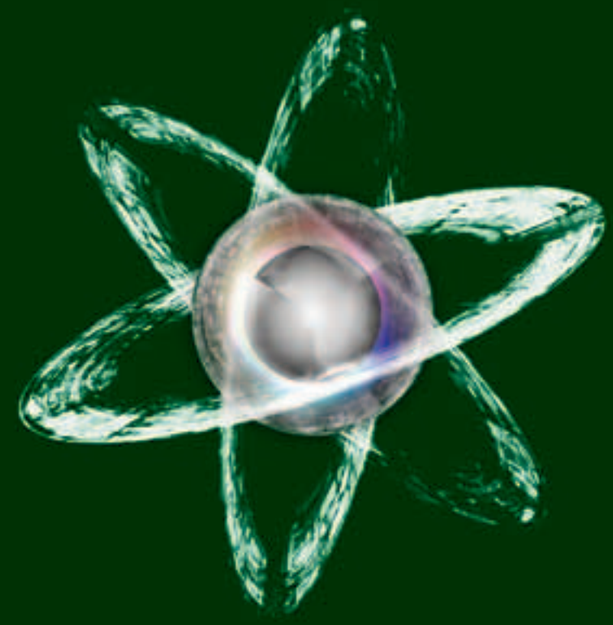


Nuclear and Radiation Safety in Ukraine

Annual Report
2005

The State Nuclear Regulatory Committee
of Ukraine

Nuclear and Radiation Safety in Ukraine, Report 2005 was approved by the Editorial Board of the State Nuclear Regulatory Committee of Ukraine (SNRCU) consisting of: Mykolaichuk O.A., Chairperson of the State Nuclear Regulatory Committee; Makarovska O.A., Deputy Chairperson of the State Nuclear Regulatory Committee; Ananenko O.M., Head of Monitoring and Emergency Preparedness Department; Zenjuk L.O., Head of International Cooperation and European Integration Division; Kozulko T.V., Head of Chaiperson's Activity Analytics And Organization Department; Kutuzova T.Y., Head of the Safe Radwaste Management and Decommissioning Department; Matveyeva V.G., Head of Legal Department; Stolyarchuk B.V., Head Of Nuclear Facilities Curator Department; Fridman D.M., Press Secretary of the Chairperson of the State Nuclear Regulatory Committee; Schevchenko I.A., Head Of Nuclear Facilities Safety Analysis Department; Koscharna O.P., Chief Research Officer Of the National Institute for Strategic Research under the National Security and Defense Council of Ukraine .

The State Nuclear Regulatory Committee extends its appreciation for taking the active part in the preparation and drafting of the Nuclear and Radiation Safety in Ukraine, Report 2005, to Golubovskiy-Onicimoviy G.M., Deputy Director of the SNRCU Public Board, the Honorary Director of All-Ukrainian Ecological Public Organization "Mother–86"; to Zenyuk O.U., Head Of The Nuclear-Industrial Complex Department of the Ministry of Fuels And Energy of Ukraine; to Gromov G.V., Head Of The Analytical Research Bureau for Nuclear Power Plants Safety; Zayests I.V., Head of External Information Communication Department of National Nuclear Energy Generating Company "Energoatom".

DEAR READERS!

You are holding the Annual Report on Nuclear and Radiation Safety in Ukraine, 2005.

Th Report materials give you the insights of the legal basis of activities in the area use of nuclear energy; the main areas of activity of control and regulatory Bodies in this area; activities, which have been performed throughout the reporting period to enhance the level of nuclear and radiation safety in Ukraine.

While preparing the Report for publishing, experts of the State Nuclear Regulatory Committee of Ukraine strived to provide the most complete and objective information to community on the status of nuclear and radiation safety in Ukraine; moreover, we tried to do that for you, dear readers, in the most convenient and easily understood form.

We hope, that with your help, we'll be able to receive the answer to the question of whether or not have we managed to achieve the challenging objective.

We would be grateful for all of your comments, advises and wishes as to the improvement of the of this Report structure.

If, after you have read the Report, there would be more questions from you, do not hesitate to ask them during our telephone hotlines or during the visiting hours for citizens arranged by the management of the State Nuclear Regulatory Committee of Ukraine. The info on the time and place of these arrangements you may find at the website of the State Nuclear Regulatory Committee of Ukraine:
www.snrc.gov.ua

Chairperson
of the State Nuclear
Regulatory Committee of Ukraine

O.Mykolaichuk

CONTENTS

LIST OF ABBREVIATIONS

ChNPP – Chernobyl NPP
CMU – Cabinet of Ministers of Ukraine
CSF – Chernobyl Shelter Fund
ETC – Emergency Technical Centre
FCM – Fuel-Containing Masses
FE – Fuel Element
FS – Feasibility Study
IAEA – International Atomic Energy Agency
IAMS – Shelter integrated automated monitoring system
ICSRM – Industrial Complex for Solid Radioactive Waste Management
IEC – Information/Emergency Center
INES – International Nuclear Events Scale
IRS -Ionizing Radiation Source
KhIEP – Kharkiv Institute "Energoproekt"
KIEP – Kyiv Institute "Energoproekt"
KhNPP – Khmelnitsky NPP
KNRI – Kyiv Nuclear Research Institute of the National Academy of Sciences of Ukraine
LRTP – Liquid Radwaste Treatment Plant
MFA – Ministry of Foreign Affairs
MFE – Ministry of Fuels and Energy
MHB – Multi-Place Hermetical Basket
MJU – Ministry of Justice of Ukraine
MUE – Ministry of Ukraine for Emergencies and Affairs of Population Protection from Consequences of the Chernobyl Catastrophe
NASU – National Academy of Sciences of Ukraine
NAEK "Energoatom" – National Nuclear Generating Company "Energoatom"
NI – Nuclear Installations
NM – Nuclear Materials
NNPT – Nuclear Non-Proliferation Treaty
NPU – Nuclear Power Unit
NPP – Nuclear Power Plant
NRC USA – Nuclear Regulatory Commission (USA)
NSC – New Safe Confinement
NSCKPI – National scientific centre "Kharkiv Physics/technical Institute"
PE – Public Enterprise
PPS – Physical Protection System
SO – Scheduled Outage
RA – Regulatory Act
Radwaste – Radioactive Waste
RIA – Risk-Informed Approaches
RNPP – Rovno NPP
RWDP – Radioactive Waste Disposal Point
SA – State Association
SAR – Safety Analysis Report
SE – Separate Entity
SEIAS – State emergencies informational and analytical system
SFA – Spent Fuel Assembly
SFSF – Storage Facility for Spent Nuclear Fuel
SINEI – Sevastopol Nuclear Energy and Industry Institute
SIP – "Shelter" Implementation Plan
SISP – State Interregional Specialised Plant
SNF – Spent Nuclear Fuel
PSA – Probabilistic Safety Analysis
SRW – Solid Radioactive Waste
ICSRM – Solid Radioactive Waste Management Industrial Complex
SSE – State Specialized Enterprise
SSTCNRS – State Science and Technical Centre For Nuclear and Radiation Safety
TACIS – Technical Assistance For The Commonwealth Of Independent States
UAAS – Ukrainian Agrarian Academy of Science
URSS – Ukrainian Radiation Safety Standards
VSC – Ventilated Storage Cask
WWER – Water Cooled Power Reactor
SUNPP – South Ukraine NPP
ZNPP – Zaporizhzhya NPP

INTRODUCTION

The State Nuclear Regulatory Committee of Ukraine (hereinafter – SNRCU) annually prepares Nuclear and Radiation Safety in Ukraine, Annual Report, according to the requirements of "Aarhus Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters", the Law of Ukraine "On Use of Nuclear Power and Radiation Safety", as well as the Statute of the State Nuclear Regulatory Committee of Ukraine.

This Report was developed with the objective to present results of the state policy of use of nuclear power in peaceful purposes and ensuring compliance with nuclear and radiation safety requirements in Ukraine in 2005. This Report describes the status of nuclear and radiation safety in this country and outlines the most safety significant issues.

This Report incorporates materials of inspections, reports of enterprises carrying out their activity in the area of nuclear power use, as well as the information provided by the Ministry of Fuel and Energy of Ukraine, the National Nuclear Generating company "Energoatom", the Ministry of Health of Ukraine, the Ministry of Ukraine for Emergencies and Affairs of Population Protection from Consequences of Chernobyl Catastrophe, the State Scientific and Technical Centre for Nuclear and Radiation Safety of SNRCU etc.

PART I

LEGAL BASIS OF ACTIVITIES IN THE AREA OF NUCLEAR POWER USE

Nuclear Energy Use – is a complex of activities related to application of nuclear technologies, nuclear materials, IRS in science, industry, medicine and other fields, as well as extraction of Uranium ore and radioactive waste management.

The need of legal regulation of relations in the area of nuclear power use is justified by the potential danger related to the activity in this area.

First regulatory acts in the nuclear area appeared in the ex-USSR in the middle of 50s. Those were mainly departmental statutory acts that did not resolved issues related to rights, liabilities, responsibility of relations of participants in the area of nuclear energy use.

Moreover, the control of the nuclear energy utilization was carried out by national central authorities. The republican legislation in the nuclear area was practically absent. And all this in the conditions that in Ukraine in that period were 14 nuclear installations in operation as well as a large amount of sources of ionizing radiation.

The development of national legislation in the area of nuclear energy utilization was pushed by the Chernobyl catastrophe, although first laws directed to the regulation of the activity related to mitigation of the catastrophe consequences and damages compensation appeared only in 1991when Ukraine proclaimed its independence.

First step in the creation of the legal basis of the activity in the area of nuclear energy use was the approval by the Verkhovna Rada of Ukraine (on January, 25, 1994) of the Concept of State regulation of safety and control of nuclear area in Ukraine. This Concept determined the foundations of State regulation of safety and control of nuclear area in Ukraine and main principles on which nuclear legislation is to be based, namely:

- *priority of protection of man;*
- *prohibition of certain activities without license in the area of nuclear energy use;*
- *execution of State supervision in the area of nuclear energy use;*
- *division of functions of the state control and state regulation of safety of nuclear energy use.*

Next step was the adoption of basic Law of Ukraine in the area of nuclear energy use "On Use of Nuclear Energy and Radiation Safety" of 8 February, 1995. The Law established the systematic approach to legal regulation of relations in the area of nuclear energy use. The appearance of such a law made a push for posterior development of nuclear legislation of Ukraine, in particular of laws of Ukraine "On Radioactive Waste Management", "On Mining and Milling of Uranium Ores", "On Protection of Man Against Ionizing Radiation", "On General Principles of Further Operation and Decommissioning of Chernobyl NPP and Conversion of Ruined Forth Power Unit of this NPP into the Ecologically Safe System", "On Permissive Activity in the Area of Nuclear Energy Use", "On Physical Protection of Nuclear Installations, Nuclear Material, Radioactive Waste, Other Sources of Ionizing Radiation", "On Civil Liability for Nuclear Damage and its Financial Assurance", "On Settling the Issues Related to Ensuring Nuclear Safety" and other legal/regulatory Acts.

As to the nuclear legislation development, it is also worth mentioning international acts joined by Ukraine and which became a part of national legislation. It includes, in particular, the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) that entered in force in Ukraine on December, 5, 1994. According to the article 3 of this Agreement each country-consignor to the agreement that doesn't possess nuclear weapons is obliged to sign a contract with the IAEA on applying Safeguards of non-proliferation of nuclear material. On September, 25, 1995 Ukraine signed such agreement and Verkhovna Rada ratified it on December, 17, 1997.

It is also Vienna Convention on Civil Liability for Nuclear Damage of 1963 that determines the absolute Liability of the Operator for nuclear damages. The above mentioned Convention entered in force in Ukraine on July, 12, 1996.

Besides, Ukraine ratified the Convention on Physical Protection of Nuclear Material (on August 5, 1993), Convention on Early Notification of a Nuclear Accident (on December 30, 1986), Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (on December, 30, 1986), Convention on Nuclear Safety (on December 17, 1997), Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (on April, 20, 2000).

Thus, Ukraine in relatively short period of time created its own nuclear legislation, but the quantity of new legal/regulatory acts continues to increase due to the improvement of relations in the area of nuclear energy utilization. Just for this reason, respective authorities are continuing to develop legal/regulatory documents in the area of nuclear energy utilization revising old documents and drafting the new ones including by means of adaptation of national legislation to the legislation of European Union.

In 2005 the improvement of the national legislation of Ukraine has been carried out extremely actively. The SNRCU, in the framework of its regulatory activity developed 24 draft laws.

With the purpose of strengthening the world regime of Safeguards of non-proliferation of nuclear weapons, SNRCU prepared the draft Law "On the Ratification of Additional Protocol to the Agreement between Ukraine and International Atomic Energy Agency on Applying

Safeguards in relation to the Agreement of Non-proliferation of Nuclear Weapons", which was passed by the Verkhovna Rada of Ukraine on November, 16, 2005 under the № 3092-IV and entered in force on December, 18, 2005.

On September 7, 2005, the Verkhovna Rada of Ukraine ratified the Guarantees Agreement (Project of modernization after completion of construction of 2nd power unit of Khmelnitsky NPP and 4th power unit of Rovno NPP) between Ukraine and European Bank of reconstruction and development signed on July, 29, 2004. According to this Agreement, the Bank agreed to loan to NAEK "Energoatom" the amount of 42.000.000 US dollars for financing of the part of the above mentioned project.

An important step in strengthening the regime of non-proliferation of nuclear weapons and reduction of threat of nuclear and radiological terrorism at the international level was the signing in the beginning of 2005 between Ukraine and other participating states to the Convention on Physical Protection of Nuclear Material during Diplomatic conference in Vienna (Austria) of the Amendment to the above mentioned Convention.

It is worth mentioning that it was our country among other 25 participating states that initiated amendments and, at the same time was their co-author. During years 2003-2005 Ukrainian specialists participated in numerous consultations on the concordance of amendments texts.

The significant event of 2005 was the adoption by the Verkhovna Rada of Ukraine on September,8 of the Law of Ukraine "On the Procedure for Decision-Making on Siting, Designing, Construction of Nuclear Installations and Radioactive Waste Management facilities having national significance". This Law determines the legal tool of taking decisions by the Verkhovna Rada on siting, designing, constructing nuclear installations and radioactive waste management of the national significance. According to the law, the decision on the placement on its own territory of any above mentioned sites is taken by local authorities after local consultative poll of citizens of Ukraine (consultative referendum) on the issue. This is important step on the road to employ best international practices in participation of citizens in making decisions on the construction of nuclear sites of the national significance.

During the year 2005 the Cabinet of Ministers of Ukraine (hereinafter referred to as CMU) approved a number of statutory and regulatory acts on the issues of ensuring nuclear and radiation safety.

Thus, on July, 21, 2005 the CMU issued a Resolution № 281 "On preparative measures concerning the construction of new power units of Khmelnitsky NPP" according to which Ministry of fuels and energy in cooperation with NAEK "Energoatom" have to ensure survey of sites, buildings and equipment of KhNPP-3 KhNPP-4 and based on the results present proposals concerning the possibility of use Khmelnitsky NPP site for the construction of 3d and 4th units.

The Resolution of CMU № 515-p of 13 December, 2005 approved the Concept of enhancing safety of nuclear power units in operation.

The Decree of CMU № 74 of 21 January, 2005 introduced amendments to the Decree of CMU № 912 of 1 July, 2002 "On Approval of the list of ionizing radiation sources, which use is exempted from licensing" This Decree enlarged the above mentioned list with generating devices used in medicine.. The introduction of such

The signing of the Amendment to the Convention on Physical Protection of Nuclear Material

a list is in conformity with the legislation of the European Community and, namely, Directive of the Council 96/29/Euroatom of 13 May, 1996 on the differentiated approach to regulation of activities with the sources of ionizing radiation taking into account their potential radiation hazard.

The decree of CMU № 846 of 31 August, 2005 introduced amendments to the decree of CMU № 847 of 4 August, 1997 "On establishing the State Register of ionizing radiation sources" concerning prolonged term of implementing certain measures to establish the Register.

The decree of CMU of 31 August, 2005 "On competence profile certification and motivating of staff of SNRCU, who directly are directly fulfilling duties of state regulation of nuclear and radiation safety in Ukraine" is aimed at implementation of Article 23 of the Law of Ukraine "On Use of Nuclear Energy and Radiation Safety" concerning the creation of a tool to increase of the effectiveness and efficiency of SNRCU performance.

In 2005 the work on drafting rules and regulations of nuclear and radiation safety was continued. There were 9 documents drafted for the improvement of the system of regulation of nuclear and radiation safety.

In the area of enhancing safety of nuclear installations SNRCU drafted and put into force 3 documents.

"Requirements to modifications of nuclear installations and the procedure of their safety assessment" (NP 306.2.106-2005) of 10 January, 2005. This document sets requirements to introducing changes to the design of nuclear installations in operation, establishes the procedure for safety assessment of the modifications of nuclear installations. The requirements are obligatory for the operating organization that performs its activity at certain stages of service life of a nuclear installation, for organizations rendering services to the operating organization during implementation of modifications and for expert organizations/experts that make expert assessment of modification-related documents.

The "Requirements to certification of systems of operational non-destructive examination of piping equipment of nuclear power plants" (NPU 306.2.113-2005) of 10 October, 2005 establish main criteria of certification of systems of operational non-destructive examination of equipment and piping of systems important to safety, establish the certification procedure, content of certification documents and functions of certification process participants.

"Basic Provisions of ensuring safety of interim dry type stores for spent nuclear fuel" (NPU 306.2.105-2004) were put in force on 17 January, 2005. The document determines main principles and criteria of safety of stores for temporary storage of spent fuel, which is recovered from the NPP power Units.

The documents related to management of nuclear material are:

"Methodological instructions for physical inventory and nuclear materials balance compilation (RD 306.7.112-2005) of 6 October, 2005 and "Recommendations to the accountancy of small quantities of nuclear material (RD 306.7.111-2005) of 26 September 2005. The document's effect is directed towards ensuring non-proliferation of nuclear material, improvement of their state accountancy.

Three documents are directed to the improvement of licensing (permissive) activity of SNRCU:

"Conditions of and safety requirements (licensing conditions) to activities of processing, storage and disposal of radioactive waste" (NPU 306.109-2005) establish requirements to the applicants for the license on the performing certain types of activity in the area of nuclear energy use, concerning radioactive waste management.

"Requirements and safety conditions (licensing conditions) during activity related to design of a nuclear installation or a disposal site for radioactive waste (NPU 306.110-2005) set requirements to the applicants for obtaining the license of the implementation of the type of activity in the area of nuclear energy use – "design of a nuclear installation or a disposal site for radioactive waste"

Document "Procedure of the State expert assessment of nuclear and radiation safety (NPU 306.1.107-2005) of 21 February 2005 determines how SNRCU carries out assessment of nuclear and radiation safety of licensees in the process of implementation of the licensed activity.

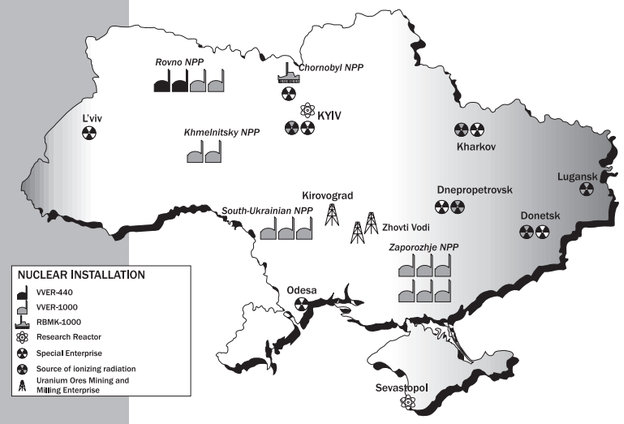
To improve emergency preparedness and effective mitigation of accident consequences is the area of the document "Provisions on planning of measures in case of an accident during transport of radioactive materials" (NPU 306.6.108-2005) of 7 April, 2005. This document establishes requirements to the content, procedure of drafting and approval of emergency actions during transport of radioactive materials.

In order to ensure regulation of construction of ISF-2 and other "dry type" stores, SNRCU has developed "Basic Provisions of ensuring safety of interim dry type spent fuel stores" (NPU 306.2.105-2005) This document contains main safety principles and criteria of interim dry type spent fuel stores and safety requirements for all stages of service life of dry type ISF. The compliance with this document's requirements is obligatory for organizations and individuals implementing activity related to, particularly, design of dry type ISF.

More detailed information on legal/regulatory Acts, international conventions and agreements, regulations and rules governing relations in the area of nuclear energy utilization is available on the SNRCU web site www.snrc.gov.ua in the "Regulations" Chapter.

SNRCU AS A BODY OF THE STATE REGULATION IN THE AREA OF NUCLEAR POWER USE

The State Nuclear Regulatory Committee of Ukraine as a central body of executive power, with special status was established on 5 December, 2000 according to the



Decree of the President of Ukraine №1303/2000. By this decree, SNRCU was given functions of defining criteria, requirements and conditions as to safety during the use of nuclear energy, issuing permits and licenses for carrying out activities in this area, executing State supervision over compliance with the legislation, rules, regulations and standards of nuclear and radiation safety and other functions of national regulatory body of nuclear and radiation safety as defined by the Nuclear Safety Convention and the Joint Convention on the Safety of Nuclear Fuel Management and on the Safety of Radioactive Waste Management.

Every year SNRCU prepares the report on its activity and the safety status of nuclear energy use, and once every three years represents the country during the meetings on the issues of meeting obligations of the Nuclear Safety Convention and Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management.

SNRCU regulates:

- *15 operated power units:*
  - *6 power units of Zaporizhzhya NPP,*
  - *4 power units of Rovno NPP,*
  - *3 power units of South Ukraine NPP,*
  - *2 power units of Khmelnitsky NPP;*
- *3 power units at the stage of decommission of Chernobyl NPP;*
- *2 operated spent nuclear fuel stores at Zaporizhzhya NPP and Chernobyl NPP, and the store being constructed at Chernobyl NPP;*
- *2 research reactors;*
- *radwaste stores and activities of radwaste management faciliites:*
  - *6 specialized enterprises of SA "Radon",*
  - *SSE "Complex",*
  - *SSE "Technocenter";*
- *Uranium industry enterprises;*
- *transport of radioactive materials through the territory of Ukraine;*
- *use and manufacture of ionizing radiation sources in radiation technologies.*

Important area of the SNRCU activity is permissive activity (licensing). Subdivisions of SNRCU carry out the following kinds of licensing activity:

- *licensing of certain kinds of activity in the area of nuclear energy use;*
- *licensing of the operating organization activity at certain stage of service life of a nuclear installation or a radwaste disposal facility and granting the Operator with separate permits for carrying out certain kinds of work or operations at the stages of commissioning and decommissioning of a nuclear installation and on the stages of operation and decommissioning of radwaste disposal facility;*
- *licensing of activity related to direct control of a reactor Unit;*
- *obligatory certification of transport packages for the transportation of ionizing radiation sources and transport containers for nuclear material.*

The decision on issuance a license for activities in the area of nuclear energy use is taken corporately at the SNRCU Licensing Commission meeting on the basis of documents prepared by respective subdivision of the Committee, and as to licensing of a certain stage of life cycle of a nuclear installations or radwaste disposal facilities, the decisions are taken at the open Board Meeting of of SNRCU.

