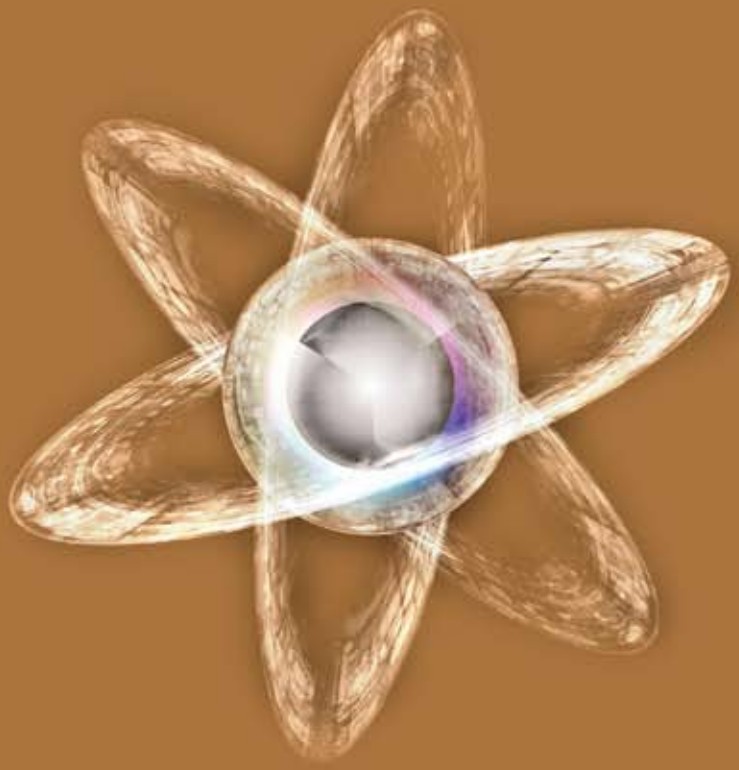


Nuclear and Radiation Safety in Ukraine Annual Report 2008

The State Nuclear Regulatory Committee
of Ukraine

Dear Readers!

This report was prepared by the State Nuclear Regulatory Committee of Ukraine to provide objective and, to the extent possible, comprehensive information concerning the status of nuclear and radiation safety in our country for the last year. The year 2008 brought certain changes to the status of nuclear power industry and attitude to it both in Ukraine and in the world.

In the world, the year 2008 was perhaps the most intensive among the last years, regarding the discussions about nuclear power renaissance and new constructions. Twenty four of thirty NPP-operating countries supported the idea of new power units' construction, and about 55 countries that had no NPP on their territories, expressed their will to have them in future. Meantime, the year 2008 was the first one for many years when not any new unit was put into operation.

The last year was also marked by quite extensive discussions and certain progress in the direction of creation of international nuclear fuel bank under the auspices of the International Atomic Energy Agency (IAEA). Thus, the temptation to build new capacities on isotope enrichment of uranium may be overcome.

It should be noted, that the last year was the year of 55 anniversary of the prominent speech of the United States President Dwight D. Eisenhower at the session of the UN General Assembly on December 8, 1953 *(The text of Dwight Eisenhower's speech is given I Annex 1)*. It was the speech, where the idea of an international nuclear fuel bank was first announced, which put a corner stone in its foundation.

In Ukraine there were no remarkable events in 2008 in the area of nuclear power use. No new units were commissioned, and no new construction was started. Nevertheless, certain progress can be reported. Nuclear fuel was completely discharged from all three Chornobyl NPP Units. For today, the rest of the fuel is stored in the storage facility SFSF-1 and at-reactor cooling ponds of units 1-3. The construction of the facility LOT-3 was completed, which is a specially equipped near-surface disposal facility for solid radioactive waste, and a procedure was started to license it for further operation.

In 2008 the last years' tendency of decreasing the number of incidents in the NPP operation was maintained, and the number reduced to 22 (against 25 in 2007). The fist time for many years the nuclear safety issues were considered at the top national level – at the National Security and Defense Board, which was a starting point for important government decisions aimed at the enhancement of nuclear and radiation safety.

CHAIRPERSON OF THE STATE NUCLEAR REGULATORY COMMITTEE OF UKTAINE

Olena Mykolaichuk

List of Abbreviations

ChNPP – Chernobyl NPP
CMU – Cabinet of Ministers of Ukraine
ETC – Emergency Technical Centre
FCM – Fuel-Containing Masses
FA – Fuel Assembly
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
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
MH – Ministry of Health
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
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
URSS – Ukrainian Radiation Safety Standards
VSC – Ventilated Storage Cask
WWER – Water Cooled Power Reactor
SUNPP – South Ukraine NPP
ZNPP – Zaporizhzhya NPP

