPPs with WWER reactor.

Under Law of Ukraine No. 2861-IV of 08.09.2005 “On Decision Making Procedures for Siting, Designing, Construction of Nuclear Installations and Radioactive Wastes Management Facilities of National Importance”, the reports on measures aimed at notification of neighboring states of a potential transboundary impact shall be developed for new nuclear installations and facilities of national importance designed for radwaste management.

Ukraine has developed the legislative and regulatory basis to ensure compliance with the justification principle of the ionizing radiation- related activity.

Scheduled and special evaluations and re-assessments of natural and man-made factors are regularly carried out according to the established procedure .

While siting and building new nuclear installations, the measures imposed by the law must be taken to inform neighboring states of any potential impact in the transboundary context.

6.2. Design and Construction (Convention Article 18)

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

6.2.1. The design and construction of a nuclear installation provides for several reliable levels and methods of protection (defence 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.

In 2008 SNRCU put into force the regulatory document “General Provisions on Safety Assurance of Nuclear Power Plants” (NP 306.2.141-2008) that take into account IAEA recommendations specified in the General Provisions of Nuclear Power Plants Safety (INSAG-12). This document identifies safety criteria, fundamental, general organizational and technical safety requirements with defense-in-depth safety strategy based and implemented at five levels with application of:

- a system of successive physical barriers on the way of spreading of ionizing irradiation and radioactive substances into environment;
- a system of technical and organizational measures aimed at protection of physical barriers and keeping their efficiency.

The designs of all nuclear installations constructed in Ukraine after the implementation of this and other regulations were subjected to revision regarding their compliance with the established requirements. Upon discovered inconsistencies, measures have been developed and implemented to remove these inconsistencies. Project on modernization and reconstruction of NPP are elaborated according to requirements of new safety regulations.

The technical and organizational measures incorporated in design to prevent any damage of physical safety barriers, to strengthen defence-in-depth safety levels, to prevent limits and conditions of safe operation and design-basis accidents from being violated, to mitigate their consequences, ensure safety in any of the design-basis initiating event.

Based on the results of the Joint Project EC-IAEA-Ukraine on the comprehensive safety assessment of NPPs in the area of design safety, international experts confirmed that there was no inconsistency discovered at Ukrainian NPPs as related to IAEA NS-R-1 requirements.

6.2.2. The technologies incorporated in the design and construction of a nuclear installation are proven by experience or qualified by testing or analysis.

Pursuant to the regulatory document “General Provisions on Safety Assurance of Nuclear Power Plants” (NP 306.2.141-2008) the technical and organizational decisions made to upgrade and improve the safety level incorporate scientific and technical achievements and are implemented in accordance with the established requirements, namely: they should be proven by the experience or by trial operation. The upgrading requirements are imposed in SNRCU's regulation “Requirements for nuclear installation modifications and for procedure of their safety evaluation” (NP 306.2.106-2005), which was developed based on IAEA NS-G-2.3.

Pursuant to regulations and rules on nuclear and radiation safety, the licensing procedure provides for the need to introduce at first a technology at a “pilot” power unit and then, after having acquired favorable results of trial operation, to adapt this measure to other power units. This procedure fully complies with the international experience and permits implementing the measures on the basis of the operating experience and proven practice.

Thus, new computer information and safety-related control systems (emergency and preventive protection, neutron flux monitoring) that were developed using up-to-date information technology and new element base, were implemented at Ukrainian NPPs in pilot operation mode. These systems were implemented at new power units of RNPP and KhNPP only after results of their trial operation were obtained and analyzed.

The introduction of new nuclear fuel design at RNPP-2 was preceded by its few years' implementation at NPPs with WWER reactor (Kola NPP (Russian Federation), Dukovany NPP (Czech Republic), Mohovce NPP and Bogunice NPP (Slovakia)).

Pilot-operated safety devices of steam generators, primary pressurizers, the containment hydrogen afterburning and monitoring system are implemented following the same procedure.

Based on results of the IAEA's full scale expert review “Comprehensive Overview of Regulating Activity”, international experts confirmed a good practice – applying “pilot approach” concept to obtain permit for similar modifications on several plants is efficient if appropriate attention is given thereby to plant differences.

6.2.3 The design of a nuclear installation allows for reliable, stable and easy manageable operation, with specific consideration of human factors and the man-machine interface.

As for design, operation and maintenance activities, the effective regulating documents on nuclear safety must take into account the means aimed at preventing personnel errors or mitigating their consequences (account of human factor).

To prevent and mitigate consequences of personnel errors the following organizational and technical measures are implemented:

- selection and high quality training of personnel, as well as constant improvement of its qualification;
- analysis and elimination of shortcomings in personnel work and training;
- appropriate use of I&C equipment;
- using facilities for diagnostics (monitoring of conditions), transmission of diagnostic notifications and providing information on conditions of structures, systems and elements important to safety;
- construction of central, unit and local control rooms detecting and preventing erroneous actions of personnel;
- using reliable and high quality communication system of central and unit control rooms with local ones and stations;
- continuous improvement of production and duty procedures, technical regulations, emergency operating procedures, guidelines on beyond design basis accident

management, methods and technical means for monitoring of conditions of structures, systems and elements important to safety;

- department control;
- adherence to and continuous improvement of safety culture.

According to requirements of new safety regulatory documents, the projects on NPP modernization and rehabilitation are elaborated with account of human factor, introduction of systems and technical means for diagnostics of operational modes and conditions, including self-diagnostics of hardware and software.

The design incorporated in Instrumentation and Control System of NPP provides the operator with information support system and system of displaying summarized information for personnel on the current safety status of reactor facility and NPP unit as a whole.

The I&C incorporated in design and introduced at power units ensure the most favorable conditions for enabling the operating personnel to make correct decisions on NPP control, to minimize erroneous decisions, as well as to ensure collecting, processing, documenting and storing appropriate data sufficient for prompt and reliable identification of initial events resulting in malfunction of normal operation and accidents, their progress, setting actual working procedure for safety systems and elements important to safety (especially those referred to Safety Classes 1 and 2), deviations from standard algorithm of personnel actions. Measures are implemented aimed at keeping information in beyond design basis accident conditions.

Ukraine assures actual compliance with requirements on implementation of new technologies with account of favorable experience or trial operation, as well as human factor.

6.3. Operation (Convention Article 19)

6.3.1. Each Contracting Party shall take the appropriate steps to ensure that the initial authorization to operate a nuclear installation is based upon an appropriate safety analysis and a commissioning programme demonstrating that the installation, as constructed, is consistent with design and safety requirements.

The legal framework of licensing procedure for obtaining initial permission to operate nuclear installation at an individual lifetime stage is determined by the Laws of Ukraine “On Nuclear Power Utilization and Radiation Safety”, “On Licensing in the Field of Nuclear Power Utilization” and “On Amendments to the Law of Ukraine on Licensing in the Field of Nuclear Power Utilization”, as well as in regulating document “General Provisions on Safety Assurance of NPPs” (NP 306.2.141-2008).

The license granted to the Operator for implementing activities at the separate lifetime stage envisage terms that determine type of works and operations that are permitted to be carried out during construction, commissioning and operation of nuclear facility provided that there is a written permit issued by SNRCU. The terms and procedure of issuing these permits are determined by SNRCU and specified in safety regulations and rules.

No new nuclear facilities were commissioned in Ukraine during the reporting period.

6.3.2. 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.

The technical procedures is the fundamental document describing safe operation of NPP, which specifies limits and terms of safe operation, requirements and basic methods of unit's safe operation, as well as general procedure for operations related to NPP safety.

Technical procedures for safe operation are elaborated according to NPP design, SAR and technical documentation on equipment.

Limits and conditions of safe operation are constantly monitored and adjusted based on the analysis of operational experience, assessment of the current safety level, new scientific and technical information, in connection with equipment upgrading and new systems introduced, as well as in accordance with new regulations that were developed and put into force.

For example, the RG-B.0.03.179-09 "Standard Procedure for Safe Operation of NPPs with WWER-1000 Reactor" was amended as related to the following positions of operational limits and conditions in transient modes:

"Preparation of RI for commissioning" as a result of amendments made to SAR of KhNPP; putting into force of new regulatory documents, technical industry solutions, operational procedures;

"On-Load Unit Operation" as results of amendments made to TSS of RF;

"Power Unit Shutdown" as result of amendments made to SAR of KhNPP-2 and operational procedures;

"Reactor Facility Operation in Refueling Mode" "Fuel Handling" as result of amendments made to design documentation.

6.3.3. Operation, maintenance, inspection and testing of a nuclear installation are conducted in accordance with approved procedures.

Operation, maintenance, inspection and testing of a nuclear installation are conducted in accordance with the approved unit technical specifications of safe operation, operating and inspection procedures.

During the reporting period all NPPs were adjusted to new technological procedures for safe operation of NPPs with WWER-1000/V-320 elaborated following Technological Procedure RG-B.0.03.179-07 for Safe Operation of a Pilot Unit with WWER-1000 (B-320) Reactor (00.00.00.RG.01) (TPSO) and other NPPs with WWER-440 and WWER-100 (V-338, V-302). The existing TPSO is subject to scheduled review according to the established procedure.

In order to maintain the capability of safety-related systems to comply with design requirements, regular maintenance, repair and inspection are carried out. These activities are arranged in compliance with instructions, programs and schedules and are carefully recorded. The conditions of maintenance, repair and inspection of safety systems are specified in the NPP SAR and respective regulations. The administrative and technical measures are determined to avoid any potential of unauthorized changes in the circuits, instrumentation and algorithms of safety control systems. After maintenance and repair, the systems and equipment are checked for operability and compliance with design characteristics with results being documented.

The operability of safety systems, safety-related systems, monitoring and control means and state of the base metal and welds of safety-important systems and components are inspected prior to NPP commissioning and within the established periods as required by technical specifications and operating procedures. The frequency and scope of periodic inspections are determined in the design and are established by schedules elaborated by NPPs. Unscheduled inspections can be conducted upon demand of the regulatory body.

The tests that are not identified by technical specifications and operating procedures are conducted upon special permission issued by SNRCU. In order to get such permission, the nuclear and radiation safety of these tests have to be justified.

During the reporting period OSART Mission and WANO peer review at KhNPP and scheduled inspections were conducted by SNRCU.

During implementation of the Joint Project EC-IAEA-Ukraine on the comprehensive safety assessment of Ukrainian NPPs in the area of “NPP Operational Safety” the following OSART Missions were carried out:

- full-scale mission to RNPP-3 and 4;
- limited mission to SUNPP-1 and 2;
- follow-up missions tot SUNPP-3 and KhNPP-1 and 2;
- expert review missions to all four sites.

Based on results of the missions, experts came to a conclusion that operational safety of Ukrainian NPPs is consistent with most of IAEA requirements and recommendations.

Measures are currently being implemented by Ukrainian NPPs with purpose of solving outstanding issues in the areas with partial compliance.

NNEGC “Energoatom” conducts internal inspections in accordance with the approved programs, such as: “The Standard Program on Inspection of NPP Nuclear Safety” and “The Program on Inspection of Safety Culture at the separate entities of NNEGC “Energoatom” etc. As a result of inspections, corrective measures have to be developed and implemented to eliminate safety deficiencies.

The results of internal inspections performed by the NNEGC “Energoatom” intended to check the safety status, as well as periodic reports on the current safety level have to be submitted by the Operator to the regulatory body. The frequency of submission and requirements for the content of reports are specified by regulatory documents.

In 2010 a new procedure was introduced envisaging that unit outage completion is preceded by inspections carried out by the operating organization as related to conducting scheduled repair works, measures of effective state and industrial programs (for safety support and improvement, modifications, lifetime extension of power units, RAW management etc.), license terms, separate permission for commissioning power unit after outage followed by refueling, inspection of power unit availability to be commissioned and its safe operation with appropriate conclusion submitted to SNRCU.

6.3.4. Procedures are established for responding to anticipated operational occurrences and to accidents.

At present, the following documents defining actions to be taken in response to events and anticipated accidents at NPPs are in force in Ukraine:

- Instructions on elimination of accidents and emergencies at the reactor facilities (ILA);
- Guidelines on Beyond-design Basis Accident Management (GBDBAM);
- Operating organization's plans on emergency and accident response at Ukrainian NPPs;
- Plans on public protection in case of man-caused and natural emergencies of regional and national levels.