Another area of the SNRCU activity is supervisory activity. The supervisory (inspection) activity is carried out by respective subdivisions of the Committee and by five State on-site inspections at NPPs under the direction of the Chief State Inspector on Nuclear Safety.

The State supervision is carried out over the following main areas:

- *compliance with the legislation, regulations, rules and standards on nuclear energy use, nuclear and radiation safety requirements by the operating organizations, enterprises, institutions, organizations carrying out works on the sites of nuclear installations, radwaste management facilities, Uranium industry sites;*
- *organization and conduct of State accountancy, prevention of illegal trafficking, ensuring safe storage of nuclear material, radioactive waste other sources of ionizing radiation;*
- *compliance with the legislation, regulations, rules and standards of physical protection of nuclear installations,* ***nuclear material[1], radioactive waste[2], other sources of ionizing radiation[3]****.*

Supervisory activity is carried out by means of everyday evaluations, inspections of compliance with nuclear and radiation safety, and, from 2004 according to the Law of Ukraine "On Amending the Code of Ukraine on Administrative Infringements" and by means of the use of enforcement measures towards individuals who fail to comply with these requirements.

As it was already mentioned, one of the forms of the State supervision are the inspections that are carried out by authorized representatives of SNRCU for the evaluation and determination of conformity of installations, facilities, systems (components) important to safety, works, documentation and competence of personnel to the established requirements. During carrying out of the State supervision in the area of nuclear energy use, planned and unplanned inspections are envisaged.

Planned inspections – is the evaluation of the conformity of Licensee's activity in the area of the nuclear energy use to the established safety requirements, carried out according to annual inspection plans. Planned inspections are composed of comprehensive, target and on-line inspections.

Comprehensive inspections are carried out in order to establish the conformity of Licensee's activity to safety requirements. Target inspections are carried out with established periodicity and envisage detailed verification of one or several safety issues and/or Licensee's activity.

On-line inspections envisage detailed verification of certain safety issues directly at workplaces in Licensee's subdivisions with the objective of taking prompt to prevent violations of safety requirements and eliminate the revealed deficiencies.

Extra-planned inspections are carried out in case if results of the planned inspections revealed specific areas of Licensee's activity or works where safety deficits are found, and which requires more detailed verification or more frequent inspections. Extra-planned inspections are composed of response inspections and specific inspections.

Response inspections are carried out in case of necessity of urgent response to the event occurred at an installation, facility.

Specific inspections are the in-depth verifications carried out in case of non-compliance with safety requirements. Such inspections are directed towards revealing the root-causes of non-compliance with safety requirements.

The inspection may include specialists of regional bodies of SNRCU as well as specialists of structural subdivisions of SNRCU, SSTC NRS, State Quality Control Center, other bodies of state safety regulation of use of nuclear energy and independent experts..

SNRCU, in conformity with current legislation, with the aim of increase the effectiveness of State regulation and prevention of violation of rules and regulations of nuclear and radiation safety, applies administrative enforcement measures to the infringers of nuclear legislation. During the reported period, State inspectors of the State inspections of nuclear safety drew up 15 protocols of administrative violations on NPP sites wer plants as well as used penalties towards 15 infringers (individuals) in form of fines. Fines were not imposed in 2005 on legal entities car-

LICENSES ISSUED IN 2005

Type of activity for which the license was issued	*Quantity of issued licenses*
Designing of nuclear installations or radwaste disposal facilities	*8*
Operation of nuclear installation or radwaste disposal facility	*1*
Processing, storage and disposal of radioactive waste	*8*
Transport of radioactive materials	*9*
Manufacture, storage, maintenance of ionizing radiation sources	*2*
Use of ionizing radiation sources	*2*
Activity related to ensuring security of nuclear material and nuclear installations	*15*

Information about issued licenses is available on the web site of SNRCU www.snrc.gov.ua in the Chapter "Activity".

NUMBER OF INSPECTIONS IN 2005

Subdivision	*Planned inspections*	*Extra-planned inspections*
Safety Assessment of Nuclear Installations Department	*6*	*2*
Central Inspection Department	*4*	*–*
Safeguards and Safe Transportation Department	*12*	*–*
State on-site inspection at Zaporizhzhya NPP	*13*	*5*
State on-site inspection at Rovno NPP	*14*	*8*
State on-site inspection at Khmelnitsky NPP	*19*	*5*
State on-site inspection at Chernobyl NPP	*16*	*12*
State on-site inspection at South Ukraine NPP	*19*	*2*

*[1]) **Nuclear material** – Plutonium, with the exception of Plutonium with isotopes concentration more than 80 % in Plutonium-238, Uranium-233, Uranium, uranium enriched with isotopes-235 or uranium-233, uranium containing mixtures of natural isotopes in form different from ore or ore remains, and any other material containing one or more of the above mentioned elements.*

*[2]) **Radioactive waste** – material objects and substances, which activity or radioactive contamination exceeds limits established by current regulations under condition that the use of these materials and substances is not envisaged.*

*[3]) **Source of ionizing radiation** – a physical object, apart from nuclear installations, containing radioactive substance, or technical device, producing or capable of producing, under certain conditions, the ionizing radiation.*

rying out their activity in the area of nuclear energy use.

For the concerted resolution of issues pertaining to the competence of SNRCU, discussing the most important areas of its activity the Committee has established the advisory body- the SNRCU Board Meeting.

Main tasks of the Board are as follows:

- *review of the proposals on forming and implementation of the Governmental policy in the area of State regulation of nuclear and radiation safety;*
- *determination of prospects and most important directions of the development of legal/regulatory basis for the State regulation of nuclear and radiation safety ;*
- *analysis of results and determination of the policy and priorities of licensing activity implementation in the area of nuclear energy use;*
- *analysis of results and determination of the policy and priorities of the State supervision over status of nuclear and radiation safety;*
- *review of expert assessment of safety and inspections of nuclear installations and radwaste disposal facilities when making decisions as to issuing licenses for activities at certain stages of a nuclear installation's life cycle;*
- *analysis of status of taking measures to implement the State policy in all areas of activity of SNRCU.*

Another collective advisory body of SNRCU is the Working Commission of normative regulation. The board was established for resolution of disputable issues related to activity normative regulation and pertains to the competence of SNRCU.

Main tasks of the Commission are forming of a long term program of drafting legal/ regulatory Acts on nuclear and radiation safety (hereinafter referred to as RA), the annual plan of normative regulation of SNRCU as well as giving recommendations to resolve disputable issues emerging in the course of RA drafting, co-ordination and approval.

The SNRCU's Licensing Commission exists for the purposes of preparing proposals concerning the taking of decisions on granting, refusal, renewal, extending or suspending, annulling or revoking a license in the area of nuclear energy use.

For reviewing scientific recommendations and proposals concerning the development of main areas of activity of the regulatory body, discussing the most important issues of applying the achievements of science and technology in the area of the nuclear energy use, ensuring compliance with nuclear and radiation safety requirements, SNRCU has established another consultative body – Scientific-Technical Council.

Main tasks of Scientific and Technical Council are the following:

- *making proposals on determination of scientifically based policy, directed to resolution of the whole complex of problems related to main areas of developments in the State regulation of nuclear and radiation safety, discussing the most important issues of use of R&D achievements and applications for the improvement of nuclear and radiation safety status ;*
- *according to the SNRCU area, making proposals and recommendations to the development of scientific research and technologies, determining perspective R&D areas, priorities in financing of scientific programs, possibility of their implementation;*
- *implementation of national and foreign science and technology achievements, advanced technologies with the aim of ensuring, on this basis, the improvement of quality of works and arrangements in issues pertaining to the competence of SNRCU;*
- *review and preparation of proposals to ensure high level of R&D developments, design and engineering solutions to the issues of nuclear and radiation safety;*
- *preparation of conclusions and recommendations for the SNRCU management concerning the improvement of practices of the State regulation of nuclear and radiation safety and forming the safety culture in the country.*

The Scientific and Technical Council involves SNRCU experts, leading scientists, highly qualified specialists, representatives of scientific and technical societies and other organizations with a vast experience and competence in the such areas as nuclear reactor physics, radiation protection, safety of nuclear power plants, technologies of nuclear fuel cycle, science of radiation materials, protection of environment against effects of radiation factors, quality assurance, non-proliferation of nuclear weapons, radwaste management, nuclear legislation, nuclear damage liability. The head of Scientific and Technical Council of SNRCU is Academician of National Academy of Sciences of Ukraine I.Vishnevskiy.

SNRCU pays a great deal of attention to the interaction with the community and mass-media.

Important event of 2005 in view of establishing the open dialogue with the community, ensuring the access to the information about the Committee's activity, involvement of citizens in the process of decision-making became the creation of the SNRCU Public Board. This consultative/advisory body involved representatives of international, national and regional public organizations, among them there were ecological, remedial, Chernobyl, children organizations, journalists, scientists, specialists in the area of nuclear and radiation safety.

As a head of the Board at its first Constituent Assembly was elected Mr. S.Kurykin, Head of political Council of the "Green party of Ukraine". His deputies became G.Golubovska-Onissimova, president of National ecological public organization "Mother-86", and B.Prister, Academician of the Ukrainian National Agrarian Academy of Science, member of the international Union of radioecologists.

Also, in 2005 SNRCU opened direct phone lines for questions on nuclear and radiation safety that are arranged twice a month with the participation of the SNRCU management.

SNRCU closely watches the coverage in the mass media (both national and international) of the events related to nuclear and radiation safety, tries to react to all problematic questions posing wide public concern in order to avoid emerging of the erroneous ideas about the state of things in such a sensitive for the Ukrainians area as the use of nuclear energy.

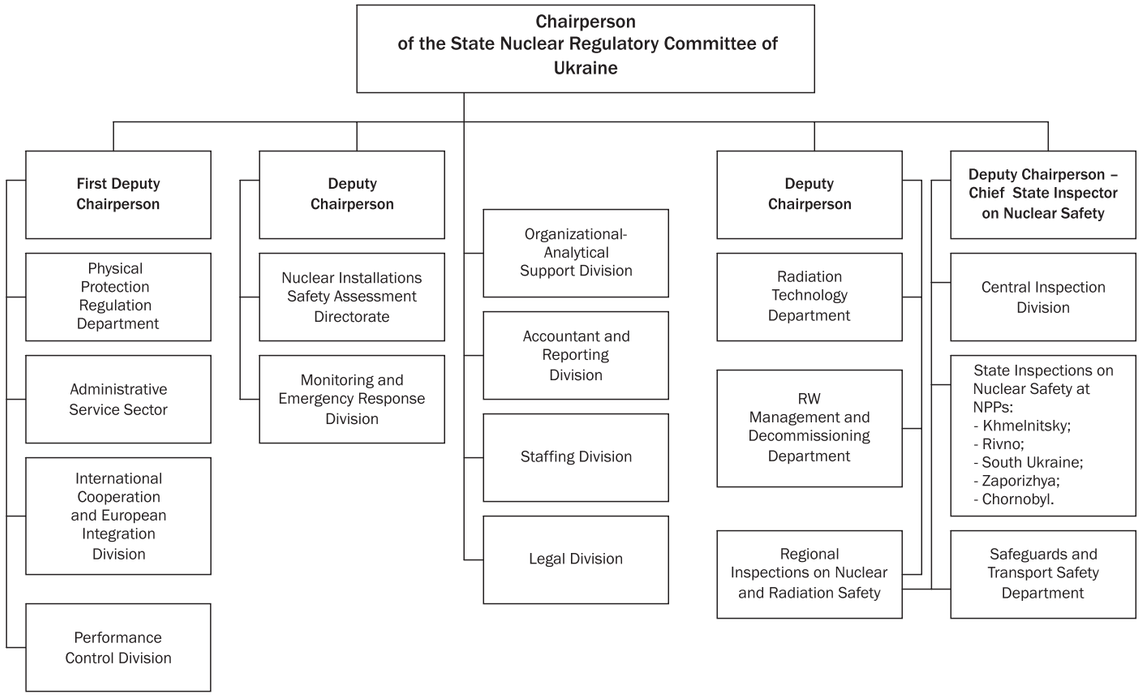
One can familiarize with speeches, reports, statements, and comments of management of SNRCU concerning current issues and important events of the discussed area on the official web site of the State Nuclear Regulatory Committee of Ukraine www.snrc.gov.ua.

For the effective execution of its functions, SNRCU makes use of scientific and technical support of the State enterprises "State Scientific and Technical Center for Nuclear and Radiation Safety", "State Center for Regulation of Quality of Supplies and Services", "Information Center of Technologies for Use of Nuclear Energy" ("Infoatom").

The State enterprise "State Scientific and Technical Center for Nuclear and Radiation Safety" (SSTC NRC) was established in y 1992 for the R&D support to the State regulatory body in the area of nuclear energy use. Today SSTC NRS makes expert assessments of nuclear and radiation safety, carries out scientific research for the national regulatory body with up-to-date methodology of regulation of nuclear and radiation safety.

"State Center for Regulation of Quality of Supplies and Services" also began its activity in 1992 within the structure of State Committee for Nuclear and Radiation Safety. It was powered with functions of regulating supplies to facilities of nuclear power engineering, arranging and conducting of scientific and technical expert assessments of thermal-mechanical and electrical equipment in for nuclear power engineering. Today the "State Center for Regulation of Quality of Supplies and Services" caries out procedures of evaluation of the conformity of products and services important for the safety of nuclear power plants.

The State enterprise "Infoatom" was established in 1994 for ensuring interface between the regulatory body and the community. Due to collaboration with "Infoatom", SNRCU has introduced automated information and analytical system, and opened its own web site.



As of December 31, 2005 overall staff of SNRCU consisted of 153 persons, including 82 males and 71 females.

Six of 146 SNRCU staff with higher education have scientific degrees. According to competence, 70% of SNRCU staff have higher technical education. SNRCU activity requires involving experts in various areas of knowledge, including physical metallurgy (material science), seismology, nuclear physics, radiology, engineering, civil engineering and operation of nuclear installations.

Heads of subdivisions and Staffing Department permanently keep filling vacancies for the State inspectors with highly qualified experts who gained working experience at NPP's and are on top of issues concerning fuel and energy complex, nuclear policy and safety.

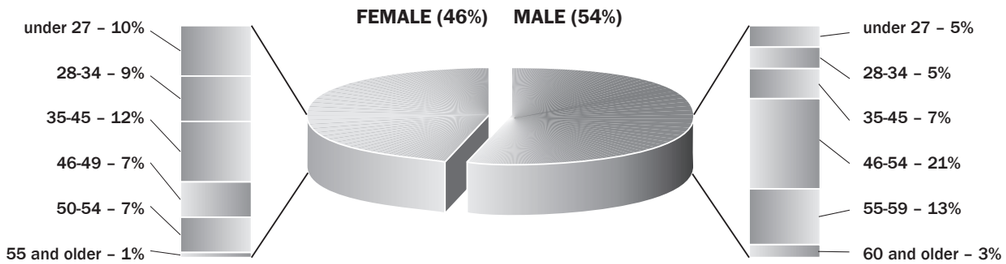
It should be mentioned that through 2005 employee turnover ratio decreased, including employees holding positions of the State inspectors. None of the least role was played here by Decree № 845 of CMU dated August 31, 2005 titled "Personnel Certification and Motivating Employees of the State Nuclear Regulatory Committee of Ukraine directly performing the State regulation of nuclear and radiation safety".

Implementation of the mentioned Decree gives opportunity to involve promising youth and allocate experienced personnel in nuclear regulation sector. At that, subject to availability of staff reserve, implementation of this Decree enables to improve personnel screening method and contributes to professional development of experts, who directly perform the State regulation of nuclear and radiation safety in Ukraine.

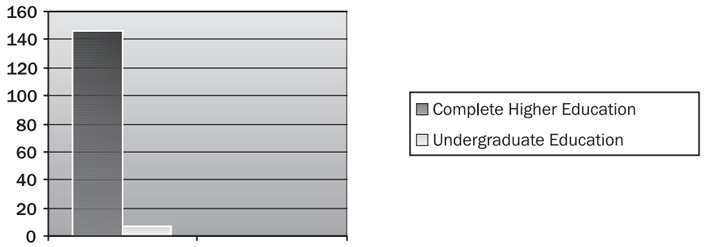
SNRCU employees are the civil servants and pursuant to the Law of Ukraine "On Civil Service" (Article 29) are required to retrain at least once per 5 years. Results of the raising skill Training are taken into account during certification and are one of grounds for promotion.

All the abovementioned gives a basis for stating, that the process of national regulation of nuclear and radiation safety involves highly skilled experts being able to take timely and competent decisions.

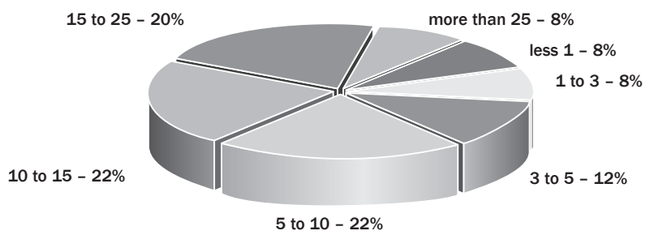
STAFF COMPOSITION ACCORDING TO SEX AND AGE GROUP



CORRELATION OF EMPLOYEES ACCORDING TO EDUCATIONAL ATTAINMENT



EMPLOYEES HAVING CIVIL SERVANT'S WORK EXPERIENCE (in years)



PART III

1. SAFETY OF NUCLEAR POWER ENGINEERING IN UKRAINE

Nuclear power as a component of fuel and energy complex of Ukraine

Nuclear power is important component of fuel and energy complex of Ukraine.

In 2005 nuclear power plants generated 88782 million kW/y or 47,9% of total generated electric power in the country.

Today 4 nuclear power plants function on the territory of Ukraine: Zaporizhzhya, South Ukraine, Khmelnitsky and Rovno, where 15 nuclear power units are in operation. From 1996 their operation is carried out by the State enterprise National Nuclear Energy Generating Company "Energoatom" (hereinafter – NAEK "Energoatom").

Since 2002, in accordance with the current legislation of Ukraine and on the grounds of comprehensive safety assessment nuclear installations and estimation of operating organization capacity to carry out all measures to ensure safety, SNRCU issued licenses to the NAEK "Energoatom" for operation of nuclear installations on the sites of South Ukraine nuclear power plant (hereinafter – SUNPP), Zaporizhzhya Nuclear Power Plant (hereinafter – ZNPP), Rovno Nuclear power Plant (hereinafter – RNPP) and Khmelnitsky Nuclear power Plant (hereinafter – KhNPP). Issuance of operating licenses for nuclear power installations was carried out under condition of their safety level compliance with national and internationally recognized requirements for nuclear and radiation safety, and under condition that NAEK "Energoatom" provides financial guarantees regarding indemnification of potential nuclear damage.

Licenses prescribe conditions and limits for carrying out the discussed activities. Technological complexes and borders of sites on which their action is spread, are established. Licensing conditions of NAEK "Energoatom" give the right to carry out independently or with involvement of a contracting organization the whole complex of activities related to operation of nuclear installations. At the same time, pursuant to the Law of Ukraine "On Nuclear and Radiation Safety", operating organization bear full responsibility for safety of nuclear installations operation.

Licensing conditions also prescribe types of activity and operations, carrying out of which is possible only upon availability of separate written permit by the SNRCU. Permits to start-up nuclear power units after scheduled outage (hereinafter – SO) with reloading of the core are issued to NAEK "Energoatom" only under condition of full implementation of measures, prescribed by previous permits and licensing conditions in force.

Six units with reactors, type WWER-1000, are in operation today on site of Zaporizhzhya Nuclear power plant, with general installed capacity 6000 MW.

Three units with reactors WWER-1000 are in operation on site of South Ukraine Nuclear power plant (series V-302 -SUNPP-1, V-338 – SUNPP-2 and V-320 – SUNPP-3).

Four units are in operation on site of Rovno Nuclear power plant. Among them – two units are with reactors of WWER-440 type and two with reactors of WWER-1000 type. In September 2004 SNRCU granted NAEK "Energoatom" with license for operation of nuclear installation "Rovno Nuclear power plant", consisting of three units, and in October 2004 – commissioning license for RNPP-4 with WWER-1000 type reactor. During 2005 SNRCU has been taken measures to assess justification materials, which were submitted by NAEK "Energoatom" regarding the possibility of obtaining operating license for RNPP-4.

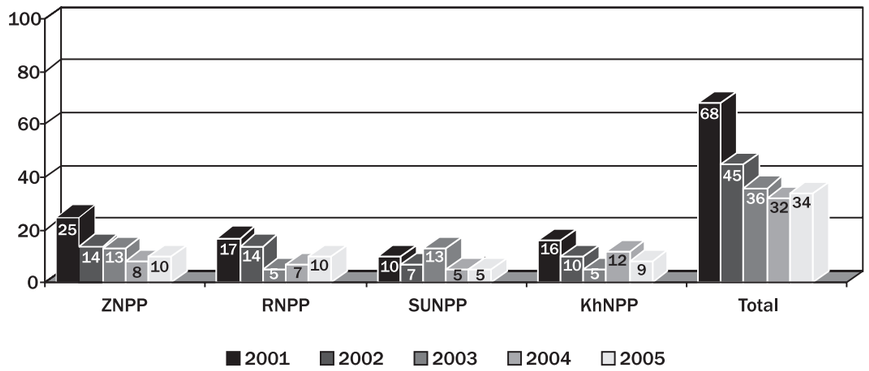
In 2005, based on the comprehensive safety assessment, the SNRCU issued the license to NAEK "Energoatom" for the right to implement activity on the life cycle stage "operation of nuclear installation of KhNPP-2". Thus, from December, 15, 2005 on site of Khmelnitsky Nuclear power plant, power is generated by two units with reactors of WWER-1000 type of a unified V-320 series.

Supervision over compliance with licensing conditions and separate written permits is continuously carried out by the State on-site inspections, and also during planned inspections by experts of other SNRCU subdivisions. Besides, discussion as to the completeness of compliance with licensing conditions and separate written permits is conducted during joint meetings of SNRCU and NAEK "Energoatom" before the completion of SO with core reloading of each operating unit.

Stringent registration of incidents and other events, which occur in the process of Nuclear power plant operation, thorough investigation of their causes and introduction of measures to eliminate the revealed deficiencies and prevention to recurrence of similar events in the future are one of the effective tools to maintain the postulated level of operational safety. All these issues are regulated by the "Provisions on the procedure of investigating violations and registration of violations in the operation of nuclear power plants", where events covered by this document are considered as violations in operation of a Nuclear power plant. As it is seen from the following diagram, the quantity of such events, beginning with 2001, notably decreases.