Nuclear and Radiation Safety in Ukraine, Report 2008 was approved by the Editorial Board of the State Nuclear Regulatory Committee of Ukraine (SNRCU) consisting of: Olena Mykolaichuk, Chairperson of the SNRCU, Oleksiy Ananenko, Information Emergency Department of the SNRCU, Iryna Balalina, Assistant to the Chairperson – Press-Secretary of the SNRCU, Sergiy Bozhko, Deputy Chairperson of the SNRCU, Taras Kozulko, Head of Organizational and Analytical Support Division of the SNRCU, Evgen Kolishevskiy, Acting Director of Dniprodzerzhynsk Environmental Non Profit Organization "The Voice of Nature", Olga Makarovska, Deputy Chairperson of the SNRCU, Andriy Martinuk, Rivno Public Organization "Ecoclub", Ivan Nekludov, General Director of the National Science Center "Kharkov Institute of Physics and Technology", Mykola Pylypenko, Director of S.P. Grigoriev's Institute for Radiology, Volodymyr Skubenko, People's Deputies of Ukraine, Volodymyr Holosha, Deputy Minister of Emergencies and Affairs of Population Protection from the Consequences of Chornobyl Catastrophe of Ukraine.
The State Nuclear Regulatory Committee of Ukraine extends its appreciation to the IAEA for assistance in publishing Nuclear and Radiation Safety in Ukraine, Report 2008, as well as to Grygoriy Gromov, Director of SSTC NRS of the SNRCU, Ilona Zayets, Direcotr of the Center for Information Policy and Public Communication of National Nuclear Energy Generating Company "Energoatom", Sergiy Pavlusha, Deputy Minister for Fuel and Energy of Ukraine, Viacheslav Sandul, Ukrainian Environmental Public Organization "Hortytskiy forum" – for taking the active part in the preparation and drafting of this Report.

In the process of preparation of the Report the IAEA and UN web-sites materials were used.

Table Of Contents

Effective Legislation – Constituent Part Of Efficient Nuclear Regulatory System

DEVELOPMENT AND IMPROVEMENT OF REGULATORY FRAMEWORK IN THE AREA OF NUCLEAR ENERGY USE

By the beginning of 2008 a well-developed nuclear legislation system was created and put in force in Ukraine. The main international conventions, regulatory documents and standards are opened for the public at the web site of the State Nuclear Regulatory Committee of Ukraine, www.snrc.gov.ua , subsection "Regulatory Acts".

As an important event in 2008, the Parliament of Ukraine passed the law of Ukraine On National Special Ecological Program on Radioactive Waste Management, and the law of Ukraine On Revising Certain Laws of Ukraine on Radioactive Waste Management. The National Special Ecological Program on Radioactive Waste Management is aimed at further improvement of the state policy and planning of further efforts on the management of radioactive waste produced at nuclear power plants of Ukraine, uranium mining and milling facilities, and other enterprises, institutions and organizations located on the Ukrainian territory, as well as the radwaste generated during the Chornobyl accident. The adoption of new law of Ukraine "On Revising Certain Laws of Ukraine on Radioactive Waste Management" ensures establishing of the National Radioactive Waste Management Fund for radioactive waste produced at nuclear power plants of Ukraine, other enterprises, institutions and organizations in Ukraine, and is aimed at fulfillment of Ukrainian obligations according to the Joint Convention on the Safety of Spent Fuel Management and the Safety of Radioactive Waste Management". Besides, this Law is aimed at enhancing the safety and protection of the present and future generations against the hazardous impact of ionizing radiation from radioactive waste, lowering the social and psychological tension related to mitigation of the Chornobyl accident consequences, and providing favorable conditions for the safe use of nuclear energy to increase living standards of Ukrainian people.

A number of international agreements entered into by Ukraine became a part of Ukrainian nuclear legislation. This is in particular the Convention on Physical Protection of Nuclear Material, which is an important instrument of ensuring international security. Ukraine complies with the Convention requirements, and takes active part in implementation of its provisions. It was our country that among other 25 member countries initiated the move of amendments to this Convention, and was their co-author. Since Ukraine signed the Amendment to the Convention on Physical Protection of Nuclear Material, this Amendment was ratified on September 3, 2008.

Ratification of the Amendment to the Convention on Physical Protection of Nuclear Material will essentially enhance physical protection, because the Amendment to the Convention on Physical Protection of Nuclear Material covers not only the nuclear materials, but also nuclear facilities, (nuclear power plants, nuclear research reactors, disposal facilities, etc.). The ratification of the Amendment to the Convention on the Physical Protection of Nuclear Material will favorably contribute to the enhancement of nuclear energy safety and security use and international nuclear non-proliferation regime.

To implement the requirements of the Amendment to the Convention on Physical Protection of Nuclear Material the State Nuclear Regulatory Committee of Ukraine prepared, endorsed and submitted to the Cabinet of Ministers of Ukraine a bill "On Revising Certain Laws of Ukraine due to Ratification of Amendment to the Convention on Physical Protection of Nuclear Material". This bill has been submitted to the Supreme Council of Ukraine. The bill will serve to improve the national legislation in the part of regulating and ensuring physical protection of nuclear facilities and other sources of ionizing radiation, as a constituent part of national security of Ukraine.