According to IAEA recommendations (NS-G-2.2), the emergency operating procedures (EOPs) were developed taking into account the international experience obtained in the area of replacement of ILA and GBDBAM. The EOPs determine actions of personnel in case of design-based and beyond-design basis accidents and are based on reactor state, symptoms and modes anticipated during transient progress, emergencies and accidents.

To date, EOPs were implemented at ZNPP No. 1-6, SUNPP No 1-3, RNPP-1 and 4. The EOPs for RNPP No 2&3 and KhNPP No 1&2 were submitted to SNRCU for approval. The implementation of EOPs for these units is expected to be completed in 2010.

SE NNEGC "Energoatom" has carried out training and examination of operating personnel of NPPs on EOPs application. Company's administrative and technical personnel of different level and state inspectors of SNRCU were trained in EOPs fundamentals. The full scale simulators of ZNPP-1,3,5, SUNPP-1,3, RNPP-1,3 and KhNPP-1 have been brought into compliance with requirements on EOPs operations and are used for training practical skills as related to actions of operating personnel in case of EOPs application.

In 2010 the peer reviews were carried out at SUNPP-1 and 2 to ensure mutual learning, summarizing of operational experience, information exchange on solving outstanding issues, familiarization, review and assessment of efficiency of organizational and technical measures implemented by SE SUNPP in terms of EOPs. The report based on the results of the peer review was submitted to NPP for further use during operation. The peer review results have confirmed its usefulness, as planned to be carried out in future.

6.3.5. Necessary engineering and technical support in all safety-related fields is available throughout the lifetime of a nuclear installation.

SE NNEGC “Energoatom” provides the permanent engineering and technical support through constant communication with Ukrainian scientific and design engineering institutes, as well as the Russian Federation organizations that took part in NPP design and now continue to provide engineering support (for example: the Russian Scientific Centre “Kurchatov Institute”, OKB “Gidropress”, FSUE “SSC RF RIAR” etc.). The effective Agreement on scientific and technical cooperation between SE NNEGC “Energoatom” and the National Academy of Sciences of Ukraine envisages planning and implementation of scientific and engineering activities.

Within SE NNEGC “Energoatom”, the engineering and technical support is provided by the Scientific and Technical Centre (Separate Entity “STC”) together with special subdivisions of NPPs (safety analysis service, departments of production manager and chief specialists etc.). In particular, divisions dealing with engineering and technical support develop regulations and methodologies, ensure planning and support of measures on modernization, safety and reliability improvement of Ukrainian NPPs.

Engineering and technical support activities at the stage of decommissioning of ChNPP units and Shelter Object transformation into ecologically safe system are carried out by structural divisions of SSE Chernobyl NPP and contracting organizations.

The Institute for Safety Issues of Nuclear Power Plants of the Academy of Sciences of Ukraine is the official research manager of works on safe operation of the Shelter Object, its transformation into ecologically safe system and decommissioning of ChNPP units. To support solving of several issues, national and foreign industrial enterprises are involved in cooperation in different areas.

As for stabilizing works carried out at Shelter Object, it should be mentioned that Ukrainian KSK Consortium is a designer of project on stabilization. The KSK Consortium includes the OJSC Scientific-Research and Design Institute “Energoatom” (KIEP), State Scientific Research Institute of Building Constructions (NIISK) and Interbranch Scientific and Technical Center “Shelter” (ISTC) transformed into the Institute for Safety Issues of Nuclear Power Plants of the Academy of Sciences of Ukraine.

6.3.6. Incidents significant to safety are reported in a timely manner by the holder of the relevant license to the regulatory body.

Under the “General Provisions on Safety Assurance of Nuclear Power Plants”, the operator is held responsible for completeness and quality of investigations, timely submission of investigation findings to the state regulatory body and development and implementation of measures to prevent further violation of normal operation and accidents.

Information on all violations of normal operation, emergencies and accidents that occur at NPPs is communicated to the state regulatory body.

Investigations are carried out in compliance with SNRCU’s document NP 306.2.100-2004 “Procedures for Investigating and Accounting NPP Operational Events”, which determines:

- procedure for investigation of events (establishing an investigation commission, determining direct and route causes, assessing them in terms of safety impact,

- developing corrective measures);
- procedure for events accounting;
- procedure for notification about events occurred in NPP operation.

In case of any operational event occurred at NPP, the following has to be submitted to the regulatory body and other organizations:

- immediate notification of the event (within an hour);
- preliminary notification of the event (within 24 hours);
- additional notification of the event (within 5 days following its occurrence in case of any changes revealed);
- report on investigation of the event (within 5 days following completion of the investigation commission's work);
- report on implementation of corrective actions specified upon the findings of investigation of events occurred in NPP operation (quarterly for each NPP).

If necessary, representatives of the state regulatory body and operating organization are involved in the event investigation commission.

A report on the event investigation is sent to all Ukrainian NPPs, operating organization and regulatory body. The NPP management reviews this report, makes it available to the subordinate personnel for familiarization, holds necessary briefings, and, if necessary, supplements or adjusts personnel training programs.

The Operator reviews this report (analysis of level 2 events) and, if necessary, requests NPP to conduct additional investigation or adjust and supplement this report. The operating organization sends a letter-demand to other NPPs to take appropriate corrective measures at these NPPs, if an event is of a branch generic character.

The corrective measures to eliminate the event consequences and avoid re-occurrence of such events must be implemented. All these measures have to be listed in the respective work implementation programs.

SNRCU analyses all events that occurred during the current year and supervises associated investigations, development of preventive and corrective measures and their implementation. Based on the analysis of investigations, data for the previous years are compared annually with those for the current year. If necessary, appropriate regulatory decisions are made.

In 2009:

- the number of reported events decreased as compared to that recorded in 2008 (22 in 2008 against 21 in 2009);
- there were no violations of limits and conditions of safe operation;
- there were no actuations of safety systems for the direct purpose under the mode not related to the assurance of a safety function.

Over the first 6 months of 2010 the number of events occurred at Ukrainian NPPs increased as compared to the similar period in 2009 (4 and 3 events, respectively).

6.3.7. Programmes to collect and analyze operating experience are established, the results obtained and the conclusions drawn are acted upon and existing mechanisms are used to share important experience with international bodies and with other operating organizations and regulatory bodies.

The Operator provides for collecting, processing, analyzing and storing of information on equipment failures and personnel erroneous actions, ensures systematization and on-line transfer of the information obtained. The information on equipment failures and personnel errors is included into annual reports on current safety status.

Safe operation of NPPs is supported by an information database on incidents, which is an integral part of the unified information system of the operating organization – “Information System on Operational Events at Ukrainian NPPs”.

The system provides for collection, analytical processing of information and information exchange with the similar information systems of the state regulatory body.

The following programs were implemented by NNEGC “Energoatom” with the purpose of exchanging information on the operational experience:

- Ukrainian database on reliability (for engineering support of equipment flaw detection system and determination of reliability characteristics of safety-related equipment and systems).
- Information system of operational events (for collecting, processing, analyzing and storing of information on equipment failures and personnel errors).
- System for assessing operational safety and technical state of NPPs with WWER (for preparing reports on NPP performances and current safety state of power units).

The operating experience is thoroughly reviewed. To perform these tasks, special departments were established in the operating organization. The IAEA and WANO are regularly informed of significant events on the basis of bilateral information exchange.

The appropriate communication is maintained with NPP designers, research institutions and equipment manufacturers to familiarize them with the operating experience and to get their respective recommendations, if necessary.

6.3.8. 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.

The design of each NPP provides for process systems and facilities for collection and preliminary treatment of solid and liquid radioactive waste directly on-site. NPP management ensures the account of the amount, movement and location of all fissile and radioactive materials, fresh and spent fuel, dismantled equipment, contaminated tools, clothing, radioactive waste (RAW) and other radiation sources.

In the framework of National Environment Program on RAW Management, “RAW Management Program of NNEGC “Energoatom” ” and “Minimization of Radioactive

Wastes of NPP”, technical measures are scheduled and implemented to develop comprehensive lines on RAW processing and conditioning, introduction of separate installations, e.g. for removal, implementation of state-of-the-art technologies for conditioning etc.

Pursuant to the regulatory safety requirements, each NPP has its Program on radwaste management (minimization) that is implemented under continuous supervision of SNRCU.

Special attention is given to measures on construction and commissioning of Complexes for liquid and solid radwaste treatment that allow reducing the amount of radwaste already accumulated and those being generated during current operation. In the framework of the international assistance projects complexes for SRAW processing are expected to be put into operation at ZNPP and RNPP in 2015. In the framework of the regulatory monitoring SNRCU has assessed design materials that are related to commissioning of:

- deep evaporation facilities intended for liquid radwaste at South Ukraine NPP;
- centrifugation facilities at Khmelnytsky NPP;
- solid radwaste processing complex at Rivne NPP and Zaporizhzhya NPP.

The work is currently carried out to develop acceptance criteria for conditioned RAW for disposal, concurrence of unified containers, improvement of RAW classification, development of regulatory and methodological documentation for clearance of contaminated and other materials from regulating control.

In the period of 2008-2009 the assessment was carried out for compliance of Ukrainian NPPs with IAEA safety standard on RAW management and decommissioning with 22 requirements in the area of RAW management and 9 requirements for decommissioning.

The detailed information on radioactive waste management at NPPs is provided in Ukraine's National Report on Compliance with the Obligations of the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management.

Ukraine consistently pursued the principles of the state policy regarding authorization in the use of nuclear energy.

The Operator assures compliance with the requirements of technical specifications of NPP safe operation developed and approved in accordance with the established procedure, as well as revision and amendment of this document taking into account the acquired experience and operating practices.

Ukrainian NPPs developed appropriate guidelines and procedures for governing the staff's actions in case of emergencies. A mechanism was created for examining personnel's knowledge of these documents and verifying the efficiency of the established requirements and provisions.

A well-developed system of engineering and technical support of the installation and branch level assures resolving of safety issues throughout all life cycle of nuclear installations.

Ukraine has created and implemented a mechanism for notifying the regulatory body of safety-related incidents, investigating these incidents, taking correcting actions and monitoring their implementation.

Ukrainian NPPs created and maintain databases within the unified information system intended for the collection, accumulation, processing, analysis and generalization of results of experience, operational practice and appropriate areas of knowledge, as well as the information exchange.