To evaluate the importance of events from the safety point of view the International Nuclear Events Scale (hereinafter – INES) is widely used; the scale was specifically developed as a tool providing information to the community. All events occurred at the nuclear power plants of Ukraine in 2005 were classified under the INES as "anomaly", "deviation" or "beyond the scale". The latest level includes events, which doesn't influence the status of nuclear and radiation safety and that's why they are beyond the scale. In 2005 there were no events of higher levels – "incidents" or "accidents".

NUMBER OF NPP OPERATIONAL EVENTS IN 2001-2005



CLASSIFICATION OF OPERATIONAL EVENTS AT UKRAINIAN NPPS IN 2005 ACCORDING TO INES

NPP	INTERNATIONAL NUCLEAR EVENT SCALE					
	Below scale	*Deviation*	*Anomaly*	*Incident*	*Serious incident*	*Accident*
	–	*0*	*1*	*2*	*3*	*4-7*
Zaporizhzhya	*4*	*5*	*1*	*–*	*–*	*–*
Rovno	*5*	*5*	*–*	*–*	*–*	*–*
South Ukraine	*2*	*3*	*–*	*–*	*–*	*–*
Khmelnitsky	*-*	*9*	*–*	*–*	*–*	*–*
Total:	***11***	***22***	***1***	***–***	***–***	***–***

Detailed information concerning the INES and international INES communication system may be found on the web site of the State Nuclear Regulatory Committee of Ukraine www.snrc.gov.ua

Modernization and safety enhancement of nuclear power units

After the Chernobyl accident the world community reviewed approaches to safety level assessment for all operating nuclear units. To this end, from 1992 to 1998 all nuclear power plants of Ukraine have been accepting international missions for verification of compliance of operating nuclear installations safety level with the international requirements. According to the results of the IAEA missions, recommendations were drawn up, which are stated in the document "Problems of safety of nuclear power plants with reactors WWER-1000/440 and their categories" IAEA-EBR-WWER-05.

With the aim to implement the IAEA recommendations and fulfill Ukraine's responsibilities in accordance with Convention on Nuclear Safety, Ministry of Fuel and Energy of Ukraine and NAEK "Energoatom" developed "Comprehensive Program for Modernisation and Safety Enhancement of Nuclear Power Units" (hereinafter – Comprehensive Program), approved by Resolution of the Cabinet of Ministers of Ukraine № 504-p of July 29, 2002.

Pursuant to the present Resolution, organization and control over implementation of the Comprehensive Program was laid upon the Ministry of Fuel and Energy of Ukraine, and NAEK "Energoatom" was defined as a responsible executor of Comprehensive Program.

The Comprehensive Program prescribed to carry out 389 unit-measures on 13 nuclear power units of nuclear power plants of Ukraine during 2002-2005.

Implementation of measures of the Comprehensive Program was aimed to achieve a number of tasks, the main of which are:

- *Elimination of pending safety problems of nuclear power plants, deviations from requirements of national regulations, which came into force after commissioning of operating nuclear power units and/or decrease of influence of such deviations on safety by means of compensatory measures;*
- *Fulfillment of responsibilities under the Convention on Nuclear Safety, approved by Ukraine, and implementation of the IAEA recommendations on safety enhancement of nuclear power plants with WWER type reactors ;*
- *Safety analysis of nuclear power units; development of List of safety enhancement measures based on the results of the analysis.*

On 7 April, 2005 there was the SNRCU Board Meeting "On the status of implementation of the Comprehensive Program measures". By the decision of the Board Meeting, for ensuring efficient control over implementation of measures in 2005, the nuclear power plants management were obliged to submit a schedule for implementation, till the end of 2005, of the Comprehensive Program measures of top priority from the point of view of safety significance, before each unit is put into scheduled outage with the core reloading. The SNRCU determined a procedure, according to which separate written permits for operation of nuclear power units after SO were issued only provided that all measures were implemented to the full scope at each unit.

Information concerning general implementation of unit-measures as per the end of 2005 is given in the Table.

Taking into consideration the completion in 2005 of the Comprehensive Program period of validity and objective causes of its non-implementation within the set term, in May 2005 the Cabinet of Ministers of Ukraine made a decision to review the Comprehensive Program and prolong it.

As a result, NAEK "Energoatom" and the Ministry of Fuel and Energy of Ukraine developed, and the Cabinet of Ministers of Ukraine by the Resolution № 515-p of December 13, 2005 approved the "Concept of safety enhancement of nuclear power plants in operation".

While preparing the Concept, "Comprehensive Program for Modernisation and Safety Enhancement of Nuclear Power Units" was analyzed together with other current programs for safety enhancement of Ukrainian nuclear power plants, documents of the IAEA for analysis of nuclear power plants with WWER reactors safety issues, and safety analysis reports.

While preparing the Concept, new approach was used and the following was made:

- *PRIORITIZATION of measures with placing an emphasis on the most safety significant. Measures for enhancement of nuclear safety, and also measures to maintain the achieved design safety level, were considered as the most important;*

STATUS
of implementing measures of "Comprehensive program for modernization and Safety Enhancement of Nuclear Power Units" according to the IAEA safety categories

IAEA category	Zaporizhzhya NPP		Rivno NPP		South Ukraine NPP		Khmelnitsky NPP		Number of implemented measures at NPP's in in 2005	Number of not implemented measures at NPP's
	Measures implemented in 2005	Remain not implemented	Measures implemented in 2005	Remain not implemented	Measures implemented in 2005	Remain not implemented	Measures implemented in 2005	Remain not implemented		
I	19/6	32	11/–	21	9/5	4	5/2	4	40/13	61
II	24/16	65	10/3	22	24/5	44	3/1	13	61/25	144
III	14/6	19	10/2	7	1/1	22	4/–	6	29/9	54
Total:	57/28	116	27/5	50	34/11	70	12/3	23	130/47	259

Recommended measures are categorized, depending on level of their safety significance from I to IV categories of priority (where I – deviation from generally accepted international practices; it is possible to consider implementation of recommendations as part of actions, directed on resolution of urgent issues; IV – crucially important to safety, require urgent actions to resolve the issue; impossibility to execute shall lead to the shutdown of reactor unit). Fullness of implementation of these recommendations is taken into consideration by international experts and IAEA missions in the course of assessment of nuclear and radiation safety status of reactor units of Soviet design.

- *REFORMATTING of measures by means of their grouping according to the main safety areas and, if necessary, joining and addition of measures, formed on the basis of safety analysis reports.*

Process of the Concept implementation will be carried out under direct control of the SNRCU with involvement of Western experts. Every year results will be drawn up, necessary measures will be taken and, as necessary, plans and schedules will be amended.

Safety enhancement of new nuclear power units KhNPP-2/RNPP-4

Activity of the operating organization related to safety enhancement of new KhNPP-2 and RNPP-4 is carried out in accordance with "Program of modernization of units KhNPP-2/ RNPP-4", aimed at bringing their safety levels to the up-to-date international requirements.

The program was approved by NAEK "Energoatom" in 1996 and coordinated with the SNRCU. Scope and deadlines of the Program of modernization are prescribed by Decision "On implementation of measures for safety enhancement and modernization of units KhNPP-2 RNPP-4" of 22April , 2003 and amendments to this Decision of 6 February, 2004. These documents passed through the state expert assessment for nuclear and radiation safety and were analyzed by western experts of "RISKAUDIT" company. Implementation of the Program of modernization will allow to provide such safety level of nuclear power units, which will correspond to the international standards and will eliminate a number of deviations from current safety requirements.

From 76 safety enhancement measures, which were subject to implementation before "start-up" of the units, 67 were implemented. For 9 measures, the operating organization provided relevant justifications and proposed compensatory measures, implementation of which ensured the SNRCU decisions concerning possibility to postpone the term of full implementation of these measures for the stage after "start-up" of the units.

In 2004 the in-depth monitoring of implementing measures on sites of Khmelnitsky and Rovno NPP was conducted by Western experts (EDF/Iberdrola/Sogin). According to the conclusions, activity of operating organization in implementing measures at units KhNPP-2 and RNPP-4 was recognized satisfactory. Experts noted positive experience of Ukraine in part of involving western experts to monitor the status of implementation of modernization program and confirmed the intention to further cooperate in conducting monitoring of measures, which are to be implemented after "start-up" of the units.

Check-up of the status of implementation of measures was also carried out by commissions of the SNRCU during inspections of operating organization readiness to carry out activities and operations at the stages of commissioning of the power units. Condition for obtaining separate written permits to perform activities and operations at the stages of commissioning was the confirmation of completion of measures to the full scope at the previous stage. Experts of State inspections at Rovno and Khmelnitsky NPP have been conducting continuous monitoring of the status of implementation of safety enhancement measures at all stages of the units commissioning.

In accordance with licensing conditions for commissioning of nuclear power units, the operating organization before 29 October, 2004 for KhNPP-2 and till 30 November, 2004 for RNPP-4 had to develop and coordinate with the SNRCU schedules for implementation of safety enhancement measures, which had to be implemented after "start-up" of the units. NAEK "Energoatom" fulfilled the mentioned conditions only on March, 16 of the last year, which is 3 (for RNPP-4) and 4 (for KhNPP-2) months later than the deadlines prescribed in licenses.

To provide appropriate control over the status of implementation of safety enhancement measures, the SNRCU prescribed a number of requirements to the procedure of reporting by NAEK "Energoatom", KhNPP and RNPP on the status of measures implementation.

In accordance with the Law of Ukraine "On Permissive Activity in the Area of Nuclear Power Use", in 2005 the operating organization NAEK "Energoatom" provided the SNRCU with application to obtain operating license for Unit 2 "Khmelnitsky Nuclear power plant" in relation to completion of the service life stage "commissioning of Unit 2".

Safety justification materials and other documents, which confirm capacity of the operating organization to carry out safe operation of unit № 2 are attached to the application.

The SNRCU together with SSTC NRS carried out the State expert assessment of nuclear and radiation safety, safety justification materials and of submitted documentation. Results of activities of national experts are fixed in the report of the SSTC NRS. Extended conclusions and proposals are brought together in the "Conclusion of the State expert assessment of nuclear and radiation safety, materials of safety justification of KhNPP-2", pursuant to which the safety level of the KhNPP-2 was recognized as such that corresponds to the up-to-date requirements.

According to the schedule of implementation of safety enhancement measures, implementation of which is to be done after "start-up" of KhNPP-2, in 2005 16 measures were planed, in 2006 – 20 measures and in 2007 – 44 measures. Experts of the SNRCU together with experts of the SSTC NRC and "RISKAUDIT" conducted analysis of the status of implementation of safety enhancement measures, which are to be implemented prior to completion termination of the first SO of Unit 2, which testifies the following.

After start-up of Unit 2, 16 measures were implemented to the full scope; 10 of them can be fully exempted from monitoring, and 6 require further implementation of additional recommendations for the period of operation. The rest of measures will be implemented during next two fuel campaigns, including SO, as it was envisaged by schedule.

Process of measures implementation will be carried out under direct monitoring from both SNRCU and

Western experts. For this, upon the initiative of SNRCU, two TACIS technical assistance projects (UK/TS/27 and UK/TS/32) were commenced. In the framework of these projects Western experts will provide assistance to SNRCU in the process of carrying out licensing of complex top-priority safety enhancement measures for KhNPP-2/RNPP-4.

Analysis of NPP's safety in Ukraine

In accordance with current Ukrainian legislation, the operation is permitted only for those nuclear installations, safety level of which is recognized as the one, that corresponds to the internationally recognized requirements on the basis of comprehensive assessment of all factors, which influence safety.

At the beginning of the 90-ies, together with declaration of independence by Ukraine, with the aim to evaluate and justify nuclear power plants safety and in accordance with the IAEA recommendations, process of comprehensive safety analysis was begun. Results of safety analysis are provided in the form of nuclear power unit safety analysis reports (hereinafter – SAR). To analyze safety Ukraine employs deterministic and probabilistic approaches, which correspond to current international practices. The task of SNRCU in this area is expert assessment of nuclear and radiation safety (hereinafter – NRS) of SAR materials, regulatory activities in part of ensuring control over its development (observance of deadlines, coordination of approaches, etc.).

In 2005 activity of the SNRCU in the mentioned area was directed to:

- *Conducting of the State expert assessment of NRS materials of Final SAR (hereinafter – FSAR) of KhNPP-2 and RNPP-4;*
- *Conducting of the State expert assessment of NRS materials of SAR of units in operation;*
- *Execution of control over observance of SAR materials development deadlines.*

Together with SSTC NRS and "RISKAUDIT" expert assessment of FSAR of KhNPP-2 was carried out, which had been submitted together with documents for obtaining license by the operating organization for activity at the stage of service life cycle "operation of nuclear installation of KhNPP-2". Safety analysis of KhNPP-2 had confirmed correspondence of level of its safety to the requirements of nuclear legislation, regulations, rules and standards of nuclear and radiation safety.

Simultaneously with the review of materials justifying safe operation of KhNPP-2, the State expert assessment of NRS materials of FSAR of RNPP-4 was conducted. It is planed to complete development of FSAR materials for RNPP-4 in the scope of conditions of the current license and to conduct their expert assessment in 2006.

In 2005 sufficient attention was paid to regulatory support to the process of developing SARs for the power units in operation. On 6 September, 2005 representatives of the SNRCU, NAEK "Energoatom" and design institutes (Kyiv Institute "Energoproekt", Kharkiv Institute "Energoproekt") held a meeting to discus issues of developing SARs for the Ukrainian power units in operation. At the meeting they analyzed the status of SAR development, determined the ways of step-by-step completion SAR of NPP pilot units and distribution of the mentioned materials to the units, which are in the process of adapting. To implement the meeting decisions, NAEK "Energoatom" developed and in December 2005 SNRCU approved the actualized "Schedules for development and submission to the SNRCU of SAR materials of NPP pilot units of Ukraine (ZNPP-5, RNPP-1, SUNPP-1). In accordance to the mentioned schedules, the operating organization has coordinate with the State Nuclear Regulatory Committee SARs of pilot units till the end of 2007.

Risk-informed approaches in regulatory activity and operation of NPPs in Ukraine

In the practices of safety analysis of nuclear power engineering safety during the last 25-30 years Risk-informed approaches (hereinafter – RIA) are widely used in the world. Adoption of regulatory decisions, taking into consideration analysis of influence consequences of such decision on severe accident risk is understood under use of RIA. At the same time Risk-informed approaches allow to increase effectiveness of safety regulation owing to priority given to activities in the areas, which have potentially high influence on risk.

In 2001 based on results of studying international experience and the status of development of probabilistic analysis of safety, the SNRCU Board Meeting took a decision concerning systematic implementation of probabilistic methods in regulatory and operation activities.

To implement the decision of the Board Meeting, "Program for implementation of Risk-informed approaches in regulatory activities and operation of NPP of Ukraine" (hereinafter – Program RIA) was developed in 2003.

Implementation of RIA is directed to: assessment of units safety level of NPP (elaboration PSA-1, PSA-2); establishment of a tool for realistic evaluation of influence of nuclear installations modifications on the safety level; decrease of workload on licensee owing to elimination of excessive conservatism of regulatory requirements and conditions of installations operation; increase of effectiveness of NPP activities (increase of the installed capacity factor) owing to decrease of excessive regulatory requirements to the licensee while preserving the required safety level; increase of regulation effectiveness owing to placing emphasis on safety deficits, conduct of risk-oriented inspection and supervision activities.

First examples of RIA methods implementation, from one side, revealed a number of existing safety deficiencies and deficits, and, from the other side – demonstrated substantial potential possibilities to decrease risk owing to optimal use of technical capabilities embedded in NPPs designs.

Program of RIA is intergovernmental. It coordinates efforts both of the regulatory body and the operating organization. RIA implementation activity involves the following directions:

- *Development of regulatory and methodological basis of RIA;*
- *Establishment of technical basis of RIA – enlargement and deepening of probabilistic safety analysis (hereinafter – PSA), adaptation of PSA to the RIA goals;*
- *Implementation of pilot projects of RIA methodology use to enhance safety and increase economic indicators of NPP operation.*

During 1997-2002 with support from the US Department of Energy, necessary infrastructure for implementation and further use of RIA was established in Ukraine. There are domestic organizations of technical support, which possess up-to-date methodology and have practical work experience. Relevant subdivisions and groups of experts were established at operating NPP's. The data bases of NPP equipment reliability were collected; thermo-hydraulic and probabilistic models for pilot units with reactors WWER-1000 and WWER-440 were developed and tested with the help of modern calculating programs. On the basis of PSA of pilot unit ZNPP-5, PSA level 1 for new units KhNPP-2/RNPP-4 was developed.

During 2004-2005 only 1 out of 12 regulatory/methodological documents, which are considered of top priority, were developed. Activities for drafting other documents, envisaged in the Program RIA, were not commenced due to the lack of financing. Development of some methodological documents, which was commenced in August 2005 in the framework of cooperation between the State Nuclear Regulatory Committee of Ukraine and US Nuclear Regulatory Commission (hereinafter – US NRC) is an exception.

Taking into consideration the situation with implementation of Program RIA, the SNRCU took decision to consider this issue at the Board Meeting. In the Decision of the Board Meeting of 12 September, 2005, implementation of Program RIA was considered as a top priority area of activities and attention of NAEK "Energoatom" was drawn to the necessity of ensuring coordination and adequate financing of activities, envisaged by the Program.

Pursuant to the Decision of the Board Meeting, on the basis of analysis of activities with RIA implementation for the period 2002-2005 and analysis of current status in the area of safety analysis and use of RIA, a new edition of the Program RIA was developed in 2005. Reviewed Program RIA coordinates and connects activities, which are financed in the framework of different programs (both national and international), and includes elements, which are not present in other programs, but which are important for effective implementation of RIA in this area. Implementation of activities under the Program RIA on the complex basis will allow to carry out in-depth analysis of NPP safety assessment to its logical conclusion, and achieve objective of NPP of Ukraine safety enhancement up to the world standards upon simultaneous increase of economic effectiveness of NPP operation.

Life-time extension of nuclear power units in operation

Design service-life of power units in operation, except for the units commissioned last year will expire in the period from 2010 to 2025:

Regulatory document of the SNRCU NP 306.2.099-2004 "General requirements to life-time extension of operating NPP beyond design service life based on the results of periodic safety assessment" came into force in 2004.

Taking into consideration the world experience, Resolution of the Cabinet of Minsers of Ukraine № 263-p of 29 April, 2004 approved the "Comprehensive Action Program for Life-Time Extension of Nuclear Power Units" (hereinafter – Comprehensive Program), implementation of which will allow to ensure economic independence of the country and stable production of nucler power.

Implementation of 17 organizational/technical, economic and social measures is envisaged in the Comprehensive Program, which are grouped in 4 blocks. There are the established procedure and deadlines of implementation of activities on preparation of Units for life-time extension, including safety re-assessment and completion of licensing process. This imposes very strict requirements to the deadlines of implementing all planned measures and requires organization of clear interaction between all participants of the licensing process.

In accordance with the Order of the Ministry of Fuel and Energy of 21 June, 2004 No. 340 NAEK "Energoatom" developed the "Action Plan for NAEK "Energoatom" for implementation of measures of the Comprehensive Action Program for Life Time Extension of Nuclear Power Units in Operation".

Action Plan implementation results in 2005 show tendencies of backlog in the deadlines of development of standard programs for evaluation of technical condition and reassignment of service life of (systems), components of power Units, making evaluation of technical condition of critical components of a power Unit, improving the diagnostic systems, development of information data bases, etc.

On September 12, 2005, the Board Meeting of SNRCU was held to discuss the status of implementing activities for justification of possibility of safe operation of reactor vessels of the nuclear power plants beyond the design service life. During the Board Meeting the participants indicated deficiencies in performance of NAEK "Energoatom" in part of carrying out monitoring of reactor vessels status of WWER-1000 type reactors.

It should be mentioned that reactor pressure vessel is one of the components, which service life determines the service life of the whole Unit. If safe operation of reactor pressure vessel is not proved for the beyond service life operation, carrying out all other works related to service life extension of systems and components is pointless.

In accordance with the Decision of the Board Meeting, NAEK "Energoatom" developed the list of measures and started work on drafting branch, regulatory, program and methodological documents (adaptation of the corresponding documents of foreign countries, which operate nuclear installations of analogous type).

Radiation safety and radiation protection of NPP personnel

Radiation safety and radiation protection of NPP personnel is evaluated by the following characteristics:

- *Not exceeding the prescribed levels of personnel exposure;*
- *Not exceeding the prescribed releases of radioactive substances into the atmosphere;*
- *Not exceeding the prescribed water discharges of radioactive substances.*

Individual health physics monitoring of personnel is arranged at the Ukrainian nuclear power plants, which envisages monitoring of external exposure with the personal dosimeters and monitor internal exposure with full body counters (spectrometers).

With the aim of implementing the principle of not exceeding the dose limits and the principle of radiological protection optimization, the Ukrainian NPP's introduced Reference levels of personnel exposure.

It should be mentioned that increased doses are received by personnel, who are directly involved in the scheduled outage activities and maintenance of process equipment and equipment, which is the source of ionizing radiation. But the received do not exceed the Reference levels and constitute 40-70% of their value.

Permissible and Reference levels of releases and discharges of radioactive substances were introduced and adopted at Ukrainian NPP's. The levels were coordinated with the Ministry of Health Protection of Ukraine.

For additional monitoring of modes of operation, repair of equipment, administrative and technological radiation safety levels were established.

Volumes of discharges were monitored every 24 hours by separate groups of radionuclides (rare radioactive gases, long-lived nuclides and radioiodine) and every month by five basic radionuclides with the help of automated systems, installed in ventilation stacks and gamma-spectrometry methods.

Based on the results of discharge levels analysis it was determined that exceeding the reference levels in 2005 was not registered. Factually, average monthly discharge levels constituted 3-7% of reference levels and 0,16-0,47% of permissible ones. Certain increase of discharge levels of long-lived nuclides from Rovno NPP and Khmelnitsky NPP in comparison with 2004 was connected with commissioning of Units RNPP-4 and KhNPP-2.

Volumes of discharges were monitored by the basic 15 radioactive nuclides. In 2005 exceeding of permissible and reference discharges were not registered. Actual levels of discharges constitute 7-17% of reference level and 0,08-1% of permissible level.