To improve the licensing procedure in the area of nuclear energy use, the State Nuclear Regulatory Committee of Ukraine developed and submitted a draft law of Ukraine "On Revising Law of Ukraine "On Authorizing Activity in the Area of Nuclear Energy Use" to the Parliament of Ukraine. After this law is passed, the procedures for issuing permits will become more predictable and transparent. Besides, the law establishes liability of entities in the area of nuclear energy use for disregarding the licensing procedures or non-compliance of the conditions of conducting the activities, which according to the law are covered by licensing procedures. The bill has passed through first debate in the Parliament of Ukraine and is under preparation for the second debate.

In 2008 improvement of the regulatory framework in the area of nuclear energy use was continued. This work was done on a systematic basis taking into consideration the experience in regulatory activity and practice in ensuring nuclear and radiation safety in Ukraine, international practice of the leading countries, and also achievements of science and engineering, international standards, including the standards of the European Community, documents and recommendations of the International Atomic Energy Agency (IAEA), Western European Nuclear Regulators Association (WENRA), and other international safety organizations.

A characteristic feature of the rule-making activity of the State Nuclear Regulatory Committee in 2008 was systematic transition in the regulations from the strict prescribing approach accepted in the former Soviet Union, to a more flexible approach in which at the level of codes and standards, only the basic provisions that do not require frequent revision remain solid. Establishing of technical requirements, which correspond to the basic provisions rests with the operator or another licensee.

It is necessary to note that the State Nuclear Regulatory Committee of Ukraine developed a hierarchical pyramid of regulations and standards on nuclear and radiation safety. The pyramid includes both high-level legislative documents (laws, international agreements), and lower lever acts (enactments of the Cabinet and the President, codes, standards, etc.).

This hierarchical pyramid defines the scope of the regulatory framework necessary to regulate nuclear and radiation safety, i.e. acts, which are valid currently, acts needed to eliminate deficiencies, and acts to be revised and amended to eliminate duplications and incompliance and to be harmonized with other regulations.

All the documents in the hierarchical pyramid are grouped in the following regulatory areas:

- *regulation of the safety nuclear facilities at all stages of their lifetime;*
- *regulation of the safety of uranium facilities;*
- *regulation of the safety of ionizing radiation sources;*
- *regulation of the safety of radioactive waste management;*
- *regulation of the safety of nuclear materials transport;*
- *safeguards;*
- *physical protection of nuclear facilities, nuclear materials, radioactive waste, other sources of ionizing radiation.*

One of the most important directions of nuclear and radiation safety regulation is the state regulation of the safety of nuclear facilities at all the stages of their lifetime. Therefore development and approval by the State Nuclear Regulatory Committee of Ukraine of "General Provisions of the Safety of Nuclear Facilities" became an important event in the regulatory field. This document replaces the former "General Provisions of Safety Assurance of Nuclear Power Plants" of 1999, and is the main document on the safety of nuclear power plants and a basic one for the development of the regulatory pyramid in this direction. The General Provisions in compliance with the IAEA recommendations define safety principles and objectives (fundamental, administrative and engineering ones), establishes safety criteria and requirements at all stages of the nuclear facility lifetime.

The next step in the improvement of safety regulation of the nuclear facilities was approval of the "Nuclear Safety Rules for Reactor Facilities with Pressurized Water Reactors". These "Rules..." establish general requirements on the design, characteristics, and operating conditions of reactor systems, as well as organizational requirements aimed at ensuring nuclear safety at all stages of the nuclear facility lifetime.

Bearing in mind the tasks put by the Energy Strategy of Ukraine on the period till the year 2030 (approved by the Resolution of the Cabinet of Ministers of Ukraine of 15 March 2006, No. 145-r) on commissioning new power units of nuclear power plants, the State Nuclear Regulatory Committee of Ukraine put into force the "Safety Requirements to Selection of Nuclear Facility Site". The "Requirements..." establish basic criteria on nuclear and radiation safety concerning the site selection for a nuclear facility, defines external hazards, which restrict its location, put the requirements on suitability of a site for a nuclear facility.

In 2008 the State Nuclear Regulatory Committee of Ukraine undertook measures to create a special regulatory framework for the safe use of ionizing radiation sources in medicine. Separate regulations in this area are necessitated by peculiarities in the use of ionizing radiation sources and the absence of documents in the existing regulatory system on nuclear and radiation safety, which would specify requirements on quality assurance for the use of ionizing radiation sources in medicine.

The two documents "Safety Requirements and Conditions (Licensing Conditions) for the Application of Ionizing Radiation Sources in Radiation Therapy, and Requirements on Quality Management System to Conduct Diagnostics and Therapy With the Use of Ionizing Radiation Sources" are the first one to fill the existing gap. During 2009-2011 it is planned to develop other six regulatory documents to regulate the safety of medical application of sources of ionizing radiation.