ANNEX 1: LIST OF NPPS OPERATED IN UKRAINE**1. Power Units in Operation**

NPP	Power Unit No.	Power capacity, MW	Reactor Type	Date of Commissioning
Zaporizhzhya	1 2 3 4 5 6	1000 1000 1000 1000 1000 1000	All V-320	December 1984 July 1985 December 1986 December 1987 August 1989 October 1995
South Ukraine	1 2 3	1000 1000 1000	V-302 V-338 V-320	December 1982 January 1985 September 1989
Rivne	1 2 3 4	420 415 1000 1000	V-213 V-213 V-320 V-320	December 1980 December 1981 December 1986 October 2004
Khmelnysky	1 2	1000 1000	V-320 V-320	December 1987 August 2004

2. Power units to be constructed

NPP	Power Unit No.	Power capacity, MW	Reactor Type	Date of Commissioning (as scheduled)
Khmelnysky	3 4	1000 1000	V-392	Initial project preparation is underway

3. Shut-down Power Units

NPP	Power Unit No.	Reactor Type	Date of Operation Termination
Chornobyl	1	RBMK-1000	30 November 1996
Chornobyl	2	RBMK -1000	11 October 1991
Chornobyl	3	RBMK -1000	15 December 2000
Chornobyl	4 -Shelter Object	Destroyed reactor RBMK -1000	26 April 1986

ANNEX 2: LIST OF THE MAIN LEGISLATIVE AND REGULATORY DOCUMENTS APPLICABLE IN THE FIELD OF NUCLEAR POWER UTILIZATION PUT IN FORCE IN 2008-2010

1. Legislative Acts

- 1.1 Law of Ukraine No. 356-VI “On Ratification of Amendment to the Convention on Physical Protection” dated 03 August 2008.
- 1.2 Law of Ukraine No. 515-VI “On Amendments to Some Laws of Ukraine on Radioactive Waste Management” dated 17 September 2008.
- 1.3 Law of Ukraine No. 516-VI “On State Ecological Programme For Radioactive Waste Management” dated 17 September 2008.
- 1.4 Law of Ukraine No. 886-VI “On National Program of Chernobyl NPP Decommissioning and Shelter Object Transformation into Environmentally Safe System”
- 1.5 Law of Ukraine No. 1393-VI “On Amendments to Some Laws of Ukraine on Full Implementation of State Regulation Functions on Nuclear and Radiation Safety” dated 21 May 2009.
- 1.6 Law of Ukraine No. 1546-VI “On Amendments to Article 2 of the Law of Ukraine On Fundamentals of State Supervision (Control) in Economic Activity on Ensuring Nuclear Energy Safe Use” dated 23 June 2009.
- 1.7 Law of Ukraine 1566-VI “On Amendments to the Law of Ukraine On Decision Making Procedure for Siting, Designing and Construction of Nuclear Installations and Radwaste Management Facilities of National Importance and Other Laws of Ukraine on Improvement of Decision-Making Procedure” dated 25 June 2009.
- 1.8 Law of Ukraine No. 1704-VI “On Building Standards” dated 05 November 2009.
- 1.9 Law of Ukraine No. 1718-VI “On Amendments to Some Laws of Ukraine Due to Ratification of Amendment to the Convention on the Physical Protection of Nuclear Material” dated 17 November 2009.
- 1.10 Law of Ukraine No. 1565-VI “On Amendments to Some Laws of Ukraine On Settlement of the Issues of Social Protection of the Population Residing on the Territory of Monitored Zones of Plants for Mining and Processing Uranium Ores and Territory of Nuclear Installations and Objects Designated for Radioactive Waste Management” dated 17 November 2009.
- 1.11 Law of Ukraine No. 1874-VI “On Amendments to the Law of Ukraine On Licensing in the Field of Nuclear Power Utilization” dated 11 February 2010.
- 1.12 Law of Ukraine No. 1813-VI “On Ratification of Grant Agreement (Nuclear Safety Project for ChNPP) between European Bank for Reconstruction and Development (Owner of Nuclear Safety Account), the Cabinet of Ministers of Ukraine and State Nuclear Regulatory Committee of Ukraine (Recipient)” dated 20 January 2010.

2. Legal acts of the Cabinet of the Ministers of Ukraine

2.1 Resolution of the Cabinet of Ministers of Ukraine No. 809 dated 10 September 2008 “On Setting Raise for State Inspectors of State Nuclear Regulatory Committee of Ukraine Working Under Special Conditions”.

2.2 Resolution of the Cabinet of Ministers of Ukraine No. 923 dated 08 October 2008 “On Procedure for Commissioning of the Completed Objects”.

2.3 Resolution of the Cabinet of Ministers of Ukraine No. 921 dated 17 October 2008 “On Approval of the Provision on Procurement of Goods, Works and Services for Public Funds”.

2.4 Resolution of the Cabinet of Ministers of Ukraine No. 976 dated 05 November 2008 “On Approval of the Procedure for Facilitating Public Examination of Government Bodies Activity”.

2.5 Resolution of the Cabinet of Ministers of Ukraine No. 1162 dated 27 December 2008 “On Approving Qualification Requirements for Head and Deputy Heads of the Government Bodies in the Field of Nuclear Power Utilization, Radwaste Management and State Regulatory Bodies on Nuclear and Radiation Safety”.

2.6 Resolution of the Cabinet of Ministers of Ukraine No. 118 dated 18 February 2009 “On Primary Measures for Construction of Khmelnytsky Unit No. 3 and 4”.

2.7 Resolution of the Cabinet of Ministers of Ukraine No. 257 dated 25 March 2009 “On Amendments to Provision on State Accounting and Control System for Nuclear Materials”.

2.8 Resolution of the Cabinet of Ministers of Ukraine No. 323 dated 08 April 2009 “On Amendments to the Resolution No.480 of 29 April 1996 of the Cabinet of Minister of Ukraine and Invalidation of Some Resolutions of the Cabinet of Ministers of Ukraine on Radwaste Management”.

2.9 Resolution of the Cabinet of Ministers of Ukraine dated 24 April 2009 “On Amedment to the Resolution of the Cabinet of ministers of Ukraine No. 303 dated 01 March 1999”.

2.10 Resolution of the Cabinet of Ministers of Ukraine No. 571 dated 10 June 2009 “On Amendment to Article 4 of the Provision on State Nuclear Regulatory Committee of Ukraine”.

2.11 Resolution of the Cabinet of Ministers of Ukraine No. 770 dated 17 June 2009 “On Peculiarities of Procuring Goods, Works and Services for Lifetime Extensions and Implementing Measures Aimed at Safety Improvement of the Operating Power Units”.

2.12 Resolution of the Cabinet of Ministers of Ukraine No. 352 dated 19 May 2010 “On Approval of the Procedure for Charges on Social and Economic Remuneration for Risks of Population Residing on the Territory of Plant Monitored Area”.

2.13 Decree of the Cabinet of Ministers of Ukraine No. 1307-p dated 08 October 2008 “On Approval of Action Plan for Implementation of Recommendations and Proposals During IAEA Mission “Integrated Regulating Activity Survey” (IRRS)”.

2.14 Decree of the Cabinet of Ministers of Ukraine No. 1299-p dated 08 October 2008 “On Approval of the Conception for Construction of New Multifunction Research Nuclear Reactor”.

2.15 Decree of the Cabinet of Ministers of Ukraine No. 1578-p dated 17 December 2008 “On Amendments to the Action Plan for 2006-2010 On Implementation of the Energy Strategy of Ukraine till 2030”.

2.16 Decree of the Cabinet of Ministers of Ukraine No. 131-p dated 04 February 2009 “On Approval of Feasibility Study for Investments into Construction of Centralized Spent Nuclear Fuel Storage Facility for Ukrainian NPPs with WWER Reactor”.

2.17 Decree of the Cabinet of Ministers of Ukraine No. 216-p dated 25 February 2009 “On Approval of the Conception of State Target Economic Programme “Nuclear Fuel of Ukraine””.

2.18 Decree of the Cabinet of Ministers of Ukraine No. 990-p dated 19 August 2009 “On Approval of Radwaste Management Strategy in Ukraine”.

2.19 Decree of the Cabinet of Ministers of Ukraine No. 1635-p dated 23 December 2009 “On Approval of the Action Plan On Liabilities and Measures in the Framework of Global Initiative to Combat Nuclear Terrorism till the end of 2010”.

2.20 Decree of the Cabinet of Ministers of Ukraine No. 299-p dated 24 February 2010 “On Amendments to the Action Plan for 2006-2010 On Implementation of the Energy Strategy of Ukraine till 2030”.

3. Regulatory and Legal Acts of the State Nuclear Regulatory Committee of Ukraine

3.1 NP 306.2.141-2008 “General Provisions on Safety Assurance of Nuclear Power Plants”

The general provisions determine needs and criteria for safety assurance of nuclear power plants, as well as basic technical and organizational measures aimed at their implementation, protection of NPP personnel, population and environment against potential radiation impact. Scope and implementation of these measures should be determined by regulations, rules and standards for nuclear and radiation safety in Ukraine.

General provisions are based on requirements of the Law of Ukraine and take into account recommendations of IAEA and International Advisor Group on Safety of Nuclear Installations within IAEA, as well as national and foreign experience in the field of NPP safe operation.

General provisions do not apply to spent nuclear fuel management systems located beyond the reactor hall and RAW management systems not included into NPP technological cycle, as well as to facilities located in NPP site area and not incorporated into the design of NPP.

Become these general provisions effective does not entail invalidation or change in terms of licenses and permits earlier issued by SNRCU.

Scope and terms for implementing requirements of General Provisions for operating power units, that in construction or substantiated by the operating organization and approved by SNRCU. As for power units with design not approved according to the established

procedure as of the date of General Provisions coming into force, the requirements thereof should be implemented in full scope.

3.2 NP 306.2.145-2008 “Nuclear Safety Rules for Reactor Installations with WWER Reactor”

The Rules apply to power units being designed, constructed, operated and decommissioned.

For power units in design and construction stages, the Rules should be adhered to in full scope.

The Rules establish general requirements for structure, performance and operational conditions of reactor installations that should be taken into account during design, construction, commissioning, operation and decommissioning of power units.

3.3 NP 306.2.144-2008 “Safety Requirements for Siting of Nuclear Power Unit”

The Requirements determined requirements for siting of nuclear power plant.

Requirements are applied to sites intended for NPP. Become the requirements effective does not entail reassessment of suitability of sites with operating NPPs.

3.4 NP 306.8.146-2008 “General Requirements for Physical Protection Systems of Nuclear Installations and Materials”

The Requirements determine procedure for defining, development and support of constant operation of effective physical protection systems for nuclear materials managed at nuclear installations, and for nuclear installations.

3.5 NP 306.8.146-2008 “General Requirements for Physical Protection Systems of Nuclear Materials during their Transportation”

The requirements determine procedure for defining, development and support of constant operation of effective physical protection systems for nuclear materials during their transportation on the territory of Ukraine.

3.6 NP 306.8.146-2008 “Requirements to Content and Structure of Plan for Physical Protection of Nuclear Installation and Materials and Plan for Accounting and Control of Nuclear Materials”

The Plan for physical protection of nuclear installation and materials and plan for accounting and control of nuclear materials are the documents confirming that the operating organization is capable to meet the requirements as prescribed by laws on physical protection of nuclear installations and materials, as well as accounting and control of nuclear materials.

3.7 Order of SNRCU No. 162 dated 19 November 2007 “On Approval of General Provisions on Safety Assurance of Nuclear Power Plants”.

- 3.8 Order of SNRCU No. 168 dated 07 December 2007 “On Approval of Requirements for Content and Structure of Safety Analysis Report on RAW Storage Facilities”.
- 3.9 Order of SNRCU No. 169 dated 07 December 2007 “On Approval of Requirements and Rules for Long-term Storage of Long-term and Highly Radioactive Wastes before their Disposal in Deep Geological Formations”.
- 3.10 Order of SNRCU No. 68 dated 07 April 2008 “On Approval of Safety Requirements for Siting of Nuclear Power Unit”.
- 3.11 Order of SNRCU No. 73 dated 15 April 2008 “On Approval of Nuclear Safety Rules for Reactor Installations with WWER Reactor”.
- 3.12 Order of SNRCU No. 156 dated 28 August 2008 “On Approval of General Requirements for Physical Protection Systems of Nuclear Installations and Materials and General Requirements for Physical Protection Systems of Nuclear Materials during their Transportation”.
- 3.13 Order of SNRCU No. 188 dated 14 November 2008 “On Approval of Requirements for Siting of Radwaste Repository”.
- 3.14 Order of SNRCU No. 196 dated 04 December 2008 “On Approval of Requirements to Content and Structure of Plan for Physical Protection of Nuclear Installation and Materials and Plan for Accounting and Control of Nuclear Materials”.
- 3.15 Order of SNRCU No. 204 dated 24 December 2008 “On Changes to the List of the officials of the State Nuclear Regulatory Committee of Ukraine whose authorities include direct performance of functions of state regulation of nuclear and radiation safety and are subject to qualification”.
- 3.16 Order of SNRCU No. 33 dated 16 February 2009 “On Validating Resolution of the SNRCU Board No. 17 dated 27 May 2008”.
- 3.17 Order of SNRCU and the Cabinet of Ministers of Ukraine No. 28/82 dated 12 February 2009 “On Approval of Provision on Interaction between SNRCU and Ministry of Health of Ukraine on State Regulation of Radiation Safety”.
- 3.18 Order of SNRCU No. 34 dated 16 February 2009 “On Approval of Requirements to Packages for Long-term Storage and Disposal of Highly Radioactive Wastes after Reprocessing of Spent Nuclear Fuel”.
- 3.19 Order of SNRCU No. 102 dated 02 July 2009 “On Approval of Procedure for Safeguards on Nonproliferation of Nuclear Weapons”.
- 3.20 Order of SNRCU No. 181 dated 29 December 2009 “On Approval of Document Forms required for Special Inspection aimed at Obtaining Permit for Special Works”.
- 3.21 Order of SNRCU No. 14 dated 08 February 2010 “On Amendments to Rules for Accounting and Control of Nuclear Materials”.
- 3.22 Order of SNRCU and State Committee of Ukraine for Industrial Safety, Labour Protection and Mountain Supervision No. 23/48 dated 01 March 2010 “On Approval of Provision on Interaction between SNRCU and State Industrial Supervision of Ukraine on State Regulation in the Field”.