DESIGN SERVICE-LIFE OF POWER UNITS IN OPERATION

Unit NPP	*Reactor type*	*Date of commissioning*	*Year of expiry of design service life*
KhNPP-1	*WWER - 1000*	*1987*	*2017*
KhNPP-2	*WWER - 1000*	*2004*	*2034*
RNPP-1	*WWER - 440*	*1980*	***2010***
RNPP-2	*WWER - 440*	*1982*	***2011***
RNPP-3	*WWER - 1000*	*1986*	*2016*
RNPP-4	*WWER - 1000*	*2004*	*2034*
ZNPP-1	*WWER - 1000*	*1984*	***2014***
ZNPP-2	*WWER - 1000*	*1985*	***2015***
ZNPP-3	*WWER - 1000*	*1986*	*2016*
ZNPP-4	*WWER - 1000*	*1987*	*2017*
ZNPP-5	*WWER - 1000*	*1989*	*2019*
ZNPP-6	*WWER - 1000*	*1995*	*2025*
SUNPP-1	*WWER - 1000*	*1983*	***2012***
SUNPP-2	*WWER - 1000*	*1985*	***2015***
SUNPP-3	*WWER - 1000*	*1989*	*2019*

Ukrainian NPP's carry out radiation monitoring in sanitary/ protective zone and in monitoring zone, which includes:

- *Monitoring of atmospheric contamination with radioactive nuclides;*
- *Monitoring of atmospheric fallouts (precipitations);*
- *Monitoring of radionuclide content in samples of soil and vegetation;*
- *Monitoring of radionuclide content in samples of milk, grain-crops, vegetables and fruits, mushrooms, sampled in inhabited areas of NPP monitoring zone;*
- *Monitoring of radionuclide content in water bodies;*
- *Monitoring of gamma exposure dose rate.*

To determine the mentioned parameters, the samples are taken at the stationary radiation monitoring posts.

Analysis of obtained results of monitoring of the abovementioned parameters demonstrates, that the actual levels of NPP influence on the environment is not distinguished from background levels and levels of environmental pollution prior to commissioning of the first Ukrainian power Units.

2. RADIOACTIVE WASTE MANAGEMENT

Radioactive waste (hereinafter – radwaste) is originated in result of electric power production by NPP and research reactors, use of sources of ionizing radiation and radioactive substances in science, medicine, industry and agriculture. Sufficient quantity of radwaste was originated from the Chernobyl accident. Also there is radwaste, originated in result of military programs implementation.

According to definition in the Law of Ukraine "On Radioactive Waste Management", the term "radioactive waste" means material objects and substances, activity of radioactive nuclides and radioactive contamination of which exceeds limits, prescribed by current regulations, under condition that use of these objects and substances is not envisaged.

The State policy in the area radwaste management is implemented by means of implementation of the Comprehensive Radioactive Waste Management Program for 2002-2005 and for the period till 2010 (hereinafter – Comprehensive Program), which is approved by the Resolution of the Cabinet of Ministers of Ukraine in edition of December 25, 2003 as per No.2015.

The objective of the Program is to ensure implementation of provisions of Article 16 of the Constitution of Ukraine, legislation of Ukraine and main directions of implementation of the State policy in the area of radwaste management, namely:

- *protection of life and health of personnel, who work with radwaste, and population from adverse effects of ionizing radiation;*
- *establishing and functioning of a unified State system of accountancy and control over movements of radwaste;*
- *development of new and implementation of existing technologies of radwaste management at all process levels;*
- *ntroduction of a special tool of financing works in the area of radwaste management.*

Unfortunately, due to the systematic lack of financing of the Comprehensive Program from the State budget, implementation of envisaged measures progresses slowly, with tangible delay with the determined deadlines.

Establishment of a unified effective State system of radwaste management is possible only under condition of functioning of the State Radwaste Management Pool, which is to be established at the expense of target allocation from enterprises, institutions and organizations producing the waste.

The Order of the President of Ukraine On decision of Council of national safety and defense of Ukraine of December 9, 2005 "On the status of energy safety of Ukraine and basic principles of the State policy to ensure it" of 27 December, 2005 No. 1863, the Cabinet of Ministers of Ukraine is entrusted to develop and introduce in two months term, according to the established procedure, for consideration by the Verkhovna Rada of Ukraine the draft law on forming the radwaste management pool, and also approves Plan of measures to ensure energy safety of Ukraine, which envisages development of the State radwaste management program till 1 January, 2007.

Development and implementation of a unified technical policy in the area of radwaste management in Ukraine belongs to the competence of the MUE. In particular, the MUE is the executor of abovementioned measures on establishing of radwaste management pool, and development of the State program for radwaste management.

Establishment of State program for radwaste management and the State radwaste management Pool will allow to ensure consistency of implementing the state policy in the area of radwaste management, rhythmic financing of the State programs, introduction of the unified technical policy on radwaste management and physical protection, conduct of systematic research and R&D aimed at resolution of issue concerning final disposal of highly active waste in deep geological formations.

Radioactive waste management on the nuclear sites

As a result of production activity of NPP, the radwaste is originated of various activity and aggregate composition – liquid and solid radwaste.

Liquid radioactive waste management

Liquid radwaste (hereinafter – LRW) are originated at NPP during operation and repair of process equipment. Such radwaste are the primary ones. The following can be referred to them:

- *Discharges from special laundries, shower-baths, laboratories;*
- *water from decontamination of rooms, equipment and pipelines;*
- *Flush and regenerative water;*
- *Leaks from equipment;*
- *Radioactive drainage.*

Their handling is carried out in specifically designated areas, located at nuclear power units and in special buildings. In these places collection of LRW is carried out. After that, the accumulated LRW are directed to the systems of special water treatment for purification from the products of corrosion and chemical mixtures. Equipment for LRW treatment belong to the systems of water purification. Purification and treatment of liquid radioactive wastes is carried out with the aim to minimize LRW volumes and to reuse the treated water.

During treatment of primary LRW in the systems of special water purification the following types of radioactive waste are created: dry reside, spent sorbents and sludge. Such products of treatment are then directed to the system of temporary storage. This system ensures acceptance, safe storage of radioactive liquid waste with high mineralization and their transport to further processing. During long-term storage, dry reside is generated, which is then taken to the deep evaporation unit UGU-1-500. Result of LRW treatment is the salt concentrate – salt fusion cake, which then transfers to a solid phase.

Also, during storage of LRW, a partial decay of radioactive nuclides takes place.

At Rovno NPP and Khmelnitsky NPP with the aim to minimize levels of LRW origination, it is proposed to introduce a centrifuge (separator) units designed for removal of mixtures from LRW, which will form in the future, and which are already accumulated in the stores.

Dynamics of accumulation of liquid radioactive waste is shown in Figure 1.

According to the results of analysis of the status of liquid radioactive waste management during the last 5 years, the following can be established.

The main source of LRW at NPP are trap (drain) waters – radioactive flows, which come through drainage to the special sewerage system. Increase of LRW generation level at the RNPP and KhNPP was primarily caused by commissioning of new units "4" and "2", correspondingly.

At the same time, the increase of accumulated volumes of salt fusion cakes is observed. This is caused by the absence of technologies of solid salt product handling in nuclear area of Ukraine.

Solid radioactive waste management

To the solid radioactive waste (hereinafter – SRW), generated during operation of NPP, are:

- *metal waste, generated from repair and reconstruction works;*
- *general mechanical rubber products, elastrons, cable products, which became out of use;*
- *Thermal insulation, no longer used;*
- *protective clothing, used personal protection equipment;*
- *spent sources of ionizing radiation and others.*

SRW management includes the following:

- *collection of SRW from places of their origination;*
- *sorting of waste by the activity level and types (which are subject to incineration; which are not subject to incineration; which are compacted; which are not compacted);*
- *transportation to places of their accumulation;*
- *transportation to the rooms where they are processed.*

Figure1. DYNAMICS OF LRW ACCUMULATION IN THE STORES OF UKRAINIAN NPP'S

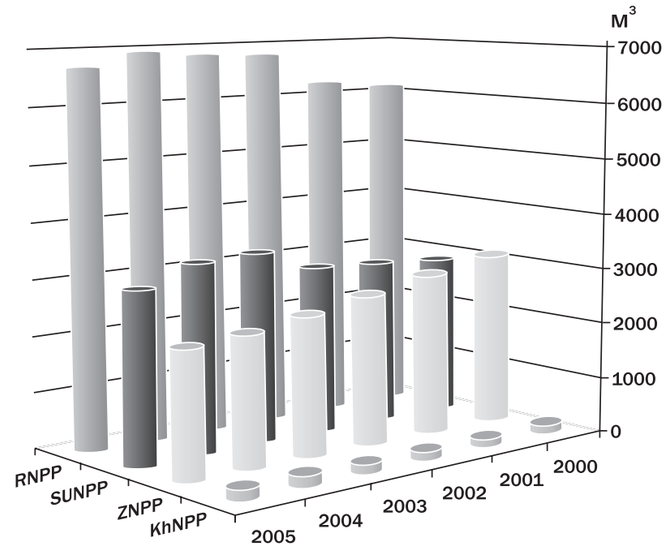
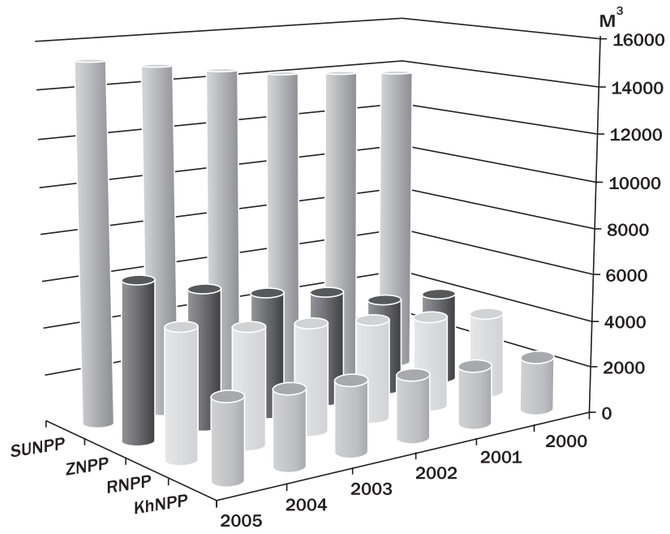


Figure 2. DYNAMICS OF ACCUMULATION SRW IN NPP STORES



For a long term storage at NPP, there are stores for solid radioactive waste, which represent reinforced concrete boxes. Each box is for loading of certain category of waste.

At NPP it is there are stores for temporary storage of dismantled bulky equipment.

With the purpose of minimizing the volumes of SWR generating and emptying of boxes from accumulated SRW at Zaporizhzhya NPP and Rovno NPP Complexes for processing the low and medium-level solid radioactive waste, which consists of incinerator of low and medium-level waste, compacting and supercompacting units, grinding and drying unit, cementation unit are being built in collaboration with European Union. Dynamics of accumulation of SRW is shown in the Figure 2.

Analysis of dynamics of the level of SRW accumulation shows, that the largest volume of SRW is generated at South-Ukraine NPP. This is due to the absence of reprocessing units for Category I of SRW (low active waste), except for availability of the compacting unit at this NPP.

Category I radwaste constitutes about 80 % of the total categories of waste.

Radwaste management is the final stage of energy production at NPP. This stage is very important for ensuring safety of the environment, NPP personnel and population.

Each NPP is equipped with appropriate process equipment for radwaste management and stores for their safe storage. Storage capacity at each NPP is calculated on the basis of design service life of a power Unit (30 years).

NPP designs did not envisage reprocessing with the purpose of decreasing the volumes of their accumulation. Since the nineties NPP of Ukraine began to implement equipment for reprocessing of radwaste, namely, deep evaporation units for liquid radwaste, sorting, incineration and compacting units for solid radwaste. The main direction of the up-to-date technical policy in the area of radwaste management at NPP is establishing of radwaste management infrastructure, which would ensure:

- *safe collection of radwaste;*
- *processing of radwaste to the condition suitable for temporary storage;*
- *casking of radwaste;*
- *transfer of radwaste to the specialized enterprises for long term storage and final disposal.*

To achieve the set objective, financially supported by NAEK "Energoatom" and with the assistance of international community, for each NPP there are design works underway or construction of radwaste reprocessing complexes has started. Commissioning of these complexes will allow to minimize tangibly volumes of radwaste through their reprocessing (incineration, supercompacting etc).

Radioactive waste management outside nuclear industry sites

Works, related to collection, transportation and storage of low and medium-level solid radioactive waste and spent sources of ionizing radiation of enterprises and organizations, which do not belong to the nuclear area, are carried out by 6 State Interregional Specialised Plants (hereinafter – SISP) of Ukrainian SA "Radon": Dnipropetrovsk, Donetsk, Lviv, Odessa and Kharkiv. Each SISP is assigned with its own zone of service, which consists of several regions:

- *to Dnipropetrovsk – Dnipropetrovsk, Donetsk, Zaporizhzhya, Kirovograd, Lugansk regions;*
- *to Donetsk – Donetsk region (decontamination of protective clothing);*
- *to Kyiv- Kyiv, Vinytsya, Zhytomyr, Hmelnitsky, Cherkasy, Chernigiv regions and Kyiv;*
- *to Lviv – Lviv, Volynsky, Zakarpatsky, Ivano-Frankivsk, Rivno, Ternopil, Chernivtsi region;*
- *to Odessa – Odessa, Mykolaiv, Kherson regions and the republic of Crimea;*
- *to Kharkiv – Kharkiv, Poltava, Sumy regions.*

SISP were established in 1960-1962 for collecting and disposal of radwaste from enterprises and establishments, which do not belong to the nuclear area.

According to legislation at this moment SISP performs its activity in radwaste management (collection, transportation and storage) on the basis of licenses, issued by SNRCU in 2001-2005.

The main tasks of radwaste management at SISP are collection of waste in zone of responsibility, their transportation and storage, execution of administrative control over mothballed stores (monitoring, supervision, repair jobs, control under lend tenure, safe-keeping of archive etc.).

Biological waste, spent sources of ionizing radiation are delivered to SISP. Biological radwaste are placed separately from solid waste in specially purposed stores using the technology of layer-by-layer cementation.

Spent sources of ionizing radiation are held in protected shell in stores for solid radwaste, as conventional radwaste, or in a specially designated shaft type store in the store for spent sources of ionizing radiation.

At the moment, for all SISP it is prohibited to accept LRW. They are only delivered in solidified form and stored as solid radwaste. Own LRW of SISP are stored in special stores.

SISP stores are built according to standard designs. Each SISP (except Donetsk) is equipped with near-surface stores for SRW, storages of shaft type for spent IRS, storages-boxes for LRW, special transport and necessary technological equipment.

Stores for SRW are engineered structures with dimensions 14,5x9,5x3,0 м and volume of 400 м³.

Stores for temporary storage of LRW are double neck cylindrical underground boxes 9x3,15 м, made of stainless steel and coated with reinforced concrete.

Store for biological radwaste are the 4 section box with volume of 60 м³.

Stores of high-level spent IRS are made of stainless steel and concreted on the depth of 6 м. Reception wavy pipe with 104 мм diameter and reception funnel are also made of stainless steel. Reception device has bibber and steel cap.

During 1985 – 1996 SISP carried out reconstruction of existing points of radwaste disposal. But taking into consideration, that the design service life of disposal facilities is 30 years, the Comprehensive program for radwaste management envisages implementation of measures to convert disposal points of SISP into points of temporary storage of radwaste in containers. Function transformation requires fundamental changes in radwaste management technology for SISPs. Disposal and long term storage of radwaste, generated at industrial enterprises, medical, research and other establishments, will be effected at the "Vector" production complex.

SA "Radon" developed and coordinated with SNRCU a Set of standard technological documentation on temporary storage of radwaste of I and II groups at specialized enterprises. Through adaptation of this standard technology to the particular conditions of production; technological instructions for temporary storage of solid radwaste of I and II groups at each SISP were developed and agreed with SNRCU.

For today none of the specialized enterprises has reprocessing units, which would decrease the radwaste volumes. None of them is provided with sorting of waste by type of possible reprocessing in the future (incineration, compacting etc.) and separate waste storage. Such sorting, according to technological instructions, should be provided by radwaste "producer".

Only Kharkiv SISP has mobile cementation units for liquid radwaste. All specialized enterprises have their stations for decontamination of protective clothing and personal protection equipment contaminated with radioactive substances (special laundry).

The problem of existing spare storages at specialized enterprises and reliability of their construction in the view of radiation safety is the most critical. Stores of shaft type for spent IRS at special enterprises were designed as the stores for disposal and their extraction was not envisaged by design.

The same critical problem is delivery for storage of spent high-level IRS. First of all, they are powerful highly-active sources, in particular, Strontium-90, included in the composition of thermoelectric generators of RITEG type; high-level sources of Cobalt-60 used in irradiators; and highly-active sources of Caesium-137 and Cobalt-60, used in medical units. According to rules and regulations for spent IRS, they have to be safely recovered from units, transported following the rules of transportation of radioactive materials to specialized enterprise and to ensure their safe storage at such enterprise, which, in turn, requires the reconstruction of facilities for storage of highly-active radwaste.

Previously, specialized enterprises subordinated to the Ministry of municipal services of the USSR and requirements to their activity were the same as for enterprises dealing with conventional industrial waste. Stores of specialized enterprises had been built according to imperfect designs (developed in late fifties), that led to radioactive accidents in Kiev and Kharkiv specialized enterprises, which resulted in pollution of underground waters with tritium outside the stores.

Kiev and Kharkiv specialized enterprises developed emergency plans, according to which anti-accident measures are in effect. "Project for minimization of influence of a radiation accident at the stores of radioactive waste № 5, 6, 7 RWDP of Kyiv SISP on environment" was developed in 2002. In November 2001 there were experimental works carried out in pumping out of LRW from accident stricken store № 5. In these works, using pin filters, 3000 l of radioactively contaminated material were pumped out. With the purpose of mastering the technology of recovery of SRW using remote control complex and improvement of construction of this complex experimental recovery of 1,4 t of SRW was carried out in production conditions. In August 2004 "Project of performing activities to mitigate of accident consequences in the stores" was confirmed by sanitary epidemiologic station and agreed by SNRCU. But there were no relevant activities performed in 2005.

At Kharkiv SISP the considerable part of the planned measures of liquidation of a radiation accident was implemented; it allowed to localize consequences of accident and to perform forecasted assessment for the future. However, it is necessary to note, that during 2001-2005 in the borehole 1n, located in the zone of highly controlled RWDP, there was gradual increasing of average annual concentration of tritium (from 2,1E+01 Bq/l in 2001 to 3,42E+05 Bq/l in 2005).

ACCORDING TO THE DATA FORM THE RADWASTE REGISTER OF 1 JANUARY 2006, SISP HAVE:

№	SISP	Solid radwaste, м³	Liquid radwaste, м³	Quantity of spent (closed) IRS, items		Activity of radwaste, Bq
				Storage in biological shielding	storage without container	
1	Dnipropetrovsk	432	70	63985	7807	7,19E+15
2	Kiev	1943	413	32128	5795	6,69E+15
3	Lviv	581	–	24538	6866	5,24E+14
4	Odessa	500	137,5	11824	10787	1,59E+16
5	Kharkiv	1875	18,9	74813	13155	3,96E+14
				207288	44787	
	TOTAL	5331	639,4	252075		3,07E+16

3. SPENT NUCLEAR FUEL MANAGEMENT AT NPPs OF UKRAINE

The spent nuclear fuel management (hereinafter SNF) at nuclear power units in Ukraine consists of three basic stages:

1. *Storage of SNF in the cooling pond with the aim of decreasing of its radioactivity and energy release.*
2. *Long-term storage in the corresponding stores for SNF.*
3. *Processing or disposal of SNF. It is necessary to mention that the R&D works in this area are actively carried out all over the world.*

The effectiveness of technology of SNF storage in the cooling pond, which is used at all the NPP of Ukraine, is proved by many years of operational experience. The essence of the technology consists in the following: fuel assemblies with spent nuclear fuel after their unloading from the reactor are placed under the water layer in the cooling pond where cooling of SNF is ensured.

After 3-5 years of SNF storage in the cooling pond its energy release and activity decreases that allows to transport SNF. For transport of SNF the special casks are used - they ensure safety of its transportation.

At the present moment, according to the international agreements, spent fuel from Rovno, Khmelnitsky, South Ukraine NPP is transported to Russia. SNF of WWER-440 (units RNPP-1, RNPP-2) are processed in Russia by the enterprise "Mayak" (Ozersk, former Cheliabinsk-65); SNF from WWER-1000 type reactors are not processed at the present moment.

In 2001 the dry spent nuclear fuel store was commissioned (hereinafter - ISF) at Zaporizhzhya NPP. It gives the possibility of long-term storage of SNF from six units of ZNPP. The principle of SNF storage is the following: 24 fuel assemblies with low energy release (<1kW) after 5 years of storage in the cooling pond are placed into the special basket which is filled in with helium (rare gas with high level of thermal conductivity) and sealed, then the basket is placed in the concrete cask. For cooling of SNF, the air circulation is sufficient. The store capacity is 380 casks in which it is possible place 9000 fuel assemblies with SNF. ISF could accept spent nuclear fuel from Zaporizhzhya NPP for all the period of its operation. According to licensing requirements ISF of ZNPP will store only the fuel of ZNPP units.

The ISF design was developed on the basis of the licensed and repeatedly tested technology of SNF storage by "Duke engineering & services" (USA). The design passed the State expert assessment of nuclear and radiation safety and it corresponds to the requirements currently in force. The store is provided with qualified staff and operation instructions. The tests on the stage of commissioning of systems and equipment of ISF proved its correspondence to the design criteria.

The ISF design is also valuable, because its components are manufactured by the enterprises of Ukraine with domestically made materials. The containers are manufactured at the enterprises located in the town of Energodar - Plant of non-standard equipment and piping and Plant of special constructions (structures). It is necessary to mention that the practices of dry cask storage of SNF that is used in ISF of ZNPP, is analogous to the same practices in USA, Canada, Germany, Switzerland, Great Britain, Lithuania.

Taking into account the positive experience of SNF storage in Ukraine at the ZNPP site, the contract between NAEK "Energoatom" and American company "Holtec International" on constructing in Ukraine of Centralized dry spent nuclear fuel store for spent nuclear fuel from Rovno, Khmelnitsky, South Ukraine NPP (CSSNF) was signed on 26 of December, 2005. The works are carried out according to the Law of Ukraine "On the Procedre of Decision-Making on Siting, Designing, Constructing of Nuclear Installations and Radwaste Management Facility of the National Significance". At the moment, according to the abovementioned the feasibility study is being prepared.

Today, spent nuclear fuel from Chernobyl NPP is stored in the cooling ponds of nuclear power units and in the Spent Nuclear Fuel Store Facility 1 (hereinafter - ISF-1) on the ChNPP site.

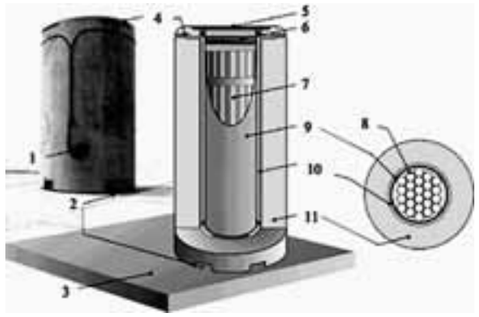
ISF-1 is the storage of "wet" type in which SNF, like in the cooling pond, is stored under the water. ISF-1 has been operating since 1986. It consists of 5 ponds of volume that amounts to 1600 m3 each: 4 ponds are in operation and one is the reserve. The capacity of each pool is 4380 of spent fuel cassettes. The spent fuel assemblies are stored in protective cases, which serve as a barrier for preventing spreading of radionuclides and ensures mechanical integrity of fuel assemblies.