As regards the regulatory framework on the safety of radioactive waste, the following shall be mentioned:

In 2008 the "Requirements on Siting of Radioactive Waste Disposal Facility" were developed and approved. The objective of this act is to establish requirements on the site selection for near-surface/geological disposal of radioactive waste, and to determine a list of factors – natural and man-caused events and processes, which shall be analyzed in determining the suitability of a site to serve as a natural barrier in the radwaste disposal system for the whole period when the disposed radwaste remains potentially hazardous, especially for the period when the engineering barriers have lost their protection properties, which is important first of all for long-lived high-level radioactive waste.

The "Rules and Requirements on Long-Term Storage of Long-Lived High-Level Radioactive Waste Prior to Disposal in Deep Geological Formation" establish requirements and rules to ensure nuclear and radiation safety at all lifetime stages of a facility for long-term storage of long-lived high-level radioactive waste – siting, designing, constructing, operating and decommissioning.

To enhance nuclear and radiation safety of radioactive waste management operations, in particular during radwaste storage, and to prevent exceeding of the dose limits, the State Nuclear Regulatory Committee of Ukraine approved the "Requirements on Structure and Content of Safety Analysis Report of Radioactive Waste Storage Facilities". This act establishes the requirements for Safety Analysis Reports for radioactive waste storage facilities at all stages of their lifetime – designing, constructing, operating, and decommissioning.

During the year 2008 the work on improvement of the regulatory framework on physical protection of nuclear facilities, nuclear materials, radioactive waste, and other sources of ionizing radiation was carried out on a systematic basis.

The "General Requirements on Physical Protection Systems of Nuclear Facilities and Nuclear Materials ", and "General Requirements on Systems of Physical Protection at Nuclear Materials Transport" were developed and put in force to determine the content of organizational, legal, engineering and administrative measures and procedure of their application by operators in determining, establishing and continuous functioning of physical protection systems of nuclear facilities and nuclear materials, and also by transporting entities at determining, establishing and continuous functioning of physical protection systems of nuclear materials for specific shipments.

To ensure further improvement of physical protection, nuclear materials control and accounting (MC&A) at specific stages of the nuclear facility lifetime, the document "Requirements on Structure and Content of Physical Protection Plan of Nuclear Facility and Nuclear Material, and Physical Protection Plan for Nuclear Materials Control and Accounting" was put in force. It establishes the requirements on structure, content, and procedure of development and approval of documents that confirm the ability of an applicant to conduct activity on physical protection, and MC&A in compliance with the law of Ukraine.

STATE REGULATION IN THE AREA OF NUCLEAR ENERGY USE

The State Nuclear Regulatory Committee of Ukraine is the main competent central executive body that regulates nuclear and radiation safety in Ukraine. It was established by the President Decree in December 2000.

The State Nuclear Regulatory Committee of Ukraine, as a regulatory body is independent from institutions and organizations that conduct their activity in the area of nuclear energy use. According to international requirements the State Nuclear Regulatory Committee of Ukraine as a regulatory body is responsible for issuing official permits, conducting regulatory activities, reviewing and making assessments, undertaking inspections and enforcement measures, as well as establishing safety principles, criteria, provisions and guides.

The main functions of the State Nuclear Regulatory Committee of Ukraine in the area of regulation of the safe use of nuclear energy are:

- *Establishing safety criteria, requirements and conditions in the area of nuclear energy use (normative regulation);*
- *Issuing permits and licenses to conduct activities in this area (licensing);*
- *Conducting supervisory activity on observance of codes and standards on nuclear and radiation safety (supervision);*
- *Imposing sanctions stipulated by law in case of violations (enforcement).*

The State Nuclear Regulatory Committee of Ukraine regulates the safety of:

- 15 power units in operation at the territory of Ukraine:
  - *6 Zaporizhya NPP Units*
  - *4 Rivne NPP Units;*
  - *3 South-Ukraine NPP Units,*
  - *2 Khmelnitsky NPP Units;*
- 3 Chernobyl NPP Units at the stage of Decommissioning;
- 2 Spent Fuel Storage Facilities in operation at Zaporizhya NPP and Chernobyl NPP, and the Storage Facility is under construction at ChNPP site;
- 2 research reactors;
- radioactive waste storage facilities and radioactive waste management plants: *6 Specialized Enterprises "Radon", State Specialized Enterprise "Complex", State Specialized Enterprise "Technocenter"*;
- uranium milling plants;
- radioactive material transport through the territory of Ukraine;
- use and production of ionizing radiation sources.

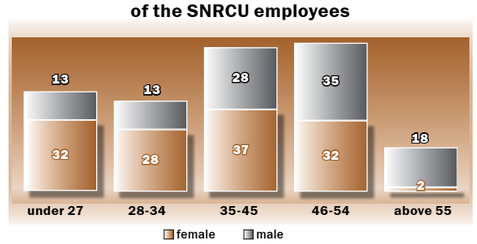
As of December 31, 2008, total number of the State Nuclear Regulatory Committee personnel was 238 (with 54 vacancies including 21 - in headquarter, and 33 - in regional inspections on nuclear and radiation safety). Gender and age distribution of the SNRCU employees is presented in the diagram below.