3.23 Order of SNRCU and the Ministry of Emergencies and Affairs of Population Protection from the Consequences of the Chernobyl Disaster No. 24/126 dated 02 March 2010 "On Approval of Changes to the Radiation Accident Response Plan".

4. Regulatory support of the area of use of nuclear energy

4.1. SOU-N NFC 1.010:2008. Rules for Maintenance and Repair Works of NPP Systems and Equipment

The Rules establish procedure for planning works on maintenance and repair, requirements for preparation and implementation of maintenance and repair works, work acceptance and quality assessment.

The Rules are applied to all NPP systems (except for identified systems) and all product types incorporated into system and requiring maintenance and repair throughout life time.

The rules should be applied during all stages of NPP life cycle:

- design;*
- development of reactor installation;*
- development of equipment for NPP;*
- construction;*
- commissioning;*
- operation;*
- decommissioning (when decommissioning is carried out, the Rules are applied to equipment that remains in operation according to operation procedures).*

4.2. SOU-N NFC 1.012:2008. Primary coolant of energy reactors of WWER-440 type. Technical requirements and quality assurance means

This regulating document is applied to primary water chemistry of Ukrainian operating power units with water-water energy reactor of WWER-440 type and determines technical parameters of primary water chemistry to ensure operability of fuel assemblies during guaranteed design lifetime, storage after operation at NPP, design lifetime of reactor installation equipment and to minimize accumulation of activated corrosion products in primary circuit of reactor installation in all design modes.

The regulating document determines requirements for primary coolant quality, water of fuel pool and refueling pit, feed-up water, "clean" condensate and deionized water for reactor installation mode under normal operating conditions.

The regulating document identifies limits on power unit operation in case of deviation of standard values for coolant quality from the range of permissible values and diagnostic values from reference levels and general requirements to reagents, sorbents and ion-exchange resins used.

4.3. SOU-N NFC 1.013:2008. Primary coolant of energy reactors of WWER-1000 type. Technical requirements and quality assurance means

This regulating document is applied to primary water chemistry of Ukrainian power units, in construction and operation, with water-water energy reactor of WWER-1000 type and determines technical parameters of primary water chemistry to ensure operability of fuel

assemblies during guaranteed design lifetime, storage after operation at NPP, design lifetime of reactor installation equipment and to minimize accumulation of activated corrosion products in primary circuit of reactor installation in all design modes.

The regulating document determines requirements for primary coolant quality, water of fuel pool and refueling pit for reactor installation mode under normal operating conditions, as well as during circulation cleaning and hot operational test, and requirements to quality of safety system environment, feed-up water, “clean” condensate and deionized water.

The regulating document identifies limits on power unit operation in case of deviation of standard values for coolant quality from the range of permissible values and diagnostic values from reference levels and general requirements to scope and frequency of chemical control, as well as to reagents, sorbents and ion-exchange resins used.

ANNEX 3: DYNAMICS IN THE NUMBER OF LICENSED EXPERTS OF NPPS IN 2005 – 2009

Number of Licensed Experts of NPP in 2005 – 2009					
Entity	2005	2006	2007	2008	2009
SE ZNPP	163	167	172	170	163
SE RNPP	89	94	97	106	106
SE SUNPP	80	80	82	76	79
SE KhNPP	40	45	48	53	54
Total	372	386	399	405	402

Data on NPP Staff Training in 2008-2009

Training Type	NNEGC “Energoatom”			Including in 2009					
	2008	2009		ZNPP	RNPP	KhNPP	SUNPP	ARS /AtomRemontService/	Head Office
	actual	Plan	actual	actual	actual	actual	actual	actual	actual
Initial Vocational Training	1640	829	2291	858	516	491	291	135	
Retraining	796	914	773	342	97	92	53	189	
Continuous Training	16149	13909	14147	4119	3763	1641	4547	77	
Special Training	22185	20853	27642	11086	5502	6986	2757	1299	12
Advanced Training	11088	5265	8691	1909	4256	819	1480	81	146
Total (person*course)	51858	41770	53544	18314	14134	10029	9128	1781	158

ANNEX 4: RADIATION SAFETY AND PROTECTION INDICATORS

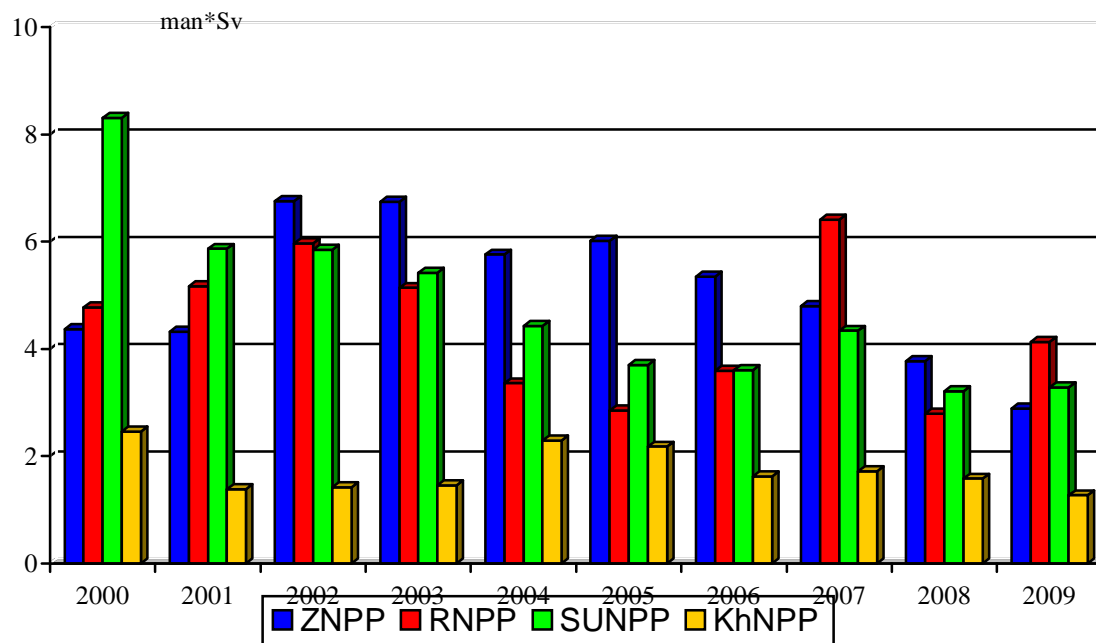


Figure 1. Collective Dose to the Staff of WWER NPP (including the personnel on assignment) in 2000 - 2009

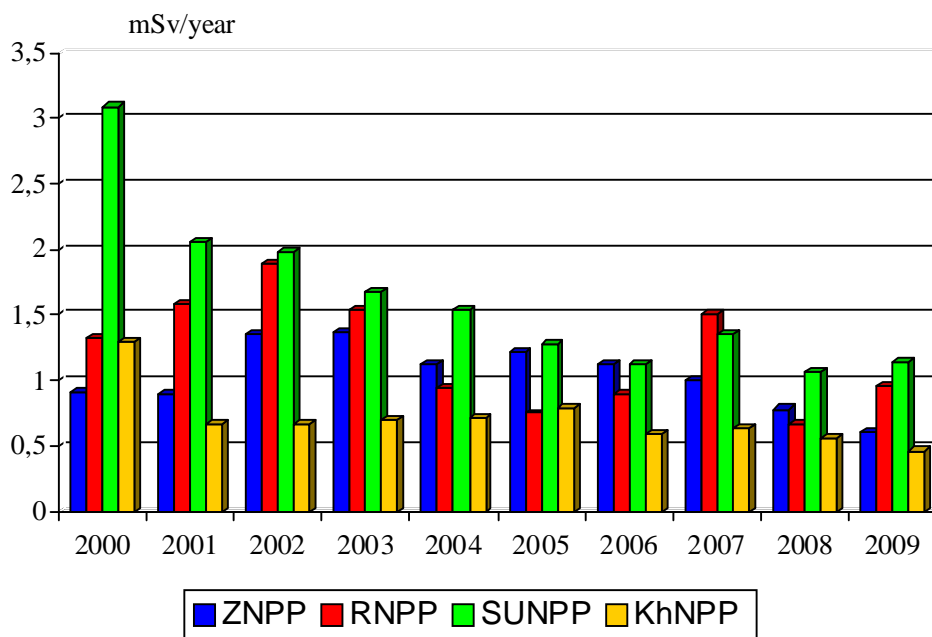


Figure 2. Average Individual Dose to the Staff of WWER NPP in 2000-2010

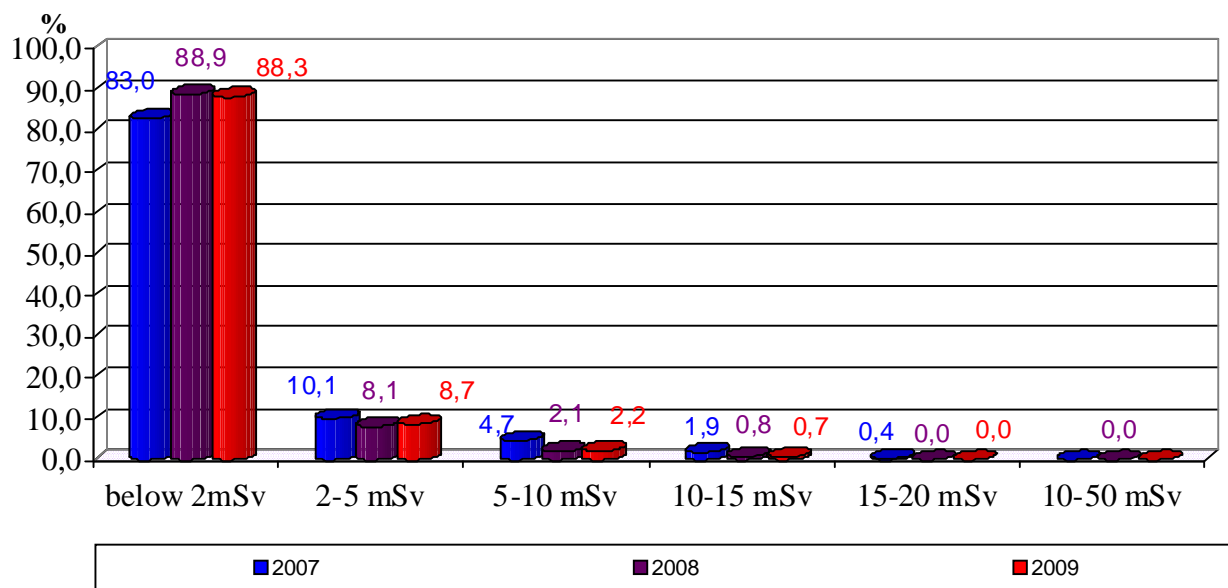


Figure 3. Percentage Distribution of the Staff of NNEGC “Energoatom” NPP within the Range of Average Individual Doses in 2007-2009

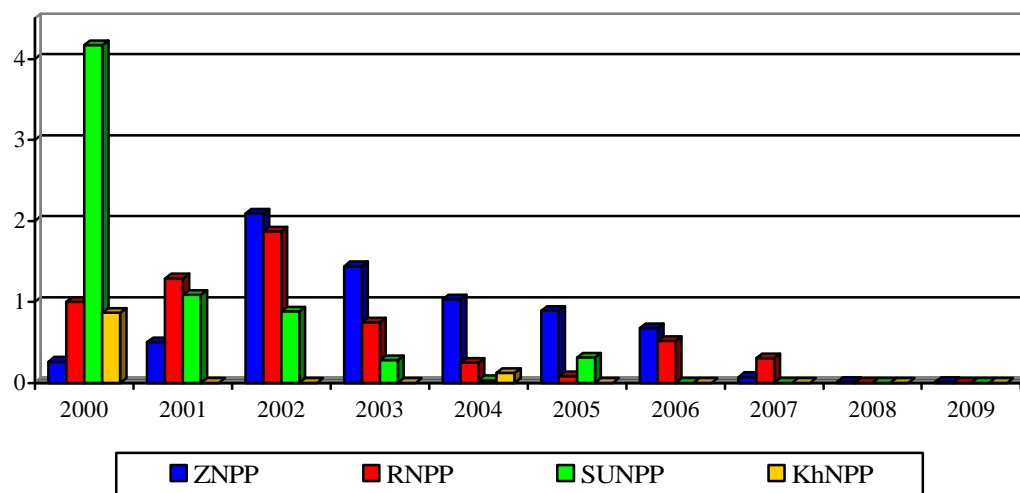


Figure 4. Share of Individuals Whose Annual Effective Dose Exceeded 15 mSv for Ukrainian NPP in 2000 – 2009