Chernobyl NPP has started the works according to "The Program for fixing and justification of term and conditions of further operation of ISF-1" are started.

Due to the delay in construction of dry spent nuclear fuel store No.2 on ChNPP site (hereinafter - ISF-2) for the placement of the fuel from the units it is planned to temporary use the ISF-1; for this purpose it is envisaged to apply re-racking technique in ISF-1. The positive experience of the use of such technique exists already gained by Leningrad NPP (Russia). To resolve issues of the use of re-racking technique, there are negotiations underway with industrial and scientific organizations of Ukraine and Russia.

At the same time, Chernobyl NPP prepares for the reconstruction of ISF-1 to ensure the possibility of sending spent fuel assemblies for further storage in ISF-2 and of timely preparation of ISF-1 for decommissioning.

ISF CASKS



1. Temperature sensor
2. Air in-flow and motion link for transportation
3. Concrete plate for storage
4. Air outlet
5. Concrete cask cap
6. Power and protective cover of basket
7. Block of 24 guiding tubes for spent fuel assemblies
8. Guiding tube
9. Basket case
10. Shell
11. Ventilated concrete cask

4. ACTIVITY FOR CONVERSION OF THE "SHELTER" INTO ECOLOGICALLY SAFE SYSTEM AND CHERNOBYL NPP DECOMMISSIONING

"Shelter"

Chernobyl NPP

Safety status of the "Shelter"

The "Shelter" is the fourth unit of the Chernobyl NPP destroyed in 1986 by beyond design accident. The top-priority measures for mitigating consequences of the accident were undertaken on this unit and the nuclear and radiation safety are permanently monitored.

The peculiarity of the "Shelter" is its potential danger, which is much bigger than it is allowed by rules and regulations for the sites nuclear and radioactive materials.

The sources of radioactive hazard are the contaminated water, fuel-containing materials inside the "Shelter", contaminated soils, status of the "Shelter" structures.

From the radiation safety point of view, the "Shelter" is, in fact, an open source of ionizing radiation, which, according to its radiation characteristics does not have analogues in the world and it can be regarded as the temporary barrier for protection of personnel, population and the environment from potential hazards.

The "Shelter", which was erected in the extreme post-accident conditions, has been functioning as protective barrier for almost 20 years. With the course of time, maintaining the safety indicators of this site at the achieved level requires more resources to consume.

In 1997 the international program for conversion of the "Shelter" into the ecologically safe system – Shelter Implementation Plan (hereinafter – SIP) was produced by joint efforts of Governments of G8, the European Commission and Ukraine elaborated

The financing of implementation of this project is provided by contributions of the donor countries to the "Shelter" Chernobyl Fund and Ukraine's contributions. The Manager of the "Shelter" Chernobyl Fund is the European Bank for Reconstruction and Development.

The activity of converting the "Shelter" into ecologically safe system is carried out within the license serial number EO № 000033 for the "Shelter" operation issued by SNRCU in December 2001. The license establishes the scope of permitted activity as well as conditions of their implementation. It envisages activity for conversion of the "Shelter" into ecologically safe system, in particular, under the Shelter Implementation Plan.

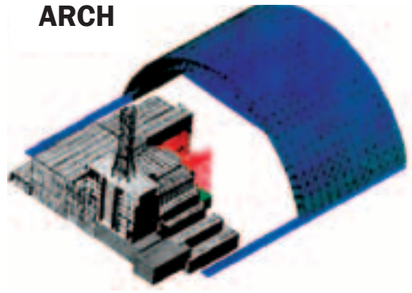
Status of implementation of the"Shelter" conversion projects

New safe confinement

All SIP projects are implemented in accordance with the Ukrainian legislation provided that SNRCU licenses their implementation.

Construction of new safe confinement (hereinafter – NSC) is a major SIP project.

According to the Law "On General Provisions of further operation and decommissioning of Chernobyl NPP and conversion of the destroyed fourth power unit of this NPP into environmentally safe system", confinement is a protective structure comprising of a complex of process equipment for removal from the fourth destroyed NPP power unit of materials containing nuclear fuel, radioactive waste management equipment and other systems. The main function of the confinement is to convert the destroyed unit into environmentally safe system and ensure safety of personnel, population and the environment.



Implementation of the NSC project envisages a long-term (100 years) reliable confinement of the radioactive waste and fuel-containing materials (hereinafter – FCM), ensuring conditions for conversion of the "Shelter" into environmentally safety system, including removal of FCM, performing radwaste management activities and dismantling (stabilization of non-stable structures.

It should be noted that construction of NSC was expected to be finished in 2004, and in 2007 it was planned to complete dismantling of non-stable structures of the "Shelter". For the present moment, construction of NSC have not started yet, only preparation works are being performed.

Feasibility study of the confinement (hereinafter -FS) was approved by the Order No. 443-p of the Cabinet of Ministers of Ukraine dated 5 July, 2004. The approved confinement will consist of Arch-like cover with fixed dimensions providing enough room for placing a number of devices, systems and components (bay – 257 m, width – 150 m, height – 108 m).

Based on results of the comprehensive State expert assessment of FS-NSC, with the aim to settle pending issues arising from the assessment, the following documents were prepared and agreed upon: "Strategy of further NSC project implementation" and the List of additional requirements established by the results of State expert assessment of FS-NSC

SNRCU is insisting on obligatory taking into account of the abovementioned documents in the course of further NSC designing.

Stabilization of building structures

The condition of building structures of the "Shelter" causes particular concern. In connection with the fact that in some rooms of the Shelter there is a high level of humidity, reinforced concrete structures are saturated with water, and exfoliation of protective anticorrosive coating takes place on the metallic structures of the outer "containment".

In order to prevent occurrence of emergencies caused by destruction of building structures of the "Shelter", stabilization measures and a complex of works for preparation of construction of NSC are carried out.

By the end of 2005, the work was completed to stabilize western and eastern support of the beam "Mammoth", on which the roof of the "Shelter" leans, and the measure was completed to stabilize plates of partition wall of deaerator rack.

It is expected that implementation of stabilization measures at the "Shelter" will be completed at the end of 2006.

It is worth mentioning, that the stabilization measures which are being implemented at the "Shelter" are the urgent stabilization measures and in case of delay in construction of a new safe confinement, SNRCU will insist on implementation of the rest of 15 stabilization measures, which would ensure reduction of risk of destruction of building structures of the "Shelter" to the admissible level.

Beam "Mammoth"

Stabilization measures in progress

Integrated automated monitoring system of the "Shelter"

Integrated automated monitoring system (hereinafter IAMS) for the "Shelter" is one of the most important systems of the "Shelter" and is intended for ensuring monitoring of nuclear and radiation safety, status of building structures, seismic monitoring. IAMS will provide a summarized information on major parameters of the "Shelter" condition, necessary for ensuring safety of works at the "Shelter".

In the fourth quarter of 2005, the SNRCU with involvement of other regulatory bodies (Ministry of Health Protection, State Fire Safety Committee and State Industrial Mining Supervision Committee of Ukraine) reviewed and approved the IAMS design documentation.

The SNRCU also approved the technical solution of SSE "Chernobyl NPP" "On ensuring sufficiency of monitoring of condition of fuel-containing masses in the "Shelter" for the period of assembling and putting into operation nuclear safety monitoring system, which is a part of IAMS of the "Shelter".

Moreover, in 2005 in the framework of SIP projects implementation, the SNRCU carried out the State expert assessment of nuclear and radiation safety and coordinated a number of projects, engineering solutions, reviewed other documentation.

In particular, the following were reviewed: strategy of management of fuel-containing materials and radioactive waste of the "Shelter", engineering solutions on temporary storage of solid radioactive waste of the 3rd group that are generated in the course of constructing of NSC, on putting into operation of a sanitary sluice on elevation +5.8 of deaerator rack, on reconstruction of exhaust ventilation and gas purification of the "Shelter", engineering solutions on changes in the working project of "Shelter" stabilization etc.

The regulatory decisions taken on the SIP projects is the SNRCU contribution to implementation of the State strategy of converting the "Shelter" into an ecologically safe system and are aimed at ensuring nuclear and radiation safety in the course of carrying out works, protection of personnel, population and the environment.

Chernobyl radioactive waste management

As a consequence of the accident at Chernobyl NPP considerable amounts of radwaste were generated in

the Exclusion and unconditional eviction Zone. The characteristics of this radwaste are varied greatly by radionuclide composition and levels of activity.

The total amount of radwaste in the Exclusion Zone (without the "Shelter" and Chernobyl NPP decommissioning waste) – about 2.8 mln. m3

The radioactive waste are kept in radwaste disposal points "Buryakivka", "Pidlisnyy", "Chernobyl NPP III Stage" and in more than 800 points of temporary localization of radwaste.

Radwaste disposal points "Pidlisnyy", "Chornobyl NPP III Stage" and points of temporary localization of radwaste do not function at present time.

The only functioning radwaste disposal point is "Buryakivka". Its operation as well as monitoring of not functioning radwaste disposal points are carried out by SSE "Complex".

Every year about 25.000 m3 of radioactive waste is delivered to the radwaste disposal point "Buryakivka". The capacity reserve of repositories which have been operable since 1987, is now expiring (out of 30 trenches with each having capacity of 23.000 m3, only 2 are the reserve), that's why, the Comprehensive Program for radwaste management envisage commissioning of the first stage of the production complex "Vector" for decontamination, transport, reprocessing and disposal of radioactive waste from the territories that suffered radioactive contamination in consequence of the Chernobyl catastrophe. In order to use finances from the State budget effectively, minimize of expenses on investments and acceleration of commissioning of the complex "Vector", from the project of the first stage the Start-up complex was singled out, which includes objects of the infrastructure and per one disposal sites for radioactive waste of each type.

The first stage of the production complex "Vector" will ensure disposal of short-lived radioactive waste generated as a consequence of the Chernobyl accident.

The first stage of the production complex "Vector" includes objects of infrastructure and 16 repositories for disposal of radioactive waste of the first type (disposal of radwaste in containers) and 40 repositories for disposal of radioactive waste of the second type (disposal of bulky radwaste in corresponding modules).

Objects of infrastructure of the Start-up complex must also ensure the operation of the specially equipped near-surface store of solid radioactive waste (LOT-3) of the industrial complex for handling of solid radwaste of Chernobyl NPP which is being constructed on the site of the Start-up complex financed by the European Commission according to the program of Chernobyl NPP decommissioning.

The works on constructing the Start-up complex are carried out according to the design, which received a positive conclusion of the comprehensive expert assessment of nuclear and radiation safety, environmental expert assessment and other assessments to the legislation of Ukraine.

Construction of the Start-up complex begun in March, 1998 was carried out by SSE "Technocenter".

The finances of the State budget of Ukraine are determined as a source of financing by the issues of expenses "Construction of the complex "Vector"; finances of centralized state capital investments.

At the same time, finances from centralized state capital investments were allocated only in 2000 and 2001.

By the prices of 2005, the estimated cost of the Start-up complex consisting of two repositories and objects of the infrastructure makes 131333,7 thousand UAH.

The scope of actual financing in previous years did not ensure the end of construction in 2004 as it was envisaged by the Comprehensive program for radwaste management.

The first stage of the production complex "Vector" is planned to be commissioned in 2007. Before the end of construction it is necessary to carry out works at the cost that makes approximately 40 % of the estimated cost of the Start-up complex.

Taking into account that objects of infrastructure of the Start-up complex must also ensure the operation of the

PRODUCTION COMPLEX "VECTOR"

1.1 – побутовий корпус №1; 1.3 – їдальня; 3 – санперепускник; 4 – пожежне депо; 8 – трансформаторна підстанція; 9 – трансформаторна підстанція с дизельмоторною станцією; 10 – водонапірна башта

above-mentioned LOT-3, delays with the Start-up complex may obliquely lead to the frustration of deadlines of projects for Chernobyl NPP decommissioning and SIP projects.

Status of Chernobyl NPP decommissioning

The activities of Chernobyl NPP decommissioning are carried out according to the license of series EO № 000040 issued by the SNRCU. This license gives the right to the operating organization to carry out a complex of works and operations related to decommissioning of nuclear installations. For this, within the license it is envisaged to issue a number of separate written permits, that is:

- *the right of SSE ChNPP to carry out activity at each stage of decommissioning – "final closure", "mothballing", "preservation" and "dismantling";*
- *to carry out certain works or operations related to designing, construction, commissioning and operation of the radwaste management facilities (equipment).*

The SNRCU established procedure and conditions of obtaining by SSE ChNPP of separate written permits to carry out works or operations related to commissioning and operation of radwaste management facilities (equipment). The grounds for obtaining such permits is submission of an application by SSE ChNPP, project of carrying out works, safety analysis report, quality assurance programs for implementation of the project.

One of the most important tasks to be fulfilled by SSE ChNPP within the next few years is to make available on the ChNPP site of plants for managing liquid and solid radioactive waste accumulated during the period of operation of Chernobyl NPP and radwaste which will be generated in the process of decommissioning of this Plant.

Reprocessing and conditioning of radwaste will be carried out at:

- *Liquid Radwaste Treatment Plant;*
- *Industrial Complex for Solid Radioactive Waste Management wich includes:*
  - *solid radwaste recovery unit;*
  - *solid radwaste reprocessing plant;*
  - *an engineered near-surface disposal facility for solid radwaste on the "Vector" Complex Site of the SSE "Technocenter"*

The implementation of these projects is financed through the international assistance to Ukraine for ChNPP decommissioning and the State Budget of Ukraine.

Liquid Radioactive Waste Treatment Plant (hereinafter- LRTP).

Construction of LRTP is being carried out according to the design approved by the Resolution of the Cabinet of Ministers of Ukraine.

The plant is designed for preliminary processing and further conditioning of liquid radioactive waste by cementation.

Erection of the plant building, which represents a monolithic structure, and assembling of equipment is completed. Pre-commissioning testing of equipment was performed.

Commissioning of the Plant (the first active drum) is envisaged in July 2006, end of the project – on 21 September, 2007.

Industrial Complex for Solid Radioactive Waste Management (hereinafter – ICSRM)

The solid radwaste recovery unit. With its help, from the existing store of solid radwaste of ChNPP, recovery, fragmentation and loading of radwaste in containers should be carried out, then containers are sent to the solid radwaste reprocessing plant, connected with the recovery unit by a transport gallery.

Demonstration of preparedness of LRTP

At the solid radwaste reprocessing plant, it is envisage to do sorting of solid radwaste of all categories, reprocessing of low- and medium-level short-lived solid radwaste by means of incineration, compacting, cementation. The final product – concrete containers with cemented radwaste – will be buried in a specially equipped near-surface store for solid radwaste.

The extracted during the sorting long-lived and highly-active radwaste will be sent to a temporary store designed for their interim storage, which is being constructed in the building of the existing store for liquid and solid radwaste of ChNPP.

Within the license of series EO № 000040 in 2003 the permits were issued for designing and operation of the solid radwaste recovery unit and the solid radwaste reprocessing plant (the permits are valid till the end of construction.)

The licenses were issued for designing and construction of Specially equipped near-surface disposal facility for solid radwaste.

The works on designing ICSRM began with a considerable delay. The contract for its construction was signed on 5 March, 2001, and only in 2003 the General Contractor for the project, that is the German firm "Nukem", finished development of the design. The design was approved by Resolution of CMU of 26 December, 2003, No. 816-p.

The deadlines of constructing the facilities of ICSRM are not complied with:

- *The solid radwaste recovery unit and the solid radwaste reprocessing plant – the delay in implementation of civil engineering works is 12 months;*
- *Temporary store for long-lived and highly-active waste – the delay in completion of the project implementation is 5,5 months;*
- *Specially equipped near-surface disposal facility for solid radwaste – the delay in implementation of civil engineering works is 5 months.*

Liquid Radioactive Waste Treatment Plant

Industrial Complex for
Solid Radioactive Waste Management

The beginning of LRTP construction outstripped the beginning of constructing ICSRM facilities for more than 2 years. As a result, at the present moment when LRTP is almost ready for commissioning, the Specially equipped near-surface store of solid radwaste where the end product of LRTP must be disposed, is still far from being completed. The necessity may arise to construct on the site of a buffer storage for temporary keeping of packages with cemented radwaste.

It was the beginning of 2004, when, taking into account requirements of the Plan of implementation of measures at the "Shelter", the decision was taken on the necessity of seeking for technical possibilities of storing in a temporary store of long-lived and highly-active radwaste of additional volume of highly-active Radwaste which would be generated during earth-moving works for preparation to the construction of New safe confinement.

The term of completion of a temporary store for long-lived and highly-active radwaste – 22 October, 2005 – was frustrated. Along with that, the changes to the design are not agreed upon yet and the safety analysis report for the temporary storage was not submitted to SNRCU.

The delay in implementation of the project and dragging out of SSE ChNPP with resolution of issues related to ensuring safety of the temporary store with the account taken of the SIP needs may lead to delays in carrying out of preparatory works for construction of New safe confinement. The search for other possibilities of storing the corresponding kinds of radwaste will lead to additional radiation and financial risks.

The issue of safety justification for the Specially equipped near-surface store for solid radwaste needs to be resolved as soon as possible. The situation now is that when the construction of the store is already underway, but the results of analysis of its safety testify for non-compliance with nuclear and radiation safety requirements, in particular, the acceptance criteria for incoming packages with radwaste are not established. A situation may appear that the packages with radwaste produced at reprocessing plants could not be disposed in a store specially constructed for that purpose because of inconsistencies between characteristics of packages with radwaste and the criteria of acceptance the packages to the store.

It is quite obvious that the ChNPP activities have to be duly coordinated, mutually approved, reasonably ensured with the necessary financing from State budget or from international assistance. For that, there is a need for applicable and duly approved corresponding corresponding program documents of all levels – beginning with National and Comprehensive programs of ChNPP decommissioning and conversion the "Shelter" into an ecologically safe system, ending with programs of implementing the decommissioning stages.

Today at ChNPP practically all current program documents have lost their actuality, and the deadlines set in them have been hopelessly frustrated. That means that development or revision of the whole hierarchy of program documents with the purpose of making them corresponding to the actual state of things and ensuring the efficient further activity of the enterprise.

The top priority task is the completion of drafting, approval and putting in force of fundamental program documents: "National program for Chernobyl NPP decommissioning and conversion "Shelter" into ecologically safe system" and the "Comprehensive program for ChNPP decommissioning".

Status of ISF-2 project implementation

According to the international agreements and commitments, Ukraine is a consignor to, Chernobyl NPP must be decommissioned. Chernobyl NPP Spent Nuclear Fuel Store (ISF-2) is the key component in the process of achievement of the set objective.

The ISF-2 has to be constructed according to the the Grant Agreement (Chernobyl NPP nuclear safety project) between the European Bank for Reconstruction and Development (EBRD) being the disponent of the Grant financial resources from the account on nuclear safety, by the Government of Ukraine and Chernobyl NPP (from 12 November, 1996), ratified by the Law of Ukraine.

According to the results of the tender, the contract was concluded with the FRAMATOME consortium, the Contract (CHNPP/C-2/033) for the construction of ISF-2 under the "turn key" conditions.

In the process of licensing and construction of ISF-2 certain problems were revealed, which demanded and still demand development and implementation of measures to eliminate. The numerous negative comments to the ISF-2 design, which were brought to light during the licensing process, were not duly worked through, had which led to the problems with the construction of ISF-2.

After the ChNPP has reported on the violation of the contractual obligations, in May of 2003 the construction works were suspended. In the result of work of expert group of DTF "AREVA", with the FRAMATOME in its composition, it was confirmed, that the systems and equipment of the ISF-2 required substantial redesign, since the operational features of the analogous spent nuclear fuel management systems, practically, were not taken into consideration. There was formed a new group of designers and they started to search for the ways of the redesigning the ISF-2.

Insuperable in principle for the FRAMATOME there appeared to be a problem of drying spent fuel assemblies (SFA) before their storage, which the FRAMATOME accused the ChNPP of, which, allegedly, did not warn it on the potential presence of water under the shells of assemblies.

As a "decision of compromise", FRAMATOME offered a so-called solution of "porous insert". This solution is based on the fact, that the "porous insert" (selectable filter) in the cartridge with the SFA would prevent the break of the cartridge at the pressure rise because of evaporation of the potential water out of the SFA.

During the profound analyses of the proposal, which was carried out jointly by the Ukrainian and Western European experts, it appeared, that the use of the "porous insert" would lead to the serious problems with ensuring safety, reliability of the storage system and violation of the technical specifications requirements (TS) for the ISF-2, basic principles of safety, etc.

In 2005, the SNRCU rejected the proposal as such, that did not correspond to the basic safety principles, and insisted on the additional design works for ISF-2 according to the TS, on the condition of obligatory presence of two barriers on the way of proliferation of radioactive substances during the SNF storage.

The Assembly of the Donors States financing the ChNPP decommissioning, held in May of 2005, took into account the conclusion pertaining the proposed concept of the porous insert and further prolongation of the project works unacceptability. The ChNPP and FRAMATOME were proposed to work out the issues of further implementation of the project.

With the participation of the representatives of the SNRCU and the Ministry of Emergency Situations there are permanently held negotiations with the SSE ChNPP with the contractors, the EBRD and Assembly of Donors in respect of the conditions of further construction ISF-2, renewal of the contract etc. However, taking into account that FRAMATOME did not come up with new engineering solutions and finalized safety justifications, the ISF-2 commissioning may be forecasted as not earlier than in 2010.

The works are underway to develop the necessary legal papers for ensuring continuation of the design works. In November of 2005, according to the decision of the Assembly of Donors, the SSE ChNPP concluded a contract with the previously mentioned company "Holtec International" (which has vast experience in drying he spent nuclear fuel) on development of feasibility study and design for SFA drying system in SFSF-2. The preliminary results of the company performance present the evidence of the possibility of effective drying of SFA in the ISF-2, i.e., there is the solution to the issue, which had become a stumbling block on the way of continuing design works for ISF-2.

The specific licensing conditions of the license of the operating organization (SSE ChNPP) for the construction of a nuclear facility – ISF-2 envisage, that the works on construction of ISF-2, which fall within system and components important to safety, could be started only after the obtaining of positive conclusions by the SNRCU based on the review of the following documents:

- *conceptual decision on modernization of ISF-2 construction design;*
- *finalized ISF-2 construction design;*
- *finalized preliminary safety assessment report for ISF-2.*

At present time, the SSE ChNPP carried out preparation works to ensure drafting of the mentioned documents.