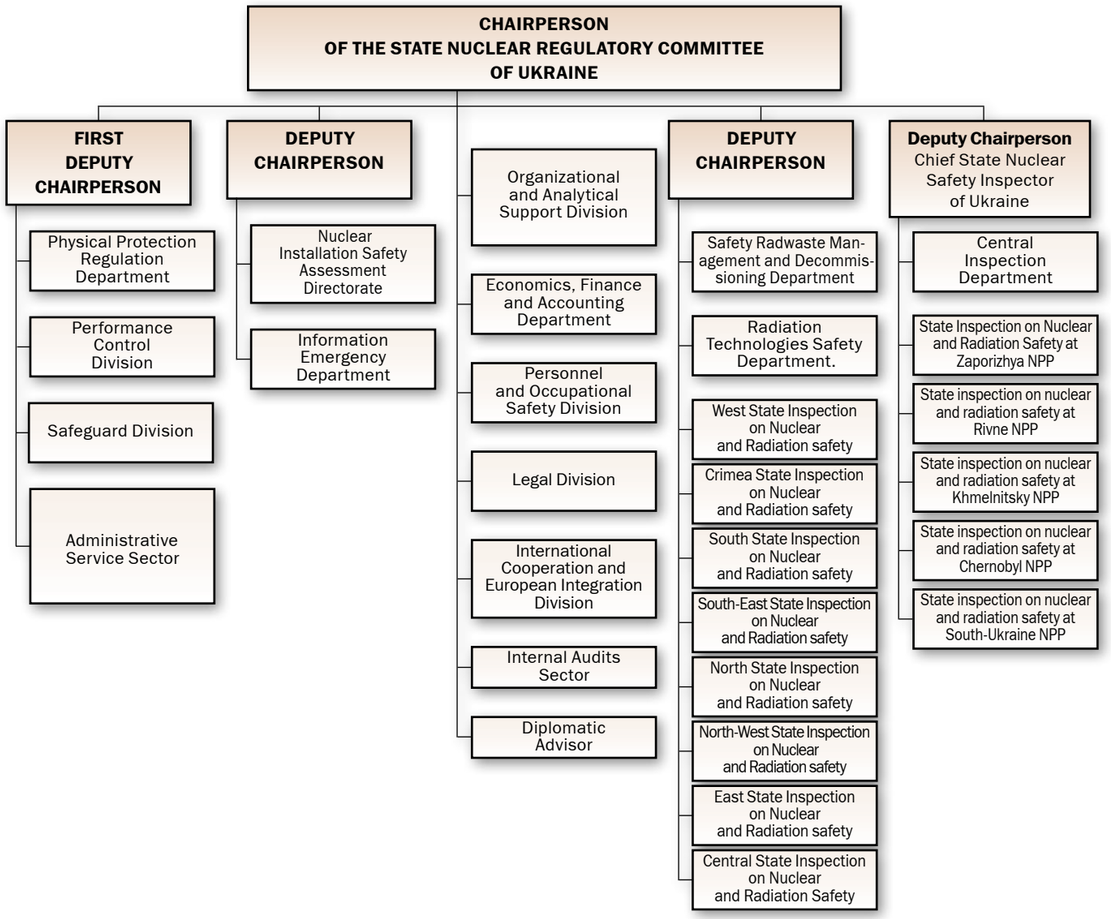
70 % of staff members have higher technical education. They were employed by SNRCU after gaining experience in industry, design and scientific institutions. Most of them previously worked in the area of nuclear energy use.

In June 2008 the activity of the State Nuclear Regulatory Committee of Ukraine on compliance with the IAEA standards was assessed in the framework of independent IAEA mission "Integrated Regulatory Review Service" (IRRS).

As the IAEA Director of Division of Nuclear Installation Safety, Mr. Philippe Jamet pointed out, the IRRS mission in Ukraine was the first such mission in the post-soviet countries, and the third full scope mission in the world (the first full scope mission

Gender and age distribution of the SNRCU employees





was held in France in November 2006, the second one – in Spain in February 2008). Mr. Jamet also mentioned that the State Nuclear Regulatory Committee of Ukraine successfully and in a very short term managed to prepare to IRRS mission, including self-assessment issues, and compliance of the activity with IAEA standards.

The group of the Mission experts was headed by Chairperson of the State Nuclear Safety Authority of Czech Republic, Mrs. Dana Drabova. The group consisted of 20 experts from the regulatory authorities of Finland, Russia, Bulgaria, the USA, Belgium, Slovak Republic, France, Hungary, as well as experts from IAEA, European Commission and an observer from Japan.

During the Mission working meetings were held in the Ministry of Fuel and Energy, Ministry of Health, SSTC NRS, NAEK Enegoatom, South-Ukraine NPP, Specialized Enterprise "UkrDO "Radon", "Grygoriev Institute for Medical Radiology", and "Marzeyev Institute for Hygiene and Medical Ecology".