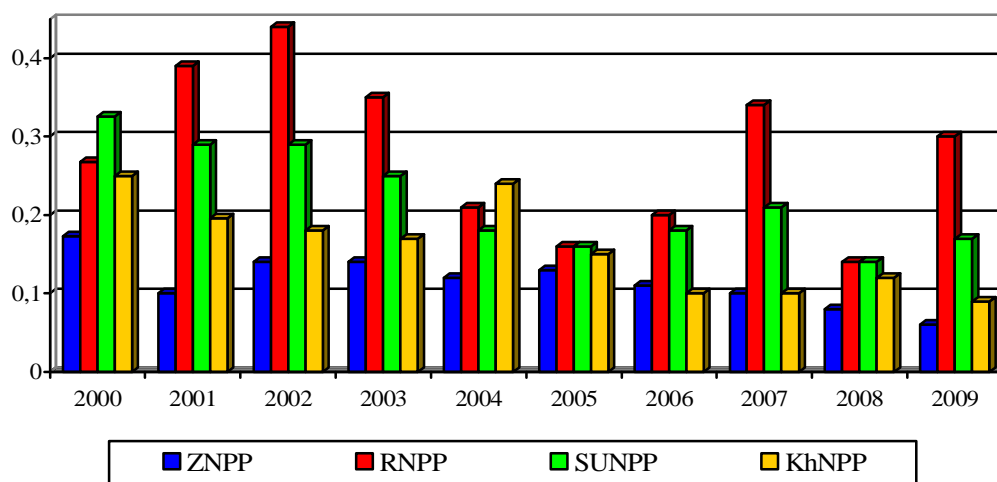


Figure 5. Ratio of the Collective Dose to Electric Power Production Output, man*cSv/MW*year for Ukrainian NPPs in 2000-2009

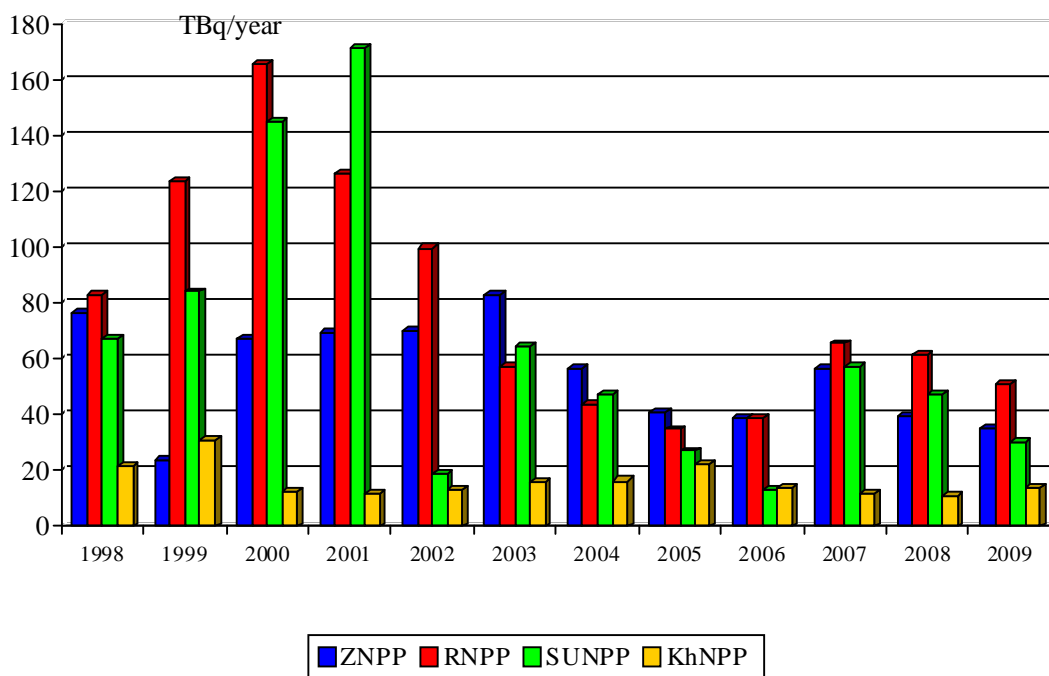


Figure 6. Total Release of Noble Radioactive Gases from NPPs in 2000-2009

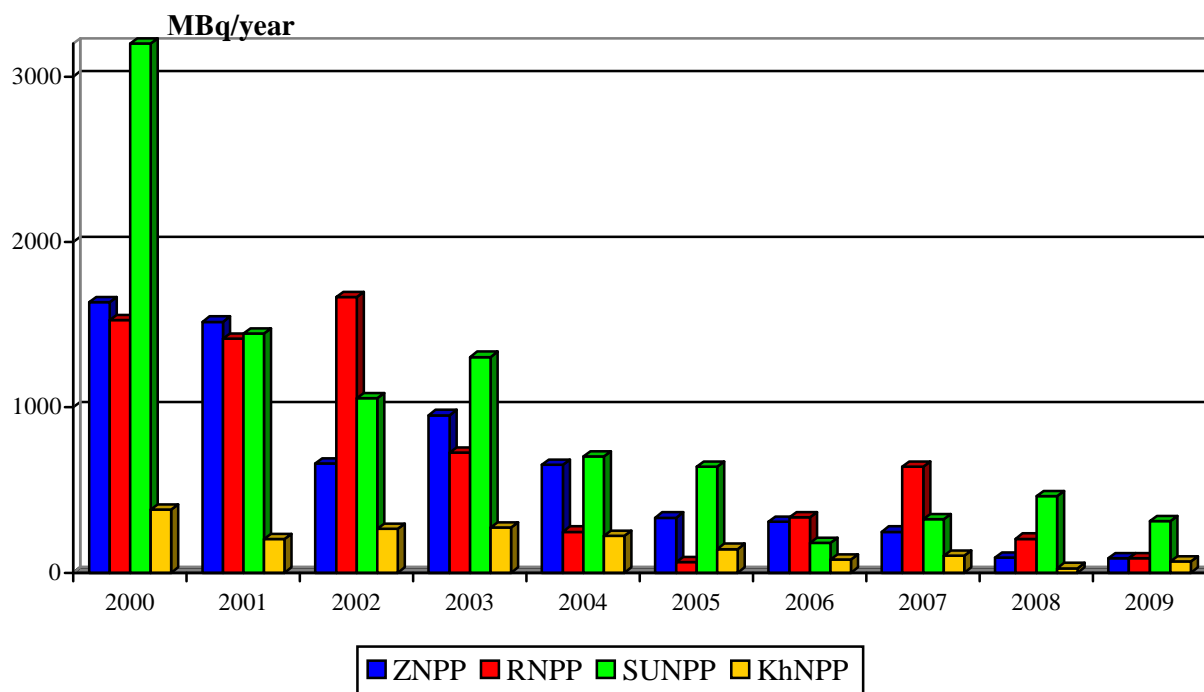


Figure 7. Total Release of Iodine Radionuclides from NPPs in 2000-2009

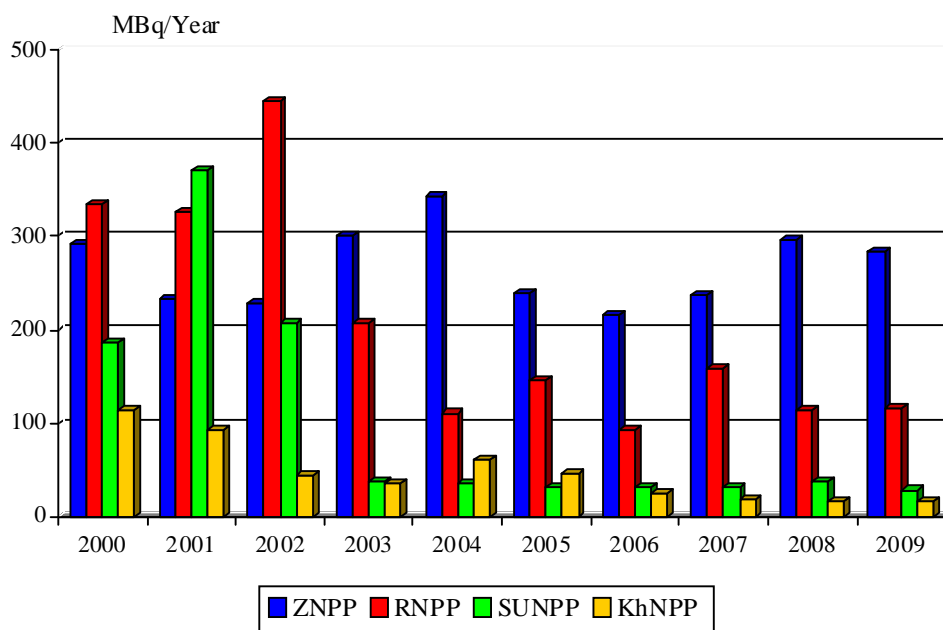


Figure 8. Total Release of Long-lived Radionuclides from NPPs in 2000 - 2009

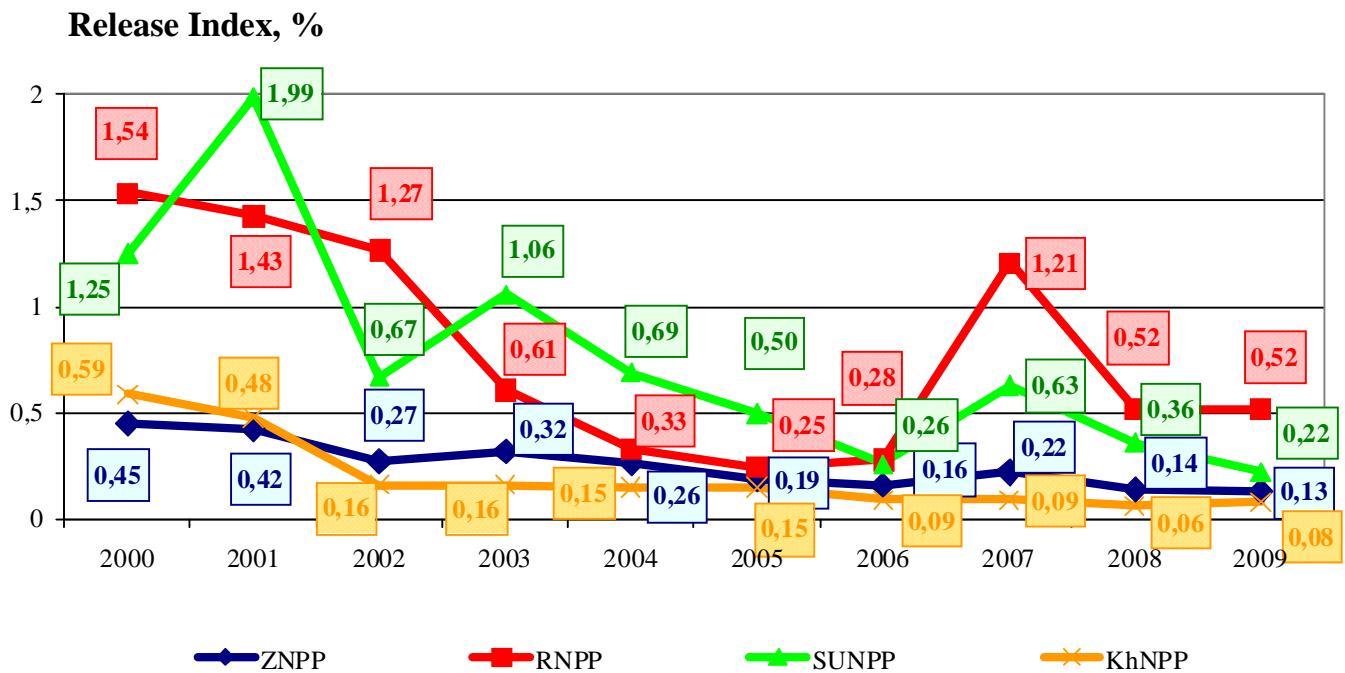


Figure 9. Trends in Overall Indexes of Gaseous & Airborne Radioactive Material Releases from the Company's NPP to Environment in 2000 – 2009