Taking into account the uncertainty with further implementation of the ISF-2 project, there is the necessity to search for alternative solutions for spent nuclear fuel management. For the fulfillment of the protocol decision of the SNRCU Board Meeting of 14 November, 2005, the SSE ChNPP developed the "The Concept of Arranging Activities on the Spent Nuclear Fuel Management at Chernobyl NPP."

It is planned, that after completion of construction and commissioning of ISF-2, it will also accept spent fuel from ISF-1 which have been in operation on the Chernobyl site since 1986.

Spent Nuclear Fuel Store – 2

5. SAFETY OF URANIUM MINING AND MILLING INDUSTRY

The following enterprises worked in the processing of uranium ores with the purpose of obtaining the raw material for production of fuel for nuclear power plant (NPP) and other purposes on the territory of Ukraine: The State Enterprise "Eastern Ore Mining and Processing Plant" – SE "SkhidGZK" (Zhovti Vody, Dnipropetrovsk region) and the Industrial Association "Prydniprovsky Chemical Plant" – IA "PKhZ" (Dniprodzerzhynsk, Dnipropetrovsk region).

SE "SkhidGZK".

SE "SkhidGZK" – is the only enterprise in Ukraine, which carries out all the activities in mining and milling of uranium ores. The processing of uranium ores and obtaining of the uranium concentrate (U3O8) is carried out at the Hydrometallurgical plant (HMP). The mining of the uranium ore is carried out underground at the Smolinsky and the Ingulsky mines. Novo-Kostyantynivskiy mine in Kirovograd region is prepared for industrial operation and at present time is at the stage of dry mothballing.

In the course of processing uranium ores significant quantities of waste of the uranium ore processing – tailings containing radionuclides of natural origin. The storage of uranium ores waste from the SE "SkhidGZK" was carried out in two tailing pits: "KBZ", which, at present, does not function and in the gully of "Scherbakivske".

It is necessary to note, that in Zhovti Vody of Dnipropetrovsk region – is the only place in Ukraine, where, starting from the 50`s, there were both mining and milling (processing) of uranium ores. The inhabitants of the city were forced to live in the are of a long-term man-induced radiation contamination, as during the construction works there was adding of gobs, which had increased background radiation. Near the city, there is the tailing pit and slag stockers, which contain significant quantities of natural radioactive nuclides.

Due to the situation, occurred in Zhovti Vody and with the purpose of ensuring radiation and social protection of population, in 1995 the State Program for Measures on Radiation and Social Protection of Population was developed for Zhovti Vody of Dnipropetrovsk region. At the same time, the financing of the Program was unsatisfactory – 20% of the planned amounts annually. In 2003 this Program was reviewed. Based on the review results, the Program amended and approved by the Cabinet of Ministers' Resolution of 5 May, 2003 No.565 with the validity term for 2003-2012.

In 2005, as in the previous years, SNRCU carried out the control over compliance with rules and regulations of radiation safety during the activities with the uranium ores processing at the SE "SkhidGZK". The problematic issue remains the establishing of contemporary system of health physics monitoring for the personnel by way of introduction of personal dosimeters of internal exposure of the (daughter products of radon decay) and receipt of uranium according to the biophysical analyses results.

IA "PKhZ".

IA "PKhZ" is located in Dniprodzerzhynsk, Dnipropetrovsk region. From 1946 to 1991 it was engaged into the complex processing of uranium ores, while also, from the process solutions of uranium industry the mineral fertilizers were obtained.

Construction of the plant and its activities in the processing of uranium containing raw material was carried out under conditions of special secrecy without adhering to the simplest ecological requirements, that is why only recently there appeared a possibility to introduce practical measures in part of ecological protection of the environment from the consequences of the production activities of the site. Uranium production at the IA "PKhZ" was stopped in 1991.

At present, in nine tailing pits, located on the territory of the IA "PKhZ" and beyond its fence, there is stored approximately 36 mln. tons of radioactive waste of uranium ores processing with the total activity of nearly 75 thousand Ci. Most of these tailing pits do not function, they are not covered up and exert significantly harmful influence on the environment, personnel and population. According to the results of the inspections, there were detected the drains of radioactively contaminated underground waters into the river of Konoplyanka and the river Dnipro. The engineered structures of the tailing pits are in the emergency condition, which may lead to the accident situations.

According to the requirements of the "Sanitary Rules of Liquidation, Mothballing, Conversion of the Enterprises of Mining and Milling of Radioactive Ores" (SP LKP-91), all the sites and facilities of the former uranium industry must be liquidated, mothballed or converted for the use in other branches of national economy with the submission of all the required documentation. 14 years passed after termination of uranium ores processing at the IA "PKhZ", but there have been no activities carried out to mitigate the consequences of the uranium facilities operation and only at present time they are about to start

It is necessary to note, that after the restructuring of the IA "PKhZ" the independent enterprises of different profile there have been founded on its basis ("Smoly", "Zirconium", SE "PKhZ", SE "Agrophos", SE "Ammophos", SE "Polychim", SE "Baryer", etc.) These enterprises are located on the radioactively contaminated territory of the IA "PKhZ" – nearly 80% of the territory of the IA "PKhZ" is contaminated with the radioactive nuclides of uranium line. The dose rate of gamma radiation on the surface of soil is from 30 to 3000 mkR/ year. As a consequence, the workers of the above enterprises suffer from uncontrollable radiation, which, in turn, is the violation of the requirements of the Law of Ukraine "On Protection of Man against Ionizing Radiation".

In 2003 the Ministry of Fuel and Energy of Ukraine developed the State Program of Converting of the Hazardous Facilities of Production Association "Prydniprovskiy Chemical Plant" into Ecologically Safe Status and Ensuring the Population Protection from the Adverse Effects of Ionizing Radiation for 2005 – 2014 (hereinafter – the State Program), which was adopted by the Decree of the Cabinet of Ministers of Ukraine No. 1846 of 26 November, 2003.

To implement the measures of this Program of the Ministry of Fuel and Energy of Ukraine SE "Barrier" was established, which, at the end of 2003 obtained the license for activities on processing of uranium ores in the part of liquidation of uranium sites (facilities). Financing of the measures of the State Program began in August, 2005. At the first stage of implementation the State Program measures the radiation survey was started for the sites (facilities) of the former IA "PKhZ" (mainly, tailing pits) as well as monitoring of the environment in the region of their location.

The results of the observations, conducted in the second half 2005 in the framework of implementation of first-priority measures of the Program, have demonstrated, that the main source of contamination of Dniprovska water system are discharges of drainage water from the site facilities to the river of Konoplyanka. Also, the survey revealed the gradual accumulation of uranium in the bottom sediments of the river of Dnipro. The research of the contaminated air showed that the content of radioactive aerosols in the air on the territory of the IA "PKhZ" was 3-5 times higher than on the territory of the city.

In 2005, on the territory of the IA "PKhZ" the works were carried out to dismantle radioactively contaminated pipes, which earlier were used for the technological purposes in uranium ores processing. The dismantling of those pipes allowed to decrease radiation effects on personnel of the enterprises (facilities), which are located on the territory of the industrial site.

Besides, in 2005 the remediation works started at the storage of "Base C" – the former store of uranium ore, located at the distance of over 10 km from Dniprodzerzhynsk on the territory of the "Sukhachivske" industrial site. With the purpose of the decreasing radioactive contamination of the territory of the store, the decision was made to remove the rest of the uranium ore and reprocess it at the Hydrometallurgical plant of the SE "SkhidGZK" in Zhovty Vody. With this purpose, the project was developed for conducting works; the project passed the State expert assessment on nuclear and radiation safety.

The works on remediation of the territory, which were carried by the personnel of the SE "SkhidGZK" under the supervision of the radiation monitoring service of the SE "Barrier" started on 5 October, 2005.

The bridge with the technological pipes before and after dismantling.

6. USE OF IONIZING RADIATION SOURCES

Computer tomography – diagnostics

Radiotherapy – cancer treatment

Activities related to use of ionizing radiation sources

Ionizing radiation is able to penetrate the matter, change its properties, that is why ionizing radiation sources (hereinafter – IRS) are used widely in industry, medicine, agriculture, R&D and education.

In medicine radioactive pharmaceuticals and X-ray equipment are used for disease diagnostics, radioactive iodine is used for treatment of thyroid diseases, and radiation ability to destroy malignant cells have brought many patients back to life. In medicine IRS have been used for more than 100 years. IRS use in medicine keeps developing, for example, in such perspective technologies as tomography.

Ability of ionizing radiation to kill harmful microorganisms is used in sterilization equipment, which ensure biological protection for appliances, food.

In industry ionizing radiation sources are widely used for ensuring safety of production: for strength testing, manufacturing method control (density control etc.), moisture measurement. IRS are nearly indispensable in LEDs used under oppresive conditions or in cases of emergency.

Its hard to imagine exploration of mineral resources without IRS use during borehole logging. Isotope analyzers of composition of geological specimens are also irreplaceable instrument of geologists.

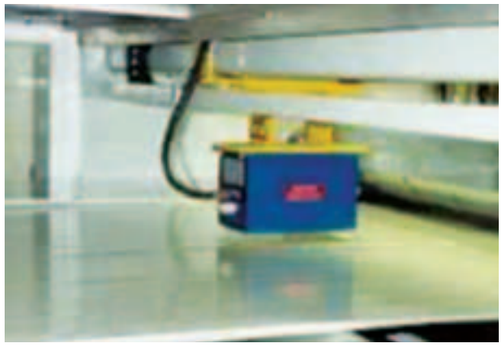
Undoubtedly, abovementioned technologies do not exhaust the whole spectrum of IRS use. Wide usage of IRS began in the 30-ies of the last century and has a steady tendency for development and increase.

2833 medical institutions in Ukraine (excluding dental surgeries) operate using IRS. They include: 47 cancer clinics, using highly active ionizing radiation sources; 2629 radiographic departments and 57 computer tomography scanning departments.

In 2005 activity concerning non-medical IRS usage was performed by approximately 2500 subjects of activity in the area of use of nuclear energy. Most of the enterprises using IRS are located in Dnipropetrovsk, Donetsky, Kharkiv, Lugansky regions and in Kiev.

Nowadays turning out of radioactive materials for production of radiation sources is not carried out in Ukraine, but 9 enterprises produce generating devices, and 4 – equipment, which is grouped with the use using imported sources.

Sludge flow monitoring



Skim density measurement

Requirements for ensuring safety and security of ionizing radiation sources

As with any other technology in the world, technologies of using ionizing radiation sources is connected with the benefits and with the risk. Degree of risk greatly depends on the type and quantity of radiation.

Ionizing Radiation Sources Safety and Security System was established in Ukraine with the aim to minimize risk related to the use of ionizing radiation sources, ensuring radiation protection of personnel, population and the environment. This system is based on the state regulation of safe use of IRS. This regulation is carried out by the SNRCU.

Overall view of nuclear power use regulatory system, including the IRS use, is represented in the Part II. The basic elements of the State regulation are the correspondent legislation, which includes a system of rules and regulations on radiation safety; permissive (licensing) activities (certification, registration and licensing); and also supervisory activities.

Legal basis for safe use of IRS was established in Ukraine. The List of Ukrainian laws, regulations and rules on safety, regulatory requirements could be found on the web site of the State Nuclear Regulatory Committee of Ukraine: www.snrc.gov.ua.

The main current trends of improvement of safety rules and regulations are the following:

- *Differentiation of safety requirements depending on the level potential hazard connected with certain types of activity at certain types of equipment (sources);*
- *Final substitution of the Soviet Union norms and rules with national rules and regulations.*

Activity involving IRS use, which is not hazardous, is not regulated. The use of IRS with very low level of potential hazard, are exempted from licensing[1], but such IRS are subject to registration, and their production and maintenance should be licensed.

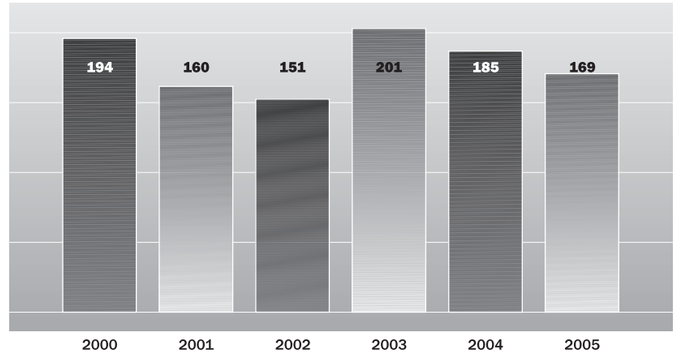
The following is the list of the main tasks of the IRS licensing process[2]:

- *ensuring use of only those sources of ionizing radiation, which safety level conforms to the internationally accepted standards, based on the detailed assessment of all factors influencing safety, including ensuring of physical protection;*
- *ensuring work in the area of use of nuclear energy only for individuals and legal entities, which could guarantee meeting requirements of nuclear and radiation safety regulations, rules and standards.*

Thus, licensing is a strong tool for compliance with all safety requirements. The State's using this tool ensures verification of compliance of IRS with the safety requirements before the beginning of the activity, which involves the IRS use, and a company (institution, organization), intending to use IRS are required to implement all the safety measures beforehand. For example, in the course of licensing, before the beginning of activity with IRS use, the following main IRS safety and security measures are subject to examination: availability of room and equipment (units), which design underwent the State expert assessment for radiation safety and ecological expert assessment, if there is a threat of releases and discharges of radioactive materials; availability of all safety systems (including physical barriers, blockings and alarms, which prevent unauthorized access to the radiation hazardous areas as well as unauthorized use of IRS, availability of qualified personnel, who passed the examination on meeting radiation safety regulations, rules and special test for the trustworthiness; radiation monitoring system and individual health physics monitoring; IRS accountancy and control system; emergency preparedness.

830 enterprises, institutions and organizations perform their activities with the use of IRS, and are subject to licensing. 649 of these enterprises have the licenses for the use of ionizing radiation sources. 63 enterprises only store the X-ray equipment. 72 enterprises of 649 perform servicing of medical and industrial generating devices, radionuclide IRS. 4 enterprises perform IRS testing with the purpose of determining their specifications (technical characteristics) as well as leaktightness tests ("Promizotop", "Ukrmetalurgizotop", "Vygleizotop", "Atomiks"). The licenses are granted for 3 years. The following diagram represents the number of licenses, granted for the years of SNRCU regulatory activity.

THE NUMBER OF LICENSES, GRANTED FOR THE YEARS OF SNRCU REGULATORY ACTIVITY.



[1]) Activity involving IRS included to "List of IRS exempt from licensing", approved by Decree № 912 of Cabinet of Ministry of Ukraine dated July 1, 2002 is not subject to licensing.

[2]) Decree №1782 of Cabinet of Ministers of Ukraine dated December 6, 2000 ratified Procedure of licensing for individual activities in nuclear energy use. Types of activity involving IRS use, rules, requirements and conditions of performing such activities are established in "Safety Requirements and Conditions (licensing conditions) for activities involving IRS use" approved by the Order No.125 of State Nuclear Regulatory Committee of Ukraine dated December 2, 2002, and registered by the Ministry of Justice on December 17, 2002 with the number 978/7266.

Significant achievement in licensing activities is licensing of ionizing radiation sources use in medical institutions since 2005.

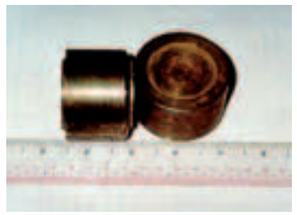
There are enterprises failing to implement all safety and security measures for IRS and obtain a license because of insolvency – budget organizations and enterprises are bankrupts. For the most dangerous IRS SNRC developed a Concept of the State end-user program for "Providing safe storage of spent highly-active ionizing radiation sources", which was approved by the Cabinet of Ministers of Ukraine. Development of this program is expected to be completed in 2006.

Strict national IRS accountancy is the important prerequisite for ensuring safe use of IRS. SNRCU is governing the creation of national IRS registration accountancy and control system – the State IRS Register. Today the Central registry centre of the State IRS Register and eight regional centres in Kiev, Odessa, Rivno, Dnipropetrovsk, Donetsk, Lviv, Kharkiv, Simferopol are established and functioning. Registration of IRS in the Register is obligatory in Ukraine. Due to this, today it is impossible to purchase IRS legally without appropriate national registration and accountancy.

The procedure was developed for interaction between the Register and the Customs Service. The Register is filled out with the data on type of a source, isotopes, their activity, accelerating voltage (for generators), serial number, information on unit for this source, source owner and its mailing address, license number etc. The Register tracks down IRS throughout its all service life – from importing or manufacture till exporting from Ukraine or its disposal.

Non-compliance with requirements for ensuring safety and security of ionizing radiation sources and potential consequences

If ionizing radiation sources are not under the State regulatory control, if the rules and regulations on radiation safety are not complied with, it could result in radiation accidents with very severe consequences (severe diseases, amputations) and even fatal cases. Incidents with severe consequences around the world are happened almost every year. Such incidents took place in the recent 15 years in El Salvador, Israel, Belarus, Vietnam, Iran, Peru, Panama, USA, Brazil. The last major incident with severe consequences took place in Ukraine in 1988. Because of ingress of radioactive cesium, left uncontrolled, into crushed stone, which was used in production of building structures for apartment houses 2 families were exposed. It caused radiation sickness, which resulted in untimely death of several people.



View of irradiator unit source in protective shield and capsule without biological protection

According to current Ukrainian legislation, any deviation from safety rules and regulations is considered as an incident, which is subject to investigation with subsequent corrective action. Each enterprise, institution or organization using IRS are required to develop emergency plans in which, among other things, there should be actions envisaged for loss or theft of IRS. In case the fact of a radiation accident is established, according to safety rules and licensing conditions, all organizations and institutions listed in emergency plans, should be promptly informed and emergency plan measures should be taken.

According to SNRCU information, during 2005 there were 35 radiation incidents with IRS, including:

- *22 – detection of radioactively contaminated scrap metal;*
- *9 – detection of IRS in illegal turnover (2 – in scrap metal, 4 – during examination, 3 – as the result of investigation);*
- *1 – loss of IRS which was found subsequently;*
- *2 – detection of nuclear material in illegal turnover.*

The above incidents did not have radiological consequences for population.

Especially hazardous sources are the sources, which, for one reason or another, appeared to be out of regulatory control (never have been controlled or were left without control, lost, not returned back, stolen, or illegally handed over) i.e. in illegal turnover. Procedures to be taken in case of detection of IRS in illegal turnover are established by the Decree of the Cabinet of Ministers of Ukraine[1] .

In case of detecting of suspicious material/object, all measures aimed at examination of thereof are taken: local executive authorities, if information was given by individuals or legal entities; agencies performing investigation, and the State Customs Service, if suspicioust object was detected during investigation by law enforcement authorities or in the process of customs control.

Coordination of further action in case of detecting a suspicious object is carried out by local executive power authority.

[1]) № 813, dated June 2, 2003 "On Aproval of Procedure for interacting between executive power authorities and legal entities carrying out activities in the are of use of nuclear energy in case of detection of radionuclide ionizing radiation sources in illegal trafficking"(turnover).

7. EMERGENCY PREPAREDNESS AND RESPONSE TO MAN-INDUCED AND NATURAL EMERGENCIES

The unified State system for prevention and response to man-induced and natural emergencies

In Ukraine all measures on emergency preparedness and emergency response are integrated into the Unified State System for Prevention and Response to Man-Induced and Natural Emergencies (hereinafter- USSE) which was created and implemented according to Resolution of the Cabinet of Ministers of Ukraine № 1198 of 3 August 1998. According to the above-mentioned Resolution, SNRCU has been made responsible for control of creation and activity of functional subsystem "Safety of Nuclear Installations" which acts at the facility and national levels of USSE.

At the facility level, the activity of this functional subsystem of USSE is ensured by the State inspections for nuclear safety at nuclear power plants which interact not only with the personnel of NPP but with local Commissions for man-induced and ecological safety and emergencies of satellite towns of NPP's, regional Bodies of the Ministry of Emergencies and other subsystems of USSE.

Principal measures on organization and carrying out works for elimination of consequences of any emergencies of natural and man-induced character, the procedures of work of by the governmental bodies, forces and means of USSPER, necessary financial, material and other resources are envisaged by the Plan of reacting to emergencies of the national level, which was approved by the Decree of Cabinet of Ministers of Ukraine 16 November, 2001, No. 1567.

The specific nature of response to radiation accidents is reflected in the Plan of response to radiation breakdowns, which was developed jointly with experts of the Ministry of Emergencies, Ministry of Fuel and Energy, Ministry of Health and Ministry of Nature according to the Decree of the Cabinet of Ministers of Ukraine on 7 February 7, 2001, No.122 "On the complex of measures aimed at effective implementation of the State policy in the area of protection of population and territories from man-induced and natural emergencies, preventing and prompt response to them, for the period till 2005". The Plan was developed for ensuring the coordinated prompt response by forces and means of national system of emergency response with the account taken of the IAEA recommendations, in particular publications from the series of IAEA Safety Standards GS-R-2 "Preparedness and Response to a Nuclear or Radiological Emergency Safety Requirements". The Plan was approved by the joint Order of SNRCU and the Ministry of Emergencies on 17 May, 2004, No. 87/211 and registered in the Ministry of Justice on 10 June, 2004, No. 720/9319.

With the purpose of improving the system of emergency preparedness and response, SNRCU in 2005 developed "Plan of Response of Functional Subsystem "Safety of nuclear installations" of the Unified State System for Prevention and Response to Man-Induced and Natural Emergencies" which was put in force by the SNRCU Order of 10 January, 2006, No. 4.

NAEK "Energoatom" emergency centers

The system of emergency preparedness and response of NAEK "Energoatom" is the component f the functional subsystem of USSE "Nuclear power engineering and fuel and energy complex" of the Ministry of Fuel and Energy of Ukraine. This functional subsystem includes also a separate subdivision of NAEK "Energoatom" – Emergency and Technical Centre (hereinafter- SE ETC) which is situated in Bilogorodka, Kiev region.

If there is an emergency at NPP, forces and means of SE ETC are directed to the accident stricken facility where they are subordinated emergency manager fro mitinating accident consequences. Using, if necessary, robotics and other unique engineering means, the centre has to provide help to the personnel of the accident stricken facility to carry out radiation and engineering survey, collection and localization of radioactive waste, decontamination etc.

According to requirements of the document "Principal provisions of organization of system of preparedness and response of NAEK "Energoatom" to accidents and emergencies at the Ukrainian NPP's, main and back-up emergency response centers must function in NAEK "Energoatom".

The reserve crisis centre of NAEK "Energoatom" has been established on the basis of the former off-site emergency response centre of Chernobyl NPP in Dniprovske, Chernigiv region. During the accident-free period, the premises of the reserve emergency rsponse centre are used for training of personnel in actions in case of occurrence of accidents at NPP's. During 2005, the refurbishment of the conference-hall of NAEK "Energoatom" Commission Headquarters for emergencies was carried out, and one of the premises was

readapted for workplaces of the engineering support team and equipped with modern computer equipment.