The review of the regulatory activity was performed on the following directions: legal framework and government authorities, regulatory body functions and authorities, radioactive materials transport, emergency preparedness, radioactive waste and decommissioning, management system.

The IRRS mission results were summarized in the report, which contained 20 recommendations, 34 suggestions, and marked out 14 good practices.

The State Nuclear Regulatory Committee of Ukraine prepared respective Plan of Implementation of the IRRS mission recommendations and suggestions. This document was approved by Resolution of the Cabinet of Ministers of Ukraine of 8.10.2008, No. 1307-r. The Plan contains 17 measures that are to be implemented during 2008 – 2010. The Ministry of Fuel and Energy, Ministry of Emergencies, Ministry of Health, Ministry of Environment, Ministry of Finance, Ministry of Legal Affairs, and the State Committee for Consumer Standards are engaged in the "Plan of Implementation…" activity.

On 28 August 2008 the State Nuclear Regulatory Committee of Ukraine obtained the international Quality Certificate that confirms compliance of the SNRCU quality management system with the ISO 9001:2000 requirements concerning the regulatory services in the area of nuclear and radiation safety. It was preceded by an internal audit, and a pre-certification audit performed by independent organization.

The first stage of implementation of the SNRCU quality management system was completed.

The quality management system has become an integral part of a management activity of the State Nuclear Regulatory Committee of Ukraine, which is confirmed by proposals made during audits to upgrade quality guides and methodologies.

The next step will extend the quality management system to cover on-site and regional insections of the SNRCU. In this regard "Schedule of measures on implementing the quality management system and ensuring its functioning in the on-site inspections and the state inspections on nuclear and radiation safety according to the standard ISO 9001-2001 for 2008-2009" was approved.

Besides, the quality officers were assigned in the inspection offices, and along with the inspection heads they passed a special training course. The quality management documents were modified considering the feedback of their application in regional inspections. In 2009 it is scheduled to perform internal audits (including state inspections). According to results of these audits the quality management documents will be corrected. It is planned to question the system users, and analyze the system functioning by top management, make preparations to certification of inspections and the certification of the quality management system of inspections as a part of the QMS of the State Nuclear Regulatory Committee of Ukraine.

To develop recommendations on pending issues and key directions of activity in the area of state regulation of nuclear and radiation safety a special advisory body – the Board of the State Nuclear Regulatory Committee was established and started its work. The Board performs its work in the format of meetings which are held not less than once in three months. The Board members are Chairperson of the State Nuclear Regulatory Committee, respective Deputies (according to the position), other SNRCU top executives, managers of enterprises, institutions and organizations, that are under the control of the State Nuclear Regulatory Committee of Ukraine, and also, upon agreement, Parliament Delegates and leading scientists representing National Academy of Sciences of Ukraine (NASU). Managers and experts from other central and local executive authorities, local self-governing authorities, Parliament Delegates of Ukraine, representatives of enterprises, institutions and organizations, public, and mass-media may take part in the Board meetings as well.

In 2008 11 meetings of the SNRCU Board were held, at which more than 30 issues important to nuclear and radiation safety were considered. In particular, the discussions were focused on safety enhancement of the operating NPP units, safety issues of radioactive waste management at the Chernobyl site and in the Exclusion Zone, ensuring the safety and security of ionizing radiation sources in Ukraine, radiation conditions of the facilities of the former industrial corporation "Pridniprovsky Chemical Plant", safe operation of the research reactor WWR-M of the Institute for Nuclear Research of NASU.

Materials of the SNRCU Board meetings are available for the public at the web site of the State Nuclear

The IAEA IRRS Mission to Ukraine, chaired by Mrs. Dana Drabova (Czech Republic)

Regulatory Committee of Ukraine, www.snrc.gov.ua , subsection "Activity".

Advisory and consultancy functions at SNRCU are fulfilled also by Scientific and Technical Council, Reactor Safety Council, and the Public Council.

The main task of Scientific and Technical Council (STC) as an advisory body of the State Nuclear Regulatory Committee of Ukraine is making proposals concerning determination of scientifically justified policy, aimed at solving the problems in the top directions of development of the state nuclear regulatory system, discussing the most important issues of scientific and engineering achievements aimed to enhance the safety, and also preparing conclusions and recommendations for top management of the State Nuclear Regulatory Committee of Ukraine concerning improvement of the regulatory practice in the area of nuclear and radiation safety, formation of the safety culture, etc.

Well-known experts and skilled specialists from different organizations and scientists from different areas of science are invited to the Scientific and Technical Council meetings. In the format of a meeting they have a possibility to express their considerations and opinions, and propose ways of solution of problems under consideration.