Discharge Index, %

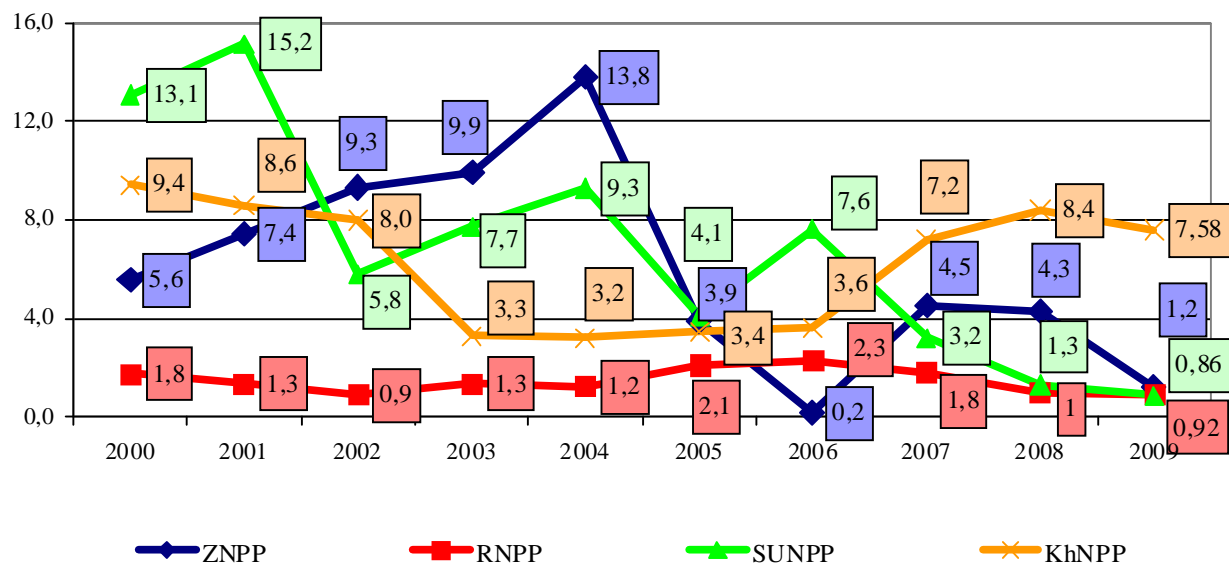


Figure 10. Trends in Overall Indexes of Radioactive Material Discharge from NPP of the Company in 2000 – 2009

ANNEX 5: INFORMATION ON CHORNOBYL NPP

Pursuant to the Law of Ukraine “On the Ratification of Convention on Nuclear Safety”, the Convention covers the arrangements for safety assurance of Chornobyl NPP nuclear facilities, including nuclear material accounting and control and the IAEA safeguards implemented at the SSE “Chornobyl NPP”.

Currently, under the licenses issued by the SNRCU in 2002, the activities are carried out on ChNPP site to close the operation of Units 1, 2 and 3 and make them prepared for further decommissioning. Other efforts on transformation of the Shelter Object into an environmentally safe system are underway along with operation of a nuclear facility – Spent Nuclear Fuel Storage (SNFS-1).

Work is being conducted at units in the areas as follows:

- Maintaining a safe status of power units and daily normal operation of systems and components;
- Removing nuclear fuel from power units;
- removing operating media and potentially hazardous substances from systems and equipments;
- final shutdown of systems and equipment;
- removing radioactive waste from power units
- conducting a comprehensive condition inspection of power units condition;
- partially dismantling systems and equipment located outside the reactor facility;

The following activities are underway at Shelter Object in the following areas:

- Daily operating and maintaining a safe condition of the Shelter Object;
- Designing, preparing and constructing a new safe confinement;

The Spent Nuclear Fuel Storage-1 is being operated under the license issued by the State Nuclear Regulatory Committee.

While making preparations for decommissioning, the following efforts are implemented:

- Construction of LRW and SRW treatment plants;
- Construction of SNFS-2 facility;
- Establishing of an infrastructure to conduct large-scale works on dismantling and re-treatment of equipment and structures of the decommissioned buildings, systems and components.
- Rehabilitation of buildings, systems and components required for safety support at the stage of operation closure and at other stages of decommissioning.
- Development of design documentation on cooling pond decommissioning;
- Development of documentations required for getting an individual license and conducting the work at the stage of a final closure and preservation of power units.

Removing Spent Nuclear Fuel from ChNPP Units

In order to launch the stage of power units decommissioning and assure the safety of work on transformation of the Shelter Object into an environmentally safe system, the activities started in December 2005 to remove nuclear fuel from SSE “Chornobyl NPP” units and transport it to existing SFSF-1. The deployed working procedure is specified in the “Concept of Arrangement of Works on Spent Nuclear Fuel Management at Chornobyl NPP”, which was agreed upon with the Ministry for Emergencies of Ukraine.

Nowadays, all nuclear fuel loaded in a core of Units 1, 2 and 3 was entirely removed and transferred to reactor spent fuel ponds.

To reduce the risk in erection of a new vent stack, on January 22, 2010 the work started to release nuclear power unit No.3 from spent nuclear fuel (SNF), which is transferred to SFSF-1. These fuel removal activities were also agreed upon with SNRCU. The removal of SNF from power unit No.3 is expected to be completed by September 2010.

In early March 2010 non-irradiated (fresh) nuclear fuel (consisting of 68 fresh fuel assemblies and 3 FAs) was dispatched to Russia.

In addition, the Project on “Modification of a Nuclear Facility. Management of Damaged Nuclear Fuel of SSE Chornobyl NPP” is being developed so that damaged and special FAs can be removed from power units and SFSF-1 (Contractor – Holtec International Company).

The following procedure has been established for the further project development.

- Pre-designing works;
- Phase 1 - project consisting of the two start-up stages, namely:
 - ü 1st Stage - “Modification of a Nuclear Facility. Handling the special spent fuel assemblies (SSFA) (measurement and thermometrics) and spent additional absorbers (SAA) at Chornobyl NPP”
 - ü 2nd Stage – “Modification of a Nuclear Facility. Handling damaged SFA (DSFA) and SAA at Chornobyl NPP”
- Phase 2 – working documentation “Modification of a Nuclear Facility. Handling DSFA at Chornobyl NPP”, including issues of DSFA management, handling of SSFA and SAA.
- uncertainty of the situation with budget funding in 2008 and the lack of funding in 2009 entailed delays in contractual work implementation and postponement of its implementation for one year.

Financing the closure of operation of Chornobyl NPP power units.

For the closure of operation of ChNPP Units 1, 2 and 3, the financing is provided from the National budget of Ukraine and covers the areas as follows:

- Maintaining a safe status of power units and the “Shelter Object” of ChNPP
- Implementing activities on preparation for decommissioning of power units and SNF and RW management at Chernobyl NPP.
- Making a Ukrainian contribution into the Chornobyl “Shelter” Fund to implement

the SIP Program.

On January 15, 2009 the Verkhovna Rada passed Law of Ukraine No. 886-VI “On a National Program for Decommissioning of Chornobyl NPP and Transformation of the “Shelter Object” into an Environmentally Safe System” that specifies the main areas of activities on ChNPP decommissioning and transformation of the Shelter Object into an Ecologically Safe System; as well as estimated funding allocations and organizational & and technical arrangements. This Law became effective on January 1, 2010, however, the Law of Ukraine “On the National Budget of Ukraine for 2010”, provides for only 54% of the total funding required to meet the planned needs in the area of the closure of ChNPP operation.

The Law of Ukraine “On the National Budget of Ukraine for 2010” allows for financing for the closure of ChNPP Units 1-3 under the following budget programs:

- Cod of program expenses classification (CPEC) 3201520 “Maintaining a safe status of power units and the Shelter Object of Chornobyl NPP” valued at UAH 460 700 000.00. These funds are to be allocated for:
 - § Keeping a safe status of power units, which are in operation now (including their maintenance), SNFS facility-1 and other process buildings;
 - § Removing potentially hazardous flammable and chemical materials, oils and other substances from systems, equipment and piping of power units under decommissioning;
 - § Finally stopping operation of individual systems and components of power units for the purpose of reducing operating costs;
 - § Conducting inspection of rooms, equipment and piping, making calculations in order to get an inventory and determine the amount of radwaste generated in the course of power units decommissioning;
 - § Developing documents required for getting work permits for the first stage of power units decommissioning.
- CPEC 3201530 “Measures on preparation for decommissioning of nuclear power units and management of SNF and radwaste at Chornobyl NPP” valued at UAH 23 100 000.00. These funds are allocated to cover:
 - § Activities, which are related to SNF handling;
 - § Works on radioactive waste management;
 - § Operation of infrastructure facilities required for implementing measures on preparation for power units decommissioning.
- CPEC 3201180 “Contribution of Ukraine into the Chernobyl Shelter Fund for SIP Program Implementation ” valued at UAH **17 518 800.00**.

Human Resources

The Staff Training Center is operating at the SSE Chornobyl NPP, which was granted a SNRCU license for training the staff holding the specified positions, and a license issued by the Ministry of Education and Science for training the staff of diverse occupations (health physicist, expert in radwaste treatment, expert in decontamination and other experts). The Center is staffed with qualified and knowledgeable instructors and equipped with necessary technical aids.

SSE Chornobyl NPP's staff is trained in accordance with the Training Programs. Training of the staff holding the specified position is delivered in accordance with individual-specific training programs developed on the basis of reference programs agreed upon with the State Nuclear Regulatory Committee of Ukraine.

SSE Chornobyl NPP is fully provided with the staff. The main emphasis is put on the training of operational personnel for newly commissioned facilities and the staff involved in activities conducted at the Shelter Object.

The effective system of SSE Chornobyl NPP Staff Training ensures that safety of nuclear facilities keeps continuously improving.

Human Factor

In order to keep the staff prepared for immediate actions to liquidate emergencies, to cope with accidents and prevent events from re-occurring in operation of ChNPP, the following efforts are undertaken by conducting:

- Emergency response trainings while delivering the training for an individual position in accordance with an individual program;
- Emergency response training for operational personnel and emergency response teams;
- Training sessions in accordance with the Continual Training (Proficiency Support) programs;
- Full-scale trainings in mitigating simulated accidents.
- Based on the staff training outcomes and results of other measures focused on improving the safety culture and implemented from 2007 up to the first quarter of 2010, no violations of nuclear safety have been observed.

Quality Assurance

Implementing a process-based approach is an integral part of NPP safety assurance. From 2008 to 2010 Chornobyl NPP implemented the “Plan on Improvement of SSE ChNPP Quality Management System for 2008-2010”, which is aimed at implementing process-based approach in ChNPP activity.

To date, all activities of SSE ChNPP are split into 59 processes, their interdependences are determined. The processes are planned, monitored and evaluated by means of key indicators; internal audits of processes are conducted as well as reviews by the management that underpins continuous improvement of the Quality Management System.

The IAEA experts highly appreciated the approaches applied to establishing of the process-based management system at SSE ChNPP.

Safety Assessment and Review

As required by codes and standards, in accordance with the SSE ChNPP's Resolution, a commission is convened once per year to evaluate the nuclear safety status of power units 1 to 3, NSFSF -1 and the Shelter Object.

Following the “Provisions on evaluation of the nuclear safety status at SSE “ChNPP”, the commission is reviewing whether nuclear safety rules, norms and procedures are met at the stage of closure of the nuclear reactor facility operation, during nuclear fuel handling activities, during maintenance of safety-important systems in the subdivisions of SSE ChNPP.