In 2005, construction and assembly works of the main crisis centre of NAEK "Energoatom" were completed, a local area network was put in operation. In order to provide reliable communication in case of emergency, a system of satellite communication was installed in NAEK "Energoatom" covering main and back-up emergency response centers, SE ETC, Rivno, Zaporizhzhya, Khmelnitsky and South Ukraine NPPs.

In 2005, the NPP process parameters transmission system was put into industrial operation ensuring the transmission in real time mode to the emergency response centers of NAEK "Energoatom" of reliable information, which characterizes the status of NPP. The system is capable of transmitting up to 10 to 15 thousand of parameters from each unit of an NPP, with the exception of KhNPP-2 from which at present time about 60 parameters are transmitted.

Besides the mentioned back-up and main crisis centers of NAEK "Energoatom", regulating documents in force envisage creation of the on-site (at NPP site) and of-site (in observation area) emergency response centers at each NPP.

The on-site emergency centre of NPP implements functions of a centre of control of actions concerning localization of an accident and mitigating its consequences on the NPP site and in the sanitary and protective (controlled) area. From this centre, the on-site emergency manager controls the activity of emergency teams, measures of monitoring and forecasting of radiation situation and protection of the personnel, develops recommendations concerning protection of the population, maintains communication with the emergency response centre of NAEK "Energoatom", corresponding structures of local executive power authorities and other organizations.

The of-site emergency response centre of NPP is envisaged to be used in cases of the accidents when the activities can not be performed in the on-site emergency response center. With this purpose, the off-site centre must be provided with necessary means of information collection and reliable means of communication.

The works on establishing crisis centres of NPP's and making them compliant with requirements of the regulatory document "Requirements on-site and off-site emergency response centres of NPP's" are planned to be completed during 2006-2007.

Information/Emergency center of the State Nuclear Regulatory Committee of Ukraine

To achieve the tasks in the area of emergency response, in 1998 the Regulatory body established an Information and emergency centre (hereinafter- IEC).

One of the tasks of SNRCU carrying out, under the Convention on Early Notification of a Nuclear Accident and Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency, of functions of the unified competent national point of communication responsible for maintaining twenty-four-hour duty, and functions of a competent national body authorized to carry out international information exchange according to the Decree of Cabinet of Ministers of Ukraine of 2 October, 2003, No. 1570 "On defining the competent national Bodies for implementation of international conventions in the area of use of nuclear energy" ,which takes into account the IAEA recommendations on distribution of functions between competent national Bodies and points of communication.

Besides the above-mentioned international conventions, SNRCU is responsible for implementation of intergovernmental agreements with other countries, which envisage mutual prompt notification and subsequent information exchange in case of nuclear or radiation emergency situation. As of 1 January, 2006, Ukraine has concluded and 13 such treaties are in force with: Sweden, Turkey, Byelorussia, Slovakia, Hungary, Finland, Norway, Poland, Germany, Austria, Bulgaria, Latvia and Romania. To these agreements, during the year the testing of communication with corresponding points of communication of these countries have been periodically carried out, and with the purpose of discussing the staus of bilateral agreements implementation, working meetings with representatives of competent authorities of Poland and Byelorussia were held.

During the shift duty in IEC, on-line communication with Ukrainian NPPs is constantly maintained, analysis and registration of information on the events at NPP's are carried out, databases "NPP Operational Events" and "Daily Reports on NPP Operation" are renewed. Every 24 hours, the "Information Summary on the Status of the Ukrainian Nuclear Power Units" is prepared and placed on the web site of the State Nuclear Regulatory Committee of Ukraine www.snrc.gov.ua and sent to the Ministry of Emergencies.

The IEC operative personnel submit daily data on status of the Ukrainian NPPs to the unit of information analytical processing of the Governmental Information Analytical System on Emergencies (GIASE) of the Cabinet of Ministers of Ukraine and to the GIASE back-up unit of the Ministry of Emergencies according to regulations for interaction between central and local executive power authorities within GIASE, as well as to the relevant department of the Cabinet of Ministers of Ukraine.

Every message on NPP operational events is placed on the website of the SNRCU, monthly summary information on NPP operational events are submitted to the Cabinet of Ministers of Ukraine and Verkhovna Rada.

In 2005 IEC of the SNRCU began operation of IEC reliable (uninterrupted) power supply system, recording of operating negotiations of IEC and automatic notification of IEC personnel.

Training in Emergency Preparedness and Response and emergency exercises

Radiation Safety Standards of Ukraine (NRBU-97) require periodic emergency exercises of operating organizations' personnel who participate in implementing emergency response measures.

Each NPP has developed an annual program of emergency exercises and the associated quarterly training schedule. The schedule provides for carrying out emergency expercises of each individual from operating personnel at least once a quarter. Based on the schedule, the NAEK "Energoatom" and NPP management conduct plant emergency exercise once a year, involving emergency response departments of the NAEK "Energoatom" management and representatives from external organizations, including the Ministry of Emergencies, Ministry of Fuel and Energy, and the SNRCU.

Such training was conducted at the South-Ukrainian NPP in September 2005. SNRCU took part in the exercise with activation of IEC and involving the State Inspectorate on nuclear safety at the NPP. According to the exercise results, corrective actions to improve the existing system of emergency preparedness and response of the SNRCU and NAEK "Energoatom" were developed.

During 2005, 347 emergency exercises were conducted at NPPs, including 26 full-scale emergency exercises.

With the purpose of improving own system of emergency preparedness and response and working out the actions in case of radiation incidents connected with terrorist attacks, in December 2005 the SNRCU prepared and carried out the emergency according to the corresponding scenario with the participation of observers from the National Security Service of Ukraine and the Ministry of Emergencies.

The SNRCU jointly with the Ministry of Emergencies and UkrGMC took part in the international training (exercise) CONVEX-3 with the conditional radiation accident at the NPP "Chernavoda" in Romania, which was arranged under the auspices of the IAEA on May 11-12th, 2005. During the two-day training, IEC was activated, the interaction with Ministry of Emergencies and UkrGMC was exercised, as well as the information exchange with the emergency response centre of the IAEA and competent authorities of other countries was carried out.

Besides, in 2005 the SNRCU took part in the the IAEA CONVEX 1b and CONVEX 2a exercises (trainings), which are annually carried out by the IAEA with the purpose of checking on-line communication between the IAEA emergency response center and national competent authorities according to the Convention on Early Notification of a Nuclear Accident and Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency

8. ACCOUNTANCY AND CONTROL OF NUCLEAR MATERIALS

System of international Safeguards

Soon after the declaration of independence of Ukraine, Verkhovna Rada in the Declaration of October, 24, 1991 declared about the intention to get rid of nuclear weapons remained as legacy from the Soviet Union and join the Treaty of the Non-Proliferation of Nuclear Weapons (NPT), and conclude the corresponding Agreement with the IAEA.

In December 1994 Ukraine joined the NPT as a non-nuclear state. The last nuclear warhead was taken out to Russia in August 1996. The Agreement between Ukraine and the IAEA on application of Safeguards in connection with the NPT (hereinafter- the Safeguards Agreement) was ratified by the Law of Ukraine of 17 December, 1997, No. 737/97-VR.

With the purpose of enhancing efficiency and effectiveness of the Safeguards regime of nuclear weapons non-proliferation, IAEA since 1997 began to introduce a new Safeguards system, which legal basis was concluding of the Additional protocol to agreements between the IAEA member-states on application of Safeguards in connection with the NPT (hereinafter- Additional protocol).

The system of so-called "traditional" Safeguards has been applied in the world for about 30 years and with the development of scientific and technical progress, new nuclear technologies, change in the political climate in the world it lost its effectiveness. The limited nature of traditional Safeguards is that they, first and foremost, ensure correctness of information on nuclear activities, which is provided by countries, but not of its completeness. Traditional Safeguards do not foresee that a country can declare not all the preliminary inventory of nuclear material. The principal consideration is given to the declared nuclear material in key places of declared nuclear facilities. So, the traditional Safeguards system is not an insuperable obstacle for the secret nuclear activity of a country.

The new system of "strengthened" Safeguards gives a possibility for the IAEA to reveal the undeclared nuclear activity of a country at the initial stage. The strengthened Safeguards will allow the Agency: to evaluate the domestic non-discrepancy of information provided by a country; evaluate the correspondence of information by the countries to other information which IAEA has, for example, to data by accountancy, based on inspection results, results of taking samples of the environment, additional access, according to open information sources; have grounds to estimation of lack or presence of undeclared nuclear material or activity.

Application of Safeguards in Ukraine

The SNRCU together with other central bodies of executive power ensures the implementation of international commitments of Ukraine concerning the nuclear weapons non-proliferation. The Presidential Decree of 6 March, 2001, No. 155/2001 conceded SNRCU the function of coordination of measures concerning the implementation of the Safeguards Agreement. In 2005 the following measures were implemented:

- *developed and sent to the IAEA: 214 reports concerning available number, changes in inventory nuclear material and other information according to the requirements of the Safeguards Agreement;*
- *sent to the IAEA: 22 in-advance notifications on export/import of nuclear materials;*
- *arranged 79 IAEA inspection at nuclear plants and 12 inspections at other enterprises of Ukraine (Supplement 1);*
- *approved the assignment of 13 IAEA employees to the positions of inspectors to carry out inspection activity in Ukraine.*

In order to ensure compliance with the requirements of Safeguards Agreement in Ukraine, the State Regulatory Body for nuclear and radiation safety established and since 1994 put in operation the State System for Accountancy and Control of Nuclear Material (ACNM). Under the ACNM functioning for 2005, the SNRCU developed following documents:

- *17 in-advance reports on import and 5 reports on export of nuclear material;*
- *31 reports on results of nuclear materials inventory;*
- *27 material and balance reports;*
- *156 reports on changes in inventory of nuclear material by inventory results.*

Based on results of the IAEA inspections of the Ukrainian facilities, 24 generalized reports with positive conclusions were submitted to the ministries and institutions for the reported period.

During the year the work has been carried out to reveal and arrange the State accountancy of nuclear material at enterprises, which have nuclear material in small quantities. In 2005, 82 such enterprises were accounted for (distribution by balance areas on the territory of Ukraine is shown in Supplement 2).

The supervision is constantly exercised over compliance with requirements of legislation, regulations and rules in part of accountancy and control of nuclear material by organizations, enterprises, institutions having nuclear materials. 12 state inspections were carried out to check the condition of keeping nuclear material and functioning of the system for accountancy and control of nuclear materials at facilities and enterprises of Ukraine. By the results of inspections, 7 prescriptions were sent, which requirements were complied with in fixed deadlines. Supplement 3 shows the schedules of inspections for previous period and the reported period.

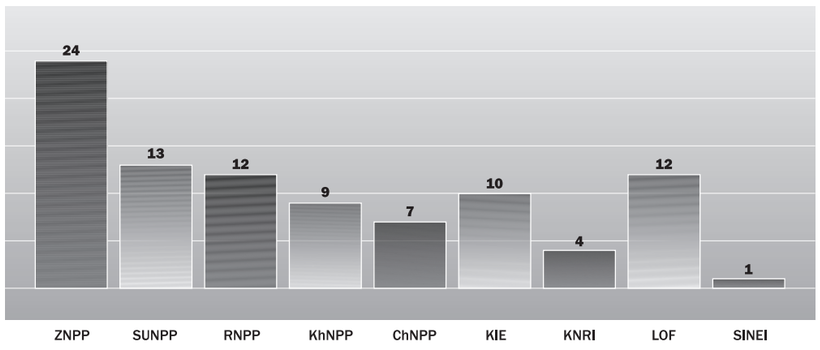
The logic step of our country concerning strengthening of nuclear weapon non-proliferation regime was the signing and ratifying of the Additional protocol by Verkhovna Rada (the Law of Ukraine of 16 November 16, 2005, No. 3092-IV16). According to requirements of the Additional protocol, Ukraine has to declare to the IAEA of nuclear activity, beginning with plans R&D works in the area of nuclear fuel cycle, information concerning manufacture of dual-use products, export of materials and equipment which are connected with nuclear activity, and ending with information on the decommissioned facilities. Besides, Ukraine commits itself to providing access for the IAEA inspectors to all sites where the location of nuclear material is declared, as well as to the decommissioned facilities.

In order to ensure the timely providing of primary declaration of Ukraine to the IAEA, a plan of measures to implement the Additional protocol has been developed, the principal measures are as follows:

- *drafting and approval by the Cabinet of Ministers of Ukraine of legal/regulatory Act which determines the procedure for providing information by executive power Bodies, legal entities and individuals for implementation of the Additional protocol;*
- *specifying the list of enterprises covered by the requirements of the Additional protocol (enterprises of nuclear fuel cycle including the those decommissioned; institutions which do R&D works in this field; enterprises manufacturing the dual-use products);*
- *arrangement for preparing information at corresponding enterprises, formatting the Ukrainian declaration according to requirements of the Additional protocol.*

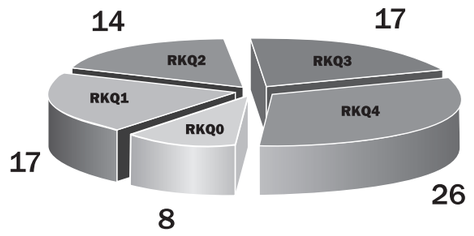
Implementation of these measures (within the planned deadlines) will allow to comply with requirements of the Additional protocol in part of providing a preliminary declaration.

Supplemen 1. ORGANIZATION OF IAEA INSPECTIONS AT ENTERPRISES OF UKRAINE (number of visits)

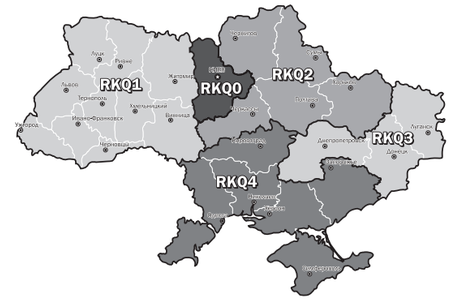


Supplemen 2.

STATE REGISTRATION OF ENTERPRISES IN 2005

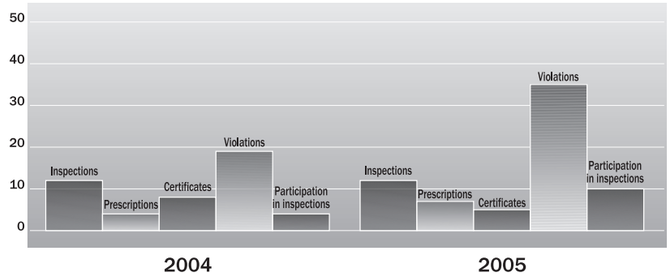


STRUCTURE OF NUCLEAR MATERIAL BALANCE AREAS



The ratification of the Additional protocol will allow Ukraine to avoid negative consequences, in particular, concerning the uninterrupted supply of nuclear fuel for NPPs, will give an opportunity to the Ukrainian scientists to take part in development and use of intellectual modern technologies in the area of nuclear fuel cycle, for example, the perspective technologies of the 4th generation nuclear reactors.

Supplemen 3. INSPECTING SAC NM OF ENTERPRISES



9. TRANSPORT OF RADIOACTIVE MATERIALS

The transport is carried out through the territory of Ukraine of:

- *fresh nuclear fuel to the Ukrainian NPPs from Russian Federation and spent nuclear fuel back to Russian Federation;*
- *low-level radio-pharmaceuticals and high-level sources of ionizing radiation (IRS) which are used in medicine for diagnostics and treatment;*
- *medium-level IRS for use in monitoring and measuring devices which are used in geological survey works;*
- *high-level IRS for radiographic flaw detection and sterilization;*
- *low-level and medium-level radioactive waste, including in 30-kilometer Exclusion Zone;*
- *uranium ore from mines to hydrometallurgical plant and uranium concentrate abroad;*
- *fresh nuclear fuel as a transit through the territory of Ukraine from Russia to Slovakia, Hungary, Bulgaria and spent nuclear fuel from Bulgaria to Russia.*

The determinant of safety ensuring is the strict compliance by the participants of transport – consignors, transporters, consignees – with legislation and safety rules of radioactive materials transport by corresponding means of transportation.

According to the legislation, the activity related to radioactive materials transportation is subject to the State regulation. The Laws of Ukraine "On Use of Nuclear Power and Radiation Safety" and "On Permissive (licensing) Activity in the Area of Nuclear Energy Use" envisage licensing of the activity related to radioactive materials transportation. According to the Decree of the Cabinet of Ministers of Ukraine "On approval of the Procedure for licensing certain types of activity in the area of use of nuclear power" of 6 December, 2000, No. 1782, in 2005 the SNRCU issued 5 licenses to juridical persons whose activity was connected with radioactive materials transportation, renewed 6 licenses and incorporated changes to 5 licenses.

Today about 40 enterprises and organizations hold licenses for the activity related to radioactive materials transportation. The biggest organizations by the scope of activities related to radioactive materials transportation are NAEK "Energoatom", Eastern ore mining and milling enterprise, Ukrainian state production association "Isotope", State interregional specialised plants of Ukrainian SA "Radon", SE "Ukrgeophysics", SSE "Complex", State international airport "Boryspil".

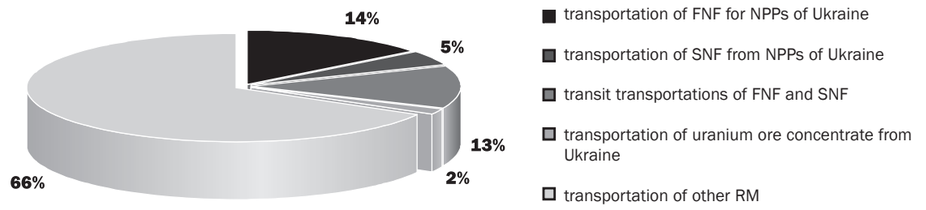
The legislation also envisages issuance permits to separate shipments of nuclear material. In 2005 the SNRCU issued 111 permits, namely:

- *transport of fresh nuclear fuel (FNF) for NPPs of Ukraine – 16;*
- *transport of spent nuclear fuel (SNF) from NPPs of Ukraine to Russia – 5;*
- *transit transport of fresh nuclear fuel from Russia to Slovakia, Hungary and Bulgaria – 12;*
- *transit transport of spent fuel from Bulgaria to Russia – 2;*
- *transport of uranium ore concentrate from Ukraine – 2;*
- *transport of other radioactive materials – 74.*

The important component of the system of regulatory measures is certification of transport packages. Since 1999 SNRCU issued nine certificates to packages designed and manufactured by the Ukrainian manufacturers. During 2005 according to "Procedure of issuing certificates of approval of designs of packages and radioactive materials, specific conditions and certain shipments" 6 certificates of approval of packages were issued and prolonged their term of validity.

The practices of radioactive material transport in Ukraine and abroad show of the high level of safety. For the last 10 years in Ukraine there were no incidents and accident registered during radioactive materials transport, with radiation consequences.

Supplemen 4. STRUCTURE OF RADIOACTIVE MATERIAL TRANSPORTATION THROUGH THE TERRITORY OF UKRAINE IN 2005



10. PHYSICAL PROTECTION OF NUCLEAR MATERIAL AND NUCLEAR INSTALLATIONS

Physical protection is a vitally important element of physical nuclear safety of nuclear installations (NI), nuclear materials (hereinafter- NM), and together with state system of accountancy and control is the tool of securing the nuclear weapons non-proliferation regime.

Physical protection of NI, NM is a totality of organizational measures, engineering and means and actions of security forces with the purpose of prevention of a theft of nuclear material or a subversive acts at nuclear-hazardous facilities. Hence, principal functions of physical protection are to: reveal unauthorized actions; evaluate the situation; detention of penetration of a trespasser; neutralize a trespasser.

SNRCU plays a key role in functioning of the State system of physical protection, because the State empowered it with responsibility for implementing the State regulation of physical protection. The Committee drafts rules and regulations on physical protection, issues licenses and carries out the State supervision over compliance with legislation requirements and licensing conditions in the field of physical protection by the Operator and licensees.

One of the measures to counteract unauthorized actions with NI, NM is to screen personnel of nuclear-hazardous sites and employees of contractor organizations for trustworthiness (a so-called special check). In 2005 the Decree of the Cabinet of Ministers of Ukraine was approved "On approval of Procedure for carrying out a special personnel check in order to authorize access to individuals to the work at nuclear facilities and with nuclear material" and the draft Law of Ukraine "On amending Article 11 of the Law of Ukraine "On Physical Protection of Nuclear Installations, Nuclear material, Radioactive Waste, Other Sources of Ionizing Radiation", in which the access procedure is fixed for foreigners to carry out special works at nuclear plants, with nuclear materials, radioactive waste, other sources of ionizing radiation in Ukraine. Introduction of the improved access procedure for foreign personnel to special works and permits to access limited access areas, in particular, on the industrial site of SSE "Chernobyl NPP", will give a possibility to raise the efficiency of implementation by Ukraine of international agreements related to Chernobyl NPP decommissioning conversion of the "Shelter" into an ecologically safe system.

During 2005 the works on servicing and maintenance of engineering means of protection as well as for upgrading of existing physical protection systems of nuclear plants, nuclear material, radioactive waste, other sources of ionizing radiation were carried out at all sites of nuclear-industrial complex. These works were carried out by the subjects of activity, which hold licenses for carrying out certain types of activity in the field of physical protection of NI, NM, Radwaste, other IRS.

At the expense of international technical assistance, works for upgrading physical protection systems at the Ukrainian NPPs have been carried out during the reported year:

- *Zaporizhzhya NPP – modernization of physical protection systems (hereinafter- PPS) at all 6 power units (with support of the United States Department of Energy);*
- *Rovno NPP – a system of video surveillance is installed at the unit № 3 (within the TACIS project of the European Community);*
- *Khmelnitsky NPP – modernization of physical protection system which is implemented in 2 stages; PPS is installed at Unit № 1 (with support of the United States Department of Energy);*
- *Chernobyl NPP – modernization of physical protection system, installation of PPS at SFSF-2, at the "Shelter" (at the expense of the grant of the European bank of reconstruction and development).*

11. RESEARCHES AND INNOVATIONS IN THE AREA OF USE OF NUCLEAR ENERGY

Research and innovations in nuclear and radiation technologies and their role in ensuring safety

One of the biggest and the most highly competent centers of physical science in Ukraine is National Scientific Centre "Kharkiv Physics & Technology Institute" (hereinafter – NSC KhPTI) in 1928 with the purpose of development of actual scientific trends (at that time – Nuclear Physics and Solid State Physics). Remarkable result was obtained after only four years – lithium atom nuclear fission was done.

In the postwar years KhPTI was one of the most active participants in works related to the issue of use of nuclear energy in the USSR. A series of new materials, processes and plants were introduced in the industry, in particular: technology of manufacturing fuel elements for nuclear reactors, compact accelerators of charged particles etc.