Among issues that were discussed by the SNRCU Scientific and Technical Council in 2008 were the issues of radiation safety that could have direct impact on health of personnel and the public because of hazardous impact of the ionizing radiation, namely:

- *Problems of dose monitoring of inner irradiation of personnel of uranium mining and milling industry, coal and iron mines, workers of the Exclusion Zone (07.10.2008);*
- *Topical issues of arrangement and purpose of further development of radiation monitoring system in Ukraine for emergency response and assess impact on the environment by enterprises acting in the area of nuclear energy use and radwaste management (23.12.2008).*

In 2008 the Reactor Safety Council was established. This is a consultative and advisory body with main objective to provide independent and qualified recommendations on the issues of shaping and implementing national policy concerning the safety of nuclear power and research reactors in accordance with the practice of leading nuclear states. The first meeting of the Reactor Safety Council was held in Kiev on 18 July 2008.

The list of the Reactor Safety Council members was composed of well-known experts that were resigned from the government authorities or operating organizations, but whose names were closely connected with the nuclear power history in the world. Their management abilities and qualified opinions are important to formulate a balanced professional approach to contemporary challenges in the safety area. Among Ukrainian experts there are Grigory Kopchinsky, Mykola Shteinberg, Anatoly Kryat, Nur Nigmatullin, Anatoly Demyanenko, and Andrey Serdiuk, among the international team there are Volodymir Asmolov, Larissa Egorova, Victor Sidorenko from Russian Federation, Jurgis Vilemas from Lithuania, Rolf Janke from Germany, Borys Georgiev from Bulgaria, and Josef Mishak from Czech Republic.

Mykola Shteinberg was elected as the Head of the Reactor Safety Council, and Victor Sidorenko (Russian Federation) and Rolf Janke (Germany) were elected as his Deputies.

The countries of the European Union already have the experience of work of such consultative councils, and apply this form of constructive interaction with responsible authorities persons with the aim to make decisions adequate to the current challenges and tasks of the society and technology development.

Brief biographical notes:

M. Shteinberg *after graduating Moscow Power Engineering Institute worked as an engineer and operator at ChNPP, Deputy Chief engineer of Balakovo NPP, in 1986-1987 Chief engineer at ChNPP, in 1987-1991 Deputy Head of the State Committee of the USSR on safety supervision in nuclear power and general industry. In 1991-1995 – Head of the State Nuclear Regulatory Committee of Ukraine, in 2002-2006 – Deputy Minister for Fuel and Energy of Ukraine, Head of the commission on investigation of causes of the Chernobyl accident, member of the permanent consultative group on nuclear power under the IAEA Director General.*

V. Sidorenko *was born in Donetsk, graduated Moscow Institute for Engineering Physics, Doctor of Sciences, academician-correspondent of the Academy of Sciences of the USSR, (1981), academician-correspondent the Academy of Sciences of Russia, one of the founders of the State Committee on safety supervision in nuclear industry, from 1988 – first deputy Head of the State Nuclear Supervisory Committee ("Gosatomnadzor") of the USSR, in 1993-1996 Deputy Minister on Nuclear Energy of Russian Federation, coordinator of work on elimination of the Chernobyl accident consequences, author of the monograph "Safety of Nuclear Power Plants" and number of basic regulatory documents on the safety of nuclear reactors, special articles of nuclear safety philosophy and economy, presently – member of scientific council of Russian Scientific Center "Kurchatov Institute.*

R. Janke *was born in Germany, he took his higher education course in Moscow Power Engineering Institute, PhD candidate in technical sciences, in 1974 –1986 he worked at different positions at NPP in Germany, from 1986 – a researcher of the Chernobyl accident consequences as a member of international expert team, head of division on NPP discharges monitoring of the Federal Ministry of Ecology and Reactor Safety of Germany, since 1991 he coordinated nuclear safety projects in the Association for Technical and Nuclear Safety (GRS) of Germany; he was a co-author of a number of IAEA books, and a European Commission consultant on reactor safety.*

4th of December 2008, Reactor Safety Council's meeting considered the following issues:

- *Safety as a basis for approval of the decision on lifetime extension of NPP units;*
- *licensing of new NPP units.*

Reactor Safety Council recommended to the State Nuclear Regulatory Committee of Ukraine to perform comprehensive analysis of the legislative and regulatory basis in force, which determines or impact on licensing procedures for nuclear power units. On the basis of the analysis the measures should be developed to unlock licensing process in Ukraine. It is necessary to have the licensing process clear and transparent to all participants including the public. The process of licensing shall be aimed first of all at licensing of facilities with the proven safety level. The procedural aspects shall not overshadow the main objective of licensing – to prove safety of the nuclear facility safety.

Minutes of the Reactor Safety Council and other relevant information on its activity are placed at the web site of the State Nuclear Regulatory Committee of Ukraine, www.snrc.gov.ua, subsection "Reactor Safety Council".

To ensure efficient dialog with the public, the Public Board was established to SNRCU, and on its basis the Public Council was created in 2006. Among 35 Public Council members there are representatives of mass-media, scientists, and members of Ukrainian local communities where nuclear industry facilities are located. The Public Council Chair is the Head of the Green Party of Ukraine, Mr. Sergey Kurykin; Mrs. Hanna Golubovska-Onsimova, Honored President of NGO "MAMA-86", and Mr. Boris Prister, academician of NASU were elected as the Chair deputies.