Based on results of the review, a Report on the review of nuclear safety status of Units 1, 2 and 3, NSFSF -1 and the “Shelter Object, along with safety improvement measures are developed.

Radiation Protection

Monitoring of external exposure was carried out at ChNPP with the aid of individual health-physics system, which allow measuring deep exposure dose H_d ; skin dose H_{skin} (including that resulted from β -radiation), and crystalline lens exposure H_{lens} (from photons and β -radiation).

For the reporting period there was no excess of a dose limit and the reference level of external exposure (H_d), reference skin dose (H_{skin}) crystalline lens dose (H_{lens}) that are specified for the ChNPP staff.

During 2007-2009 the collective and individual doses to SSE “Chornobyl NPP” staff were:

Year	Collective Dose, mSv	Average Dose, mSv
2007	7598.09	2.05
2008	7447.14	2.01
2009	6689.3	1.86

In 2009 the reference level of individual equivalent doses to staff was 13.0 mSv.

From 2007 to 2009 at the SSE “Chornobyl NPP” there were no staff's members working at ChNPP whose effective dose exceeded 15 mSv.

Results of statutory measurements, as well as individual dose loads to the staff allow concluding that the radiation safety system, which is currently in place at ChNPP, is sufficiently effective.

For the reporting period the radiation situation indicators generally tended to remain stable. No reference levels established for exposure dose rates of γ -radiation were exceeded and no radioactive contamination were recorded in off-site facilities, on site and in ChNPP production premises periodically or permanently attended by the personnel.

In general, it is observed that the level of air environment contamination, which is subject to monitoring, tends to stabilize. For the reporting period the changes in radioactive aerosol activity in air inside ChNPP rooms and adjacent areas remained within their dynamics range without exceeding reference levels.

Release of long-lived radioactive nuclides from SSE ChNPP 's facilities, kBq/day:

Year 2007	Year 2008	Year 2009
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381.6	513.8	544.6
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Efforts on the evaluation of radioactive airborne releases from the “Shelter Object” through openings in its structures (“spontaneous” release) are performed by the NPP Safety Issues Institute of the National Academy of Sciences of Ukraine. To that end, four flat-bed facilities were located on a lightweight roof over the process openings (hatches No. 7, 10, 13 and 15). Period of exposure is 1 month. After the end of exposure the composition and activity of radionuclides accumulated on flat-beds were determined by means of a γ -spectrometer.

Based on the measurement results, the rate of release of a mixture of α -emitting (^{241}Am , $^{238+239+240}\text{Pu}$) and β -emitting (^{137}Cs , $^{90}\text{Sr}+^{90}\text{Y}$, ^{241}Pu) radionuclides through openings of the Shelter Object's roof was measured.

Assessing the rate of radionuclide mixture release, MBq/year (“spontaneous” release):

Type of a Nuclide	Year 2007	Year 2008	Year 2009
α -emitting	7.7	6.4	4.3
β -emitting	703	591	422

Discharge of radionuclides into the cooling pond of SSE ChNPP

Radioactive materials of SSE ChNPP are not discharged into open water reservoirs. The ChNPP cooling pond is the water reservoir simultaneously accomplishing the nature-protection and production purpose. The design does not provide for blowing-down this water reservoir. Discharge of radioactive materials into the cooling pond mainly associated with washing-out of drains and atmospheric precipitations from the site of accident-originated residual contamination.

Discharge of Radionuclides into the SSE ChNPP Cooling Pond:

Radionuclide	Discharge, GBq/year			Reference Level GBq/year
	Year 2007	Year 2008	Year 2009	
^{137}Cs	3,36	4,82	3,52	27
^{90}Sr	4,12	3,92	2,88	13

Emergency Preparedness

The SSE CHNPP staff is trained in acting in case of emergencies and their knowledge and skills of confining accidents and mitigating their consequences is improved in accordance with the developed Emergency and Accident Response Plan of SSE ChNPP.

Accounting and Control of Nuclear Material and Fulfillment of the IAEA Safeguards

The SSE “Chornobyl NPP” fully meets the requirements imposed by the State Safeguards system and secures implementation of the IAEA Safeguards System.

The activities on the State Safeguards System support is based upon the fulfillment of requirements imposed by the State Nuclear Material Accounting & Control System. In accordance with requirements of SSNMAC the officials were assigned at SSE ChNPP to be in charge of supporting the implementation of the system of nuclear material accounting and control.

In order to meet the IAEA Safeguards objectives, nuclear material accounting and control is deployed as a top propriety measure in the Safeguards area in the combination with preservation and observation as significant supplementary measures.

Pursuant to the Agreement between Ukraine and the International Agency of Atomic Energy for the Application of Safeguards in connection with the Treaty on Non-proliferation of Nuclear Weapons, the IAEA is conducting periodic inspections and technical visits.

To date, in order to support the functioning of the preservation and surveillance systems, the IAEA installed its preservation and surveillance systems and keeps them operable at power units 1, 2 and 3, SNFSF-1 and the “Shelter Object”. These systems are as follows:

- SDIS Video surveillance system at power units 1 and 2 and SNFSF-1;
- ALIS Video cameras in central halls of Units 1, 2 and 3 and SNFSF -1;
- USFM detection system at SNFSF-1;
- GRAND detection system at power units 1 and 2;
- MMCT mobile systems on the container car for transfer of spent nuclear fuel;
- ALIP video cameras on the container car for spent nuclear fuel transfer;
- Integrated detection system and video alarming systems CRSM at power unit 3;
- Fiber-optical seals COBRA and metal seals in spent fuel ponds of SNFSF-1;
- Combined monitoring system CSUMS at the “Shelter Object”.

The IAEA surveillance systems installed at SSE “Chornobyl NPP” are integrated into the unified local computer network by means of equipment and devices for local and fiber-optical information networks.

A remote monitoring system of the IAEA was installed to transfer information to the Agency from the IAEA systems installed on ChNPP .

Decommissioning of ChNPP units

Throughout the whole period of the operation closure (from 2000 to 2010):

- More than 300 systems and 700 pieces of individual equipment and components were finally shut down, accounting for more than 60% of all existing systems and components and for 97% of the total number of systems and components, which could be finally shut down before complete fuel removal;
- Over 1000 ton of equipment were dismantled in order to master the dismantling technology and acquire relevant experience;
- Reactors of units 1, 2 and 3 were “finally shut down” and their nuclear fuel was completely removed;
- Lifetime of systems and components of power units 1 and 2 was extended for 10 years (specifically, that of power unit 1 - till 2017, and unit 2 - till 2018 pory,

activities on extending the lifetime of systems and components of power unit 3 will be implemented from 2010 to 2011);

- Fresh nuclear fuel was removed from the ChNPP site' territory;
- Integrated engineering-radiation survey (IERS) of power units 1, 2 and 3 was conducted;
- IERS Data for power unit 1 were updated and similar activities for unit 2 were launched;
- Currently, spent nuclear fuel is being transferred from spent fuel pool of unit 3 to section 5 of a spent fuel pit of SNFSF -1 (with 530 SNFA of unit 3 remaining on May 1, 2010).
- Became effective:
- “National Program on ChNPP Decommissioning and Transformation of the “Shelter Object” into an ecologically safe system ”;
- “Program on Decommissioning of ChNPP Power Units ”;
- “Radiation sanitary criteria of a final status during decommissioning of ChNPP ”.

The works are underway to develop “Project on a final closure and preservation of ChNPP power units”.

Liquid Waste Treatment Plant

Financing of the Project on Nuclear Safety of “Chornobyl NPP”. Under the Grant Agreement, the construction of a Liquid Radwaste Treatment Plant is performed by the European Bank for Reconstruction and Development and (EBRD), being financed from the Nuclear Safety Account.

The liquid radwaste treatment plant (LRWTP) is a complex that provides for retrieving liquid radioactive waste from storage tanks, accepting conditioned liquid radwaste, preparing, solidifying, packing and temporally storing the conditioned liquid radioactive waste (up to 280 drums).

The capacity of the liquid waste treatment plant is 2500m³/year. Its designed lifetime shall be, at least, 20 years.

The LRWTP was constructed by the Belgium-French-Italian International Consortium including BELGATOM\SGN\FINMECANNICA SpA D'AZIE A ANSALDO NUCLEARE Companies in accordance the design approved by the Cabinet of Ministers of Ukraine. Taking into account multiple increases in contract costs and term of the project implementation, and because of negligent fulfillment of works by the Contractor, the Ukrainian side, after having got a respective approval from the Assembly of NSA countries-donors, made a decision to terminate the contract with this Contractor. As being mutually agreed, the contract was terminated in October 2006. Works on LRWTP were temporally suspended.

To date, the LRWTP is in the state of “uncompleted construction”. SSE ChNPP is conducting maintenance of systems supporting life activity of the facility.

Following the decision on further financing for completing LRWTP that was made at the Assembly of NSA Countries-Donors and in accordance with the overall procurement plan for LRWTP, which was approved by the EBRD, all activities required for completion of the Project are split into 4 Work Packages (A, B, C, D):

- Work Package A: designing and safety substantiation (including Tasks 2.1 – 2.7);
- Work Package B: procurement, construction & installation works, pre-commissioning and commissioning (including Tasks B-1 – B-9);
- Work Package C: completion of establishing of the automated technological process control system (I & C system) for LRWTP;
- Work Package D: expert & advisory services (including Tasks D-1 – D-2).
- SSE ChNPP in cooperation with Project Management Group on Safety Enhancement work on preparation and conduct of the tender procedure in accordance with the EBRD's principles and rules of goods and services procurements.
- Now are underway the contracts, which have been recently established with the Contractors as follows:
- OJSC “Kyiv Design & Development Institute “Eneroprojekt ” (Ukraine) – contractor of works under Package A (designing and safety substantiation);
- UAB “Lokmis” (Lithuania) – contractor of works under Package B-7 (procurement of mass-spectrometer);
- “SK “Ukrbudmontazh” (Ukraine), Ltd. and CJSC “Ukrenergomontazh” (Ukraine) – contractors of works of Work Package B-8 (uploading system equipment procurement, construction-and-assembling operations and starting-up and adjustment works).

For other work packages the contractors have not yet been identified.

In accordance with the updated work schedule and provided the procedure of contract conclusion is fulfilled, LRWTP is expected to be put in operation in the 3rd Quarter 2011.

Industrial Complex for Solid Radioactive Waste Management

Works under the Project “Industrial Complex for Solid Radioactive Waste Management” (ICSRM) are financed out of proceeds of European Commission allocated for implementing technical assistance programs in the nuclear safety filed in the frameworks of the TACIS program and out of proceeds of the Ukraine national budget (Contractor - NUKEM Technologies GmbH (Germany)).

The Industrial Complex for Solid Radioactive Waste Management (ISCRRM) is designed for receiving, processing, and disposing off solid radwaste accumulated during operation, and waste generated during ChNPP decommissioning, as well as operational radawaste of the Shelter Facility.

The complex belongs to the infrastructure needed for ChNPP decommissioning. The Complex consists of four interrelated subjects (“Lots”) – Lots - 0, 1, 2 and 3.

Lot – 0. Interim Storage of low and medium activity long-lived waste (LMA-LLRW) and high active waste (HARW) within the existing building on ChNPP site –Liquid and solid radwaste storage facility (LSRWSF).

Lot – 1. Facility for retrieval of solid radwaste (SRW) from the solid waste storage facility located on ChNPP site.

Retrieval capacity - 3 m³ of RAW per day, design life term – 30 years.

Lot– 2. Plant for sorting, conditioning and processing of solid radwaste from ChNPP.

Capacity - 20 m³ of non-treated waste per day, Incinerator capacity - 50 kg/hour (SRW), 10 kg/hour (LRW), cementing facility capacity - 10 m³ per day, LMA-LLRW and HARW packaging facility – 1.5m³ per day, capacity of an interim storage facility for LMA-LLRW and HARW – 3500 m³, its design life-time - 30 years.

Lot–3. Specially equipped near-surface storage of low and medium active waste. The storage is located on the VECTOR Complex site which is situated outside the boundary of SSE ChNPP. For this Lot the Customer is represented by SSE “Technocenter”.

Capacity – 55 000 m³ of waste packages, at the stage of storage filling the equipment lifetime is 30 years, period of the state control of the conserved storage is 300 years.