NSC KhPTI has unique experimental devices including electron and ion accelerators including the largest in CIS linear electron accelerators, complex of thermonuclear units "Uragan", has a large R&D production. Fundamental research is carried out in the institute with the support of international organizations. The regional centre for the system of IAEA international nuclear information is functioning.

The research basis for many scientific, scientific and technical and educational institutions are research reactors. In Ukraine, research reactors are situated on the sites of Kyiv Institute for Nuclear Research under the National Academy of Sciences of Ukraine (INR) and Sevastopol Institute for Nuclear Energy and Industry (SINEI).

One of the first research reactors built and commissioned in Soviet times was the research reactor WWR-M of Kyiv Institute for Nuclear Energy of NAS of Ukraine (hereinafter – INR).The reactor WWR-M was built 40 years ago upon the initiative of the academician I.Kurchatov as implementation of the program of providing nuclear regional centers with research reactors. The first director of the Institute, academician of NAS of Ukraine M.Pasichnyk became the organizer of the building and initiated works on the research reactor.

The experimental basis of the institute consists of unique to Ukraine nuclear and physical units (research nuclear reactor WWR-M, "hot chambers" for work with radioactive materials of high activity, cyclotrons U-240 and U-120, tandem-generator EGP-10K) which allow to carry out extensive scientific research not only for employees of the institute but for employees of other scientific institutions as well.

Principal trends of fundamental and applied sciences of INR cover nuclear physics, nuclear energy, physics of solid state and radiation physics, physics of plasma, radioecology and radiobiology.

After the Chernobyl accident, employees of INR were among the first who actively participated in mitigation of its consequences. The level of radioactive contamination of the environment in different regions of Ukraine was determined, numerous devices and units for monitoring migration of radionuclides in the environment by the condition of fuel-containing masses of the "Shelter" were developed and manufactured, and that favored considerably to mitigation of consequences of the Chernobyl catastrophe.

Nowadays the institute pays considerable attention to develop modern energy-saving radiation and plasma technologies and their introduction into production. In particular, modern health physics monitoring equipment and modern system for monitoring radiation loads on WWER-1000 reactor pressure vessel were developed and introduced at NPPs of Ukraine that allows to get at the high scientific and technical level the information necessary for accident-free operation of nuclear power units and effective radiation service life management.

Autonomous, highly-reliable and safe neutralizers of static electricity were developed, they give a possibility to reduce considerably its harmful effects in various branches of production (chemical, polygraphic, paper, textile etc).

Special types of detectors for spectroscopy of charged nuclear particles were developed and produced, their use enhances considerably the efficiency of registration and quality of data of nuclear and physical experiments that are carried out on accelerators of INR and the United institute for nuclear research (Dubna, Russia).

Principally new constructions of plasma metalizer for efficient metalizing of tiny details are proposed, which can be used in electronics, optics, micromechanics and of plasmochemical reactor which gives possibility to synthesize new film materials from metals and gases and can be used in specific electrometallurgy applications.

The process equipment was developed for work with highly-active samples of iodine-131 and technecium which can be used for manufacture of radio-pharmaceuticals.

The results of radioecology and radiobiological research obtained by scientists of KNRI are of great importance for carrying out an ecological expert assessment in the course of designing nuclear power engineering facilities (sites) and for evaluation of effects of enterprises of nuclear industrial complex on the environment.

In the institute, the work is arranged for professional training and retraining (raising expert skill) of specialists who work in the field of physical protection, accountancy and control of nuclear material in corresponding ministries and departments, on nuclear sites of Ukraine.

A number of works of INR are awarded with State prizes of Ukraine and Prizes of Presidium of NAS of Ukraine bearing names of prominent scientists. "Collection of scientific works of the Institute for nuclear research" is published by INR; scientific conferences are held annually and over 300 articles and some monographs of scientists are published.

The Institute for nuclear research has broad scientific connections. Joint R&D works are carried out with scientists of Russia, the USA, France, Germany, Italy, Austria, Poland, Sweden, Netherlands, Japan and other countries. Working relations are maintained with IAEA. The institute coordinates the activity of Ukrainian physicists in the work of above-mentioned Russian United institute for nuclear research and takes part in the work of coordinatory group for NAEK "Energoatom" on scientific support for reactor pressure vessels service life management.

All this allows the Institute to keep a high scientific level of a leading nuclear centre in Ukraine.

On 18 October, 1967 by Order of Commander-in-Chief of Navy of the USSR, the laboratory of Sevastopol Institute for Nuclear Energy and Industry (SINEI) was established with DR-100 research reactor, physical test bench (critical assembly) placed in DR-100 reactor biological shielding matrix and subcritical uranium-water assembly.

The DR-100 reactor commissioned in April, 1967, is heterogeneous, with heat capacity 200 kW. Nuclear fuel – U02 with concentration of 10% by uranium 235. The modernization of protection control system was carried out in 1977.

The physical test bench (critical assembly) put into operation in 1974 was composed of fuel assemblies, which are used in the reactor DR-100.

The subcritical uranium-water assemble was put in operation in 1964. The core of the assembly is composed of blocks of natural uranium in aluminum cladding.

Linear electron accelerators

Nuclear installations of SINEI are widely used in the educational process for students to acquire practical skills.

Ensuring safe research and innovations in the area of use of nuclear energy

The Statute of National Scientific Centre "Kharkiv Physics & Technology Institute" determines numerous directions of activity in the field of use of nuclear energy in part of ensuring development of fundamental and applied scientific research, carrying out R&D works in

Research reactor WWR-M

the field of nuclear physics and elementary particles research of influence of ionizing radiation on materials, improvement of new components of accelerator machinery for production of radioisotopes for medical and other uses, transmutation of elements. The implementation of the mentioned activity requires the introduction of system of safety measures directed to radiation protection of personnel, population and the environment, which is determined by nuclear legislation of Ukraine. The estimation of sufficiency and efficiency of functioning of these measures is checked by SNRCU in the process of issuance (re-issuing) of licenses, as well as by means of carrying out inspection and analysis of annual reports on ensuring radiation safety while carrying out each separate type of activity that are given by NSC KhPTI in a fixed term.

Besides, before carrying out of any works on modernization, reconstruction of linear accelerators and other IRS, or making any changes to the design documentation for IRS (including the development of new IRS), SNRCU carries out the State expert assessment of technical documentation on nuclear and radiation safety.

NSC KhPTI holds licenses issued by SNRCU for carrying out certain types of activity in the area of use of nuclear energy, namely: use of IRS (license of series ОВ № 000260), manufacture of IRS (license of series ОВ № 000232), reprocessing, storage and radwaste management (series ОВ № 000279); transport of radioactive waste (series ОВ № 000269).

The operation of the WWR-M research reactor of Kyiv Institute for Nuclear Research is carried out according to licensing condition of its operation license № 000051 of May, 22, 2002. In June 2005 the validity of the license was renewed (after suspension on 18 August, 2003).

During the years reactor operation there have been considerable number of scientific research performed in nuclear and neutron physics, nuclear power engineering, radiation material science, physics of condensed medium, radiation physics of semi-conductors, radiation chemistry, biology, ecology, medicine, as well as R&D works in neutron-activating analysis, neutronography, alloying silicon, development and testing of various systems of in-core monitoring, radiation and reactor material science, manufacture of radionuclides. R&D works concern resolution of both fundamental issues and applied innovations and are used practically in all areas of national economy. During 2002-2006, 23 institutes of National Academy of Sciences, 3 Universities, 3 Ukrainian institutions and 5 foreign institutions took part in research at the reactor.

Taking into account the unique features of the research nuclear reactor and interest of many institutions in its effective functioning, it got the status of the scientific object that represents a national property with corresponding financing. The proper functioning of the research reactor allowed to develop successfully a number of scientific trends, create scientific schools, the Ukrainian scientists entered the world scientific community as equal and competent participants.

In order to ensure high level of safety in process of operation, some units and systems of the reactor were modernized or replaced. Generally, the works on modernization of the reactor required about $ 4.5 mln within the last 10 years. In particular, the works were carried out to establish and put into operation of the system for monitoring and physical protection of the reactor; fresh nuclear fuel store; fire alarm; the equipment of secondary cooling system of the reactor was assembled and put in operation; designs were developed and works begun to upgrade control and protection systems, spent fuel management fuel; the liquid radioactive waste treatment plant was commissioned; the service life of reactor pressure vessel and primary piping was extended; the reconstruction of reactor cooling tower was done; the partial replacement of electric cable equipment of the reactor was done etc. And what is more, for reliable and lasting functioning of the research reactor it is planned to take a number of measures to improve fire protection, back-up power supply, radiation monitoring, emergency core cooling etc.

Jointly with Argon National Laboratory of the USA and through its financial support, calculations were done and conclusions and substantiations were drawn for transition of the reactor to low-enrichment nuclear fuel. The reduction in 2% of density of neutron flux in result of transition to such fuel will not affect results of fundamental and applied research. It is planned to purchase low-enrichment fuel at the end of 2006.

Both fresh and spent nuclear fuel is kept in conditions that correspond to the nuclear legislation in force. The capacity of the existing spent fuel store is sufficient for high-enrichment fuel available on-site.

The operation of nuclear installations of Sevastopol nuclear energy and industry institute (SINEI) is carried out according to licensing conditions of the operating license № 000131 of 24 June, 2003.

The stable and safe operation of the research reactors will give the opportunity to maintain the infrastructure of nuclear science and power engineering, as well as resolve pending issues this area.

12. INTERNATIONAL COOPERATION

Since 1991 Ukraine actively integrated in the international cooperation in the are of safe use of nuclear energy and radiation safety, by joining a number of Conventions directed to strengthening of nuclear and radiation safety regime.

The international cooperation in the area of nuclear and radiation safety is effected on the basis of multilateral and bilateral agreements, which allows Ukraine to implement the best world experience gained in ensuring the up-to-date level of nuclear and radiation safety.

The significant event of 2005 was the Third conference of consignors to the Nuclear Safety ook place April, 11th-22nd in Vienna (Austria). Ukraine confirmed implementation of its commitments set forth in the Convention on nuclear safety that was recognized by Contracting parties by results of presentation of the National report.

During the reported period, SNRCU in cooperation with Ministry of Fuel and Energy of Ukraine, Ministry of Emergencies and other ministries and organizations prepared and provided the IAEA with the Second National Report on implementation of commitments according to requirements of the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management.

In the framework of cooperation with the IAEA, Ukrainian experts during the reported period took part in 10 national and 25 regional projects of the Technical Cooperation Program. The fruitful cooperation with the IAEA was achieved through the missions of the operational safety review team of the IAEA (OSART), Working group for the IAEA Safeguards implementation under the "Agreement between Ukraine and the IAEA on implementation of Safeguards in relation to the Treaty on the Non-Proliferation of Nuclear Weapons (NPT), work of Committees for standards on nuclear safety, radiation safety, technical meetings, working groups, seminars, conferences, other IAEA missions and arrangements.

The Ukrainian delegation took part in the 49th session of the IAEA General Conference held September 26th-30th, 2005 in the IAEA Headquarters in Vienna, Austria. During the meeting with the IAEA Deputy Director General, Ms. A.Chetto the renewed Framework program of technical cooperation between Ukraine and the IAEA for the middle-term was signed. The issues of the Program were:

- *Life-time extension of NPP units;*
- *support to technical and regulatory decisions taken under Chernobyl NPP decommissioning and conversion of the "Shelter" into an ecologically safe system;*
- *comprehensive resolution of pending issues of radwaste management;*
- *expanding of IRS use in medicine, improvement the health physics monitoring system;*
- *development and implementation of physical protection technologies for nuclear power plants and nuclear material;*
- *improvement of a system and enhancement of effectiveness of nuclear and radiation safety regulation, and, also, in context of tasks of further development of nuclear power engineering, alternative fuel supply, strengthening the county's consolidation of energy safety.*

The 49th session of the IAEA General Conference

During 2005 the bilateral cooperation has been continued in the area of nuclear and radiation safety within the concluded intergovernmental and interagency agreements with foreign states (with Republic of Belarus, Russian Federation, the USA, Hungarian Republic, French Republic, Spain, Germany etc).

In 2005 SNRCU began implementation of policy of expanding the bilateral cooperation with the countries, which accepted at the national level the programs of development of nuclear power engineering, in particular it, concerns China and Turkey. The corresponding interagency Agreements on cooperation of SNRCU with regulatory Bodies of these countries were signed in June last year during the visit of the President of Ukraine to Turkey and the visit of the delegation of National administration of nuclear safety of China to Ukraine.

The cooperation with the USA continued both at the level of regulatory Bodies and through implementation of projects under support of the United States Department of Energy directed to the reduction of radiological threat. In March 2005 in Rockville there was the annual meeting of representatives of State Nuclear Regulatory Committee of Ukraine and Nuclear Regulatory Commission of the United States (NRC), which resulted in signing of the corresponding Memorandum. In September 2005 The NRC Commissioner Mr. D.Merryfield visited Ukraine with a working visit. During the visit the Parties discussed priority areas of the bilateral cooperation in regulation of NPPs safety under the Agreement between the Governments of Ukraine and the USA on operational safety enhancement, reduction of operational risks and strengthening the regulatory systems of civil nuclear facilities in Ukraine of October, 25, 1993.

In context of implemnting the policy of European integration, bilateral contacts were given a new live up at the level of managers of regulatory Bodies with countries of Eastern Europe, which recently became the EU members and had passed through a challenging road of institutional reforms of nuclear regulatory system. In particular, in December 2005 in the framework of implementation of bilateral Agreements, there were working visits by the delegations of the SNRCU to Czech Republic and Republic of Poland. The corresponding plan of cooperation is being developed with the regulatoty Body of the Slovak Republic.

The integration to EU is considered a strategic direction of Ukraine's foreign policy. One of the criteria defining the readiness of a country to join the EU is the proper level of nuclear and radiation safety in the area of use of nuclear energy.

During the reported period under the auspices of the European Commission, the work of the Team of coordination of tasks of nuclear regulation in Europe (CONCERT) has been carried out. Ukraine has been taking part in work of the Team since the moment of its establishing in 1992. The main objective of the Team activity was the exchange of experience in regulating nuclear and radiation safety in Europe. In August 2005 the Team ceased its work in connection with the preparation of new tool of the European Commission – the European Working Group for nuclear safety.

The effective tool of implementing the Action Plan Ukraine-EU is the participation of the SNRCU experts and its technical support organization in projects under the Technical Assistance for the Commonwealth of Independent States (hereinafter- TACIS) on nuclear safety supported by the European Commission. At present time 7 TACIS projects are underway, which SNRCU is a Beneficiary of.

In September 2005 Terms of Reference were approved for three new projects under the Program of actions of TACIS on nuclear safety of 2003, including

The IAEA Deputy Director General A.Chetto and the Chairperson of SNRCU O.Mykolaichuk are signing the renewed Framework program of technical cooperation between Ukraine and the IAEA for the middle-term

the project UK/RA/06 "Further development of regulatory capabilities of SNRCU through transfer of West European regulatory methodologies and techniques".

SNRCU in cooperation with Ministry of Foreign Affairs of Ukraine carried out a number of arrangements on joining Ukraine to the Global Partnership Initiative with participation of the G8 and other donor countries. The positive assessment by the Japanese experts who visited Ukraine in January-February 2005, of implementing the program of assistance by Japan in establishing in Ukraine of the State system for accountancy, control and physical protection of nuclear material provided favorable prerequisites for implementation of new projects under the Global Partnership Initiative.

Due to the support from the Canadian Government and in cooperation with the IAEA in November 2005 Ukraine held the international seminar on compliance by the member-states with the Code of Conduct on safety of ionizing radiation sources, which laid the foundation of formalization of process for information exchange between the countries, which supported this Code.

In the framework f cooperation with NATO, SNRCU took part in arrangements (events) on energy safety (Brussels) and fighting threats of terrorism (Erevan). In 2005 for the first time in the history of an independent Regulating body in Ukraine, SNRCU took part in the influential European Forum EUROSAFE in the format of discussions on "Issues of safety enhancement – reasons – strategy – implementation methods", that was a certain evidence of both increased interest paid to Ukraine and acknowledgement of the sufficient level of competence of its regulatory Body.

In 2005, together with the regulatory Body, Ministry of Fuel and Energy and the Operating organization NAEK "Energoatom" took an active part in international cooperation in the area of safe use of nuclear energy.

The most significant events took place with their participation were:

- *International seminar in Brussels organized by FRAMATOME and assistance from Representative office of Ukraine to the EU "Ukraine – EU: Cooperation in the area of nuclear energy". The objective of the seminar was to form a positive image of Ukraine's nuclear power engineering on the way of its European integration;*
- *International interministerial conference "Nuclear power engineering in the 21st century". At the conference the participants discussed pending issues and problems with CO2 atmospheric releases, application of mechanisms of the Kyoto protocol for prevention of global warming etc.;*
- *General Assembly of the World Association of Nuclear Operators (WANO) in Budapest, organizer of which was Moscow regional centre WANO;*
- *Conference of directors of Atlanta, Paris, Tokyo, Moscow centers of WANO with participation of the WANO Coordination centre in Yalta;*
- *International conference in Moscow "Development of nuclear power engineering on the basis of fast breeder reactors with closed fuel cycle. Strategy and perspectives of international cooperation".*

In the framework of bilateral cooperation between Operating organizations on January 27-28th of the last year, at the 10th joint meeting of Coordinating committee for cooperation with the Concern "Rosenergoatom", the program of cooperation for 2005 was approved. The program consisted of 16 sections on the issues of the nuclear safety enhancement, cooperation in repair works, emergency planning, interaction between emergency and engineering centers, creation of insurance stock of equipment for NPPs in Russia and Ukraine, departmental control, physical protection, metrology, radiation safety, economics, exchange of experience in start-up and commissioning of new units, training of personnel, radwaste management and others.

The program was implemented through participation in conferences, meeting, thematic seminars, working groups, trainings, technical visits, emergency exercises etc .

The First session of working group was held to develop the Program of cooperation with the Concern "Rosenergoatom" on technologies of fast breeder reactors.

On December 15-16th, 2005 at Kalinin NPP (Russia) the regular 12th session of Coordinating Committee was held, where the Program of cooperation for 2006 was approved.

During the reported period, the cooperation was underway between NAEK "Energoatom" the French company EDF in the framework of Partnership Agreement concluded on 12 June 12, 2003. The result of implementation of the Action Plan, which was signed under this Agreement was conducting in 2004-2005 of a number of seminars and on-the-job trainings, technical meetings and visits both to Ukraine and France on the following basic areas:

- *the environment (project optimization of Water Chemistry of main and auxiliary circuits);*
- *Life-time extension (project "Support to SE NAEK "Energoatom" in the course of preparation of RNPP-1and RNPP-2 (WWER – 440) for extended operation");*
- *emergency response (participation of observers in emergency exercises at French and Ukrainian NPPs);*
- *human resources (mastering methodology of evaluating of workplaces by NAEK "Energoatom" experts with the purpose of optimizing the use of human resources of the company);*
- *twin NPPs (living up the existing bilateral twin relations between NPPs of Ukraine and France and beginning twin relations between South Ukraine NPP and NPP of Saint Lorrain).*

Besides, the EDF company is the consultant of the European Commission at the industrial site of Rovno NPP under the TACIS program and provides assistance to RNPP in the framework of bilateral projects. EDF is the leader of the Consortium EDF-Traktebel-Enprima by the contract on services of a consultant to the project management unit of the project of modernization after completion of KhNPP-2 and RNPP-4 within limits of loan Agreements with EBRD and Euroatom (the contract was concluded on 6 October).

In 2005 a new area of cooperation was commenced with the company "AREVA" in the framework of Memorandum between the Ministry of Fuel and Energy of Ukraine and the industrial group "AREVA" on cooperation in the use of nuclear energy in peaceful purposes of 14 June, 2005.

The decision was taken to prepare the following projects:

- *optimization of SO timing, proceeding from the experience of work of the company FRAMATOME-ANP.*
- *Comprehensive evaluation of possibility of operating power units WWER-1000 and WWER-440 in maneuvering mode.*

The first session of the working group took place with the "Westinghouse" company on alternative fuel supply to Ukrainian NPPs and presentation of the reactor unit AP-1000.

The cooperation begun in 1992 upon the initiative of Ministry of economics, trade and industry of Japan, with Japanese information centre on power engineering Jepic-ICC continued.

In 2003 "Program of international cooperation in NPP safety management" was commenced and new forms of cooperation (courses, organization of meetings, technical visits and seminars directly in Ukraine) were introduced.

In 2005 the seminar was held on diagnostics at Rovno NPP with the participation of experts from ZhNPP, KhNPP, RNPP, SUNPP, ARS, STC and Management of the Company. In order to hold the seminar, the Japanese Party had developed, prepared, translated and distributed training materials for the participants of the seminar. The previous meeting with the delegation of Japan took place at the Manager office Direction of the Company.

The NPP experts passed the training in Japan at the courses "Study and training of personnel" and "Technology of diagnostics of electrotechnical equipment".

The cooperation of the Ministry of Fuel and Energy and NAEK "Energoatom" with European Commission is effected under the TACIS program, which has been provided to this branch since 1992 and is directed towards safety enhancement of the Ukrainian NP;s. The implementation of this program envisages a number of measures concerning operational safety of Ukraine, personnel training, upgrading the software etc.

The total number of projects under the TACIS program – 1992/2002 on nuclear safety that have been implemented and are being implemented by NAEK "Energoatom" – 150.

In 2005 the Action Plan for nuclear safety TACIS-2004 was approved by the European Commission and the Government of Ukraine. The total sum allocated for Ukraine constitutes 12,3 million Euro, and 2 million Euro is allocated for the joint TACIS project with Russia TAREG 01/04. In the program TACIS-2004 there are three projects planned for NAEK "Energoatom":

- *Phase of preparation PPP of three-year project for the second stage for RNPP – U1.01/04 "Reprocessing of solid radioactive waste for Rivno NPP". Budget – 1,5 million Euro.*
- *Phase of preparation PPP of three-year project for the second stage for ZhNPP – U1.03/04 "Reprocessing of solid radioactive waste for Zaporizhzhya NPP". Budget – 1,5 milion Euro.*
- *U2.01/04 "Support in establishing the Scientific and technical centre of NAEK "Energoatom". Budget – 1,5 million Euro.*

The international cooperation of the Ministry of Emergencies as a specially authorized central executive power Body in the issues the protection of population and territories from man-induced and natural emergencies, rescue, fire safety, protection of population and territories from consequences of Chornobyl catastrophe, including social protection of the citizens who suffered from Chornobyl catastrophe, conversion the "Shelter" into an ecologically safe system, remediation of territories contaminated by the Chornobyl catastrophe, consisted, mainly, in participation of representatives of the Ministry of Emergencies in trainings (exercises), which were carried out by international organizations with the purpose of retraining or the professional skill of experts, as well as participation of subdivisions and representatives of the Ministry of Emergencies in preparation and conducting exercises on the joint actions of special services of member states under conditional man-induced and natural emergencies.

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