At present the status of works is following::

For Lot - 0 – all activities under contract have been completed, the Contractor has got a Facility Acceptance Certificate.

For Lots 1 and 2 - all activities under contract have been completed, the Contractor has got a Facility Acceptance Certificate;

The committee completed its work on acceptance of equipment and systems after individual and comprehensive testing.

In May 2010 the State Nuclear Regulatory Committee of Ukraine granted an individual permission for commissioning a solid radwaste retrieval facility (hereinafter - SRWRF, Lot 1) and a plant for solid radwaste treatment (SRWTP, Lot 2) of the Industrial Complex for Radioactive Waste Management at SSE “Chornobyl NPP”.

The scheduled date for commissioning of the Industrial Complex for Radioactive Waste Management is – December 2010.

Additional Works under the Project on Industrial Complex for Radioactive Waste Management

1. For the Project “Additional Works in the Framework of the ICRWM in Chornobyl. Supply of a Ventilation System for Building 84”, financing is provided by the European Commission (Contractor - NUKEM Technologies GmbH (Germany)).

The supply ventilation in room 138, building 84 was fully installed. In 2009 the Customer gave to the Contractor a Facility Acceptance Certificate. Now the package of document for Lot -1 operational license is being prepared.

The work is expected to be completed in December 2010.

2. The Project “Additional Works in the Framework of the ICRWM in Chornobyl. – Providing support in licensing activities, including development and review of the related licensing documentation, and also supervision over “hot” testing” is financed by the

European Commission (Contractor (consultant) - NUKEM Technologies GmbH (Germany)).

Under the contract for supporting “hot” testing, the work on metrological qualification and finalization of testing programs is going on in cooperation with the Consultant.

The work with the SNRCU experts is conducted to take into consideration the comments on previous SAR for Lots – 1 and 2; and FSAR for Lot – 0.

SSE ChNPP is reviewing a work implementation schedule for the “hot” testing support, which was received from the Consultant.

The completion of “hot” testing is scheduled for August 2010.

Spent Nuclear Fuel Storage Facility (SNFSF-1)

Financing of activities under the Project “SSE ChNPP. SNFSF-1. Rehabilitation of a process & transfer part” is provided from the State Budget of Ukraine (Contractor - CJSC “Kyiv Research and Development Institute “Energoprojekt” (Ukraine)).

The Spent Nuclear Fuel Storage Facility (SNFSF-1) is a “wet”-type spent nuclear fuel storage facility. SNFSF -1 has been operating since 1986.

Nowadays, SNFA are stored in the fuel cooling ponds in single-pieced cartridges filled with water. These cartridges form a barrier that prevents radonuclides from spreading and secure mechanical integrity of fuel assemblies.

Significant delay in commissioning of SNFSF-2 results in deploying SNFSF-1 within the next years as a main storage facility of SNF at SSE ChNPP.

The storage is designed for receiving and storing temporally spent nuclear assemblies coming from reactor halls of power units after their preliminary dwelling. On May 01, 2010 there are 18053 spent nuclear fuel assemblies placed in the five sections of the fuel cooling pond of SNFSF-1 which was put into operation in 1986.

For unloading the spent nuclear fuel assemblies, the existing process & transfer part of SNFSF-1 is expected to be rehabilitated.

The objective of the SNFSF-1 process & transfer section rehabilitation is to ensure safe fulfillment of the process & transfer operations for re-unloading of SNFA from SNFSF-1, for their loading into a transportation container and transportation to SNFSF-2.

At present:

- Construction and installation works have been completed for the 1st start-up complex (installation of the re-unloading system). A Certificate of facility operability has been received;
- A decision on putting the re-unloading system, which belongs to transfer and process part of SNFSF-1, into research operation was developed and agreed upon

with SNRCU;

- A certificate was issued by the State Architect & Construction Control of Kyiv Region stating that the above-said built facility complies with the design documentation, state standards' requirements, construction norms and regulations.

The expert appraisal of the working documentation for the 2nd start-up complex as well as the implementation of the 2nd start-up complex of the project are expected to take place provided that a relevant financing is available.

Since the beginning of 2010 the work have not been carried out because of lack of financing of contractual works. Therefore, the deadline for rehabilitation completion has not yet been specified.

Spent Nuclear Fuel Storage Facility (SNFSF-2)

Works under the Project “Contract for Completion of a Dry-type Spent Nuclear Fuel Storage Facility on Chornobyl NPP site ” is financed by the EBRD out of the proceedings of the Nuclear Safety Account in accordance with the Grant Agreement (Contractor is “Holtec International” (USA)).

The storage facility for ChNPP Spent Nuclear Fuel (SNFSF-2) is a key component of the process of ChNPP decommissioning. ChNPP is facing a need for storing spent nuclear fuel as well as spent additional absorbers, which now are being stored in power unit pools and in the spent nuclear fuel storage facility (SNFSF-1). SNFSF-1 is a “wet”-type storage facility (it means that spent nuclear fuel is stored in water) and is not designed for long-term storage of spent nuclear fuel. Completing construction of SNFSF-2 will allow resolving an issue of long-term storage of spent nuclear fuel of ChNPP.

SNFSF-2 is intended for receiving, preparing for storage and storing spent nuclear fuel assemblies and spent additional absorbers accumulated at Chornobyl NPP.

Having a capacity of 2500 SNFAs per year, SNFSF-2 will allow receiving for storage, preparing for storage and storing over 21000 SNFA from RBMK -1000 for the period of 100 years.

SNFSF-2 consists of 2 parts:

- Facility for preparing nuclear spent fuel for its further storage;
- Storage area for spent nuclear fuel.

In 2007 the SSE ChNPP and AREVA NP Consortium (a former Contractor) concluded the Agreement on Termination of Contract No. ChNPP C-2/2/033 for designing, construction and commissioning of SNFSF-2. Under this Agreement, the uncompleted construction object - SNFSF-2, in its current status, was transferred to the Customer (ChNPP).

The Assembly of NSA Donors approved a decision on concluding a contract with the Holtec International Company to complete construction of a spent nuclear fuel storage facility and on allocating the funding to complete this project implementation.

In 2007 a contract was concluded between SSE ChNPP and Holtec International to complete the Project on SNFSF-2. As per terms of this contract, the Project shall be implemented through two individual stages ("Permits") for the following activities implementation:

Permit 1. Developing design documentation and providing support for getting a license for construction;

Permit 2. Performing construction and installation works, conducting pre-commissioning tests, providing support for getting a license for SNFSF-2 commissioning.

Works under Permit 1 are being completed now, and now the following activities are underway:

- Support is provided for conducting a comprehensive state expert appraisal of the document package "SSE CHNPP. Spent nuclear fuel storage facility (SNFSF-2). Construction Completion Project" at the Ukrderzhbudexpertise Central Service of the Ministry of Regional Construction of Ukraine;
- Support is provided for conducting an expert appraisal on nuclear & radiation safety of the previous SAR for SNFSF-2 at the State Scientific and Technical Center for Radiation and Nuclear safety;
- Support is provided for conducting an expert appraisal on nuclear & radiation safety of technical documentation for test specimens Double Wall Canister (DWC) and the Forced Gas Dehydration System (FGDS) at the State Scientific and Technical Center for radiation and nuclear safety.

The commissioning is scheduled for 2014.

ANNEX 6: INFORMATION ON THE SHELTER OBJECT

Among all nuclear facilities of Ukraine, the Shelter Object, which is unique in the world practice, have the special place. The Shelter Object is Chornobyl NPP Unit 4 destroyed by the beyond design accident in 1986, which lost all its functional features and where top priority measures were undertaken. Nowadays, activities are currently going on at this unit to mitigate accident consequences and assure monitoring of its state, its nuclear and radiation safety.

The Shelter Object is not a facility, which was created in accordance with the rules and standards governing siting, designing, construction, commissioning, operation and decommissioning of nuclear plants. The current status of the Shelter Object does not and cannot comply with safety standards and regulations applicable in the nuclear power engineering and conventional industrial safety requirements.

Pursuant to the Law of Ukraine “On Ratification of the Nuclear Safety Convention”, the Shelter Object does not fall under this Convention due to its uniqueness being the result of global consequences of the Chornobyl disaster and because nowadays it is impossible for the Shelter Object to reach the satisfactory safety level as requested by requirements of the Convention.

The Shelter Object in its current status is qualified as a site for near-surface storage of piled-up radwaste (an interim piled-up radwaste storage facility under stabilization and rehabilitation). In other words, all nuclear and radioactive materials located at the Shelter Object are radioactive waste. The activities at the Shelter Object are regulated in accordance with its qualification specified in NRBU-97/D-2000, based on the effective regulatory and legal acts on nuclear and radiation safety.

Accident-originated radwaste, which are open sources of ionizing radiation and available in a large quantity at the Shelter Object without being provided with reliable protective barriers, represent a serious actual and potential hazard to the staff, the public (including future generations) and the environment.

As per conditions of the license granted by SNRCU for the Shelter Object operation, the objective of any activity at the Shelter Object (including the Shelter transformation into an environmentally safe system) is protecting the staff, public and the environment from an impact of radioactive materials available at the Shelter Object or on its site. Any activity pursuing other purposes is prohibited at the Shelter Object.

Transformation of the Shelter Object into an environmentally safe system requires considerable financial and material resources as well as international support to resolve this large-scale problem as soon as possible.

Information: *Under the Memorandum of Understanding signed between the Government of Ukraine, Governments of “Great Seven” Countries and the European Community Commission concerning the closure of Chernobyl NPP, signed in December 1995, the Recommended Course of Actions was developed providing for three phases of measures to*

be implemented for transforming the Shelter Object (SO) into an environmentally safe system:

Phase 1 – stabilization and other short-term measures.

Phase 2- preparation for transferring it into an environmentally safe state.

Phase 3- transferring it into an environmentally safe state.

Under the Shelter Implementation Plan (SIP) actions of the first two phases are being implemented. The major task of SIP is to build a new safe confinement – a protective structure housing a set of technological equipment, which are intended for removing all nuclear fuel containing materials from destroyed power Unit 4 of Chornobyl NPP, and for handling radioactive waste, and also housing other systems intended for the power unit transformation into an ecologically safe system and for safety assurance of the staff, public and the environment. The confinement's lifetime is 100 years. As regards retrieval of fuel-containing materials and other high-level waste from the Shelter Object, to date, there are only conceptual decisions and preliminary estimates of costs and time required for these decisions implementation.

In general, SIP provides for implementing 22 tasks including the overall project management .

The construction of a confinement was expected to be completed in 2004. And the activities on dismantling of the SO's unstable structures were expected to be entirely implemented in 2007.

Under the Shelter Implementation Plan (SIP), the following major infrastructure facilities were commissioned: the Shelter Object's staff training centre, a rehabilitation centre, a construction basis for the Shelter Object stabilization, a station for small equipment and tools decontamination, a sanitary inspection post intended for 1430 persons, a sanitary airlock on elevation +5.800, an analytical centre, external engineering networks for the SIP infrastructure facilities.

An upgraded dust suppression system was put into operation, the integrated database of the Shelter Object was put into research & commercial operation.

Activities aimed at implementing the emergency stabilization measures for SO civil structures have been completed. SNRCU approved a decision on operation of civil structures (confining structures) of the Shelter Object.

Works are underway to establish the integrated computer-aided system for nuclear, radiation, seismic monitoring and control of the status of civil structures, a fire protection system, and the access control and physical protection system .

After completion of the tendering process and in accordance with decisions of the Assembly of Chernobyl "Shelter" Fund Donors, in September 2007 a contract for designing and construction of a new safe confinement (NSC) was signed between SSE ChNPP and the Joint venture (JV) "NOVARKA" (France) as a tender winner.

Currently, the designing works are underway covering the following areas: temporary foundations, a site for the Arch erection, main structures of the Arch. The JV "NOVARKA" is implementing preparatory works on site and prepare necessary documents to get permits for civil works.

In order to support the NSC project the following efforts are undertaken under SIP:

- A site is being prepared for further construction of NSC; the territory is being cleared and planned, excavation works are being performed for further construction of the NSC foundations;
- a new vent stack of the Stage II of ChNPP as well as supporting systems are being constructed.