In 2008 three Public Council meetings were held, which discussed the situation in the 30-km zone of Zaporizhya industrial complex of Hydro- and Nuclear power plants, and realization of requirements of the law of Ukraine No. 232-V of 05.10.2006, "On Certain Changes in the Laws of Ukraine Concerning Social Protection of the Population Living in the Monitoring Zone". The Public Council also considered the draft Program of re-arrangement and development of the State Nuclear Regulatory Committee of Ukraine for the years 2008-2012, the draft regulatory act "Changes in the Order of Commissioning of Nuclear Power Plants with Pressurized Water Reactors", and a draft Green Book "Safety of Ionizing Radiation Sources in Ukraine". At one of the Public Council meetings a presentation of the "Status Report on Nuclear and Radiation Safety in Ukraine" was made, at other meeting it was discussed the issue of creation favorable conditions for disabled workers at the enterprises, institutions and organizations which are under the control of the State Nuclear Regulatory Committee of Ukraine. Recommendations, proposals and comments made by members of the Public Council were taken into consideration in the work of the State Nuclear Regulatory Committee of Ukraine.

Representatives of the Public Council actively participated in the public actions that were held by the State Nuclear Regulatory Committee of Ukraine, the Public Council opinion was regularly presented at the meetings of the SNRCU Border. As an example, 27 May 2008 the members of the Public Council took part in the joint field meeting of the SNRCU Border and the Committee of the Supreme Council of Ukraine on the issues of ecological policy, use of natural resources and elimination of the Chernobyl accident consequences. The meeting was focused on the ecological and social consequences in area of the former industrial corporation "Pridniprovsky Chemical Plant" in Dneprodzerzhinsk town.

In the framework of IRRS Mission in June 2008 a meeting was arranged and held between IAEA experts and Public Council leaders. According to the IRRS Mission results, establishing of the Public Council to SNRCU was marked as a "good practice".

Materials about Public Council activity are available for public at the SNRCU web site www.snrc.gov.ua, subsection "Public Council".

2008 was the year of active work of such advisory bodies of the State Nuclear Regulatory Committee of Ukraine as Commission on Regulatory Standards and the Licensing Commission.

The Licensing Commission develops proposals for decision-making on issue, withdrawn, re-issue, prolongation, termination or cancellation, and renewal validity of licenses in the area of nuclear energy use. In 2008 the Licensing Commission held 50 meetings at which 521 cases were considered. The Licensing Commission not only examined the observance of conditions of issue, re-issue, cancellation the licenses and amendings, but also analyzed the proposed licensing conditions, proposed additional conditions and made instructions on the issues of improvement of the licensing activity.

More detailed information is available at the website of the State Nuclear Regulatory Committee of Ukraine www.snrc.gov.ua in the section "Activity".

The aim of the supervisory activity of the State Nuclear Regulatory Committee of Ukraine is to ensure protection of personnel, the public, and the environment against hazardous impact of ionizing radiation and radioactive contamination, caused by work of nuclear facilities.

The supervisory (inspection) activity provides for

- *Supervision over complance with law, codes and standards on nuclear and radiation safety, requirements and conditions of licenses and permits, physical protection of nuclear facilities, nuclear materials, radioactive waste, other sources of ionizing radiation;*

RESULTS OF LICENSING ACTIVITY IN 2008

TITLE OF ACTIVITY	Number	Number of licenses			
	new licenses	re-issued	can-celled	amen-ded	with-drawn
Design of nuclear facility or facility for radwaste disposal (117)	3	1	–	–	–
Milling of uranium ore (118)	–	–	–	1	–
Radwaste transport (119)	3	10	1	–	–
Radwaste treatment, storage, and disposal (120)	2	3	1	7	–
Production of ionizing radiation sources (121)	3	–	–	2	*1*
Use of ionizing radiation sources (IRS) (122)	249	111	15	104	*4*
Design of physical protection systems of nuclear facilities, nuclear materials, radwaste, other IRS (124)	1	2	1	1	–
Design of engineered technical means of security of nuclear facilities, nuclear materials, radwaste, IRS (125)	1	4	1	–	–
Mounting, adjustment, maintenance, repair of engineering and technical means of security of nuclear materials, radwaste, other IRS (126)	2	4	1	–	–
Training, re-training, and upgrading of qualification of specialists on technical protection of nuclear facilities, nuclear materials, radwaste, other IRS (127)	–	–	–	8	–
Operation of nuclear facility or storage facility for radwaste disposal (130)	1	–	–	8	–
Nuclear facility decommissioning (131)	–	–	–	2	–
Total:	**265**	**136**	**21**	**126**	**5**

ADMINISTRATIVE SANCTIONS WERE APPLIED TO PERSONS IN 2008

STRUCTURAL DIVISIONS	Article 95 KUpAP		Article 188-18 KUpAP		TOTAL:	
	Number of cases/ persons penalized	Sum of fines (Hr)	Number of cases/ persons penalized	Sum of fines (Hr)	Number of cases/ persons penalized	Sum of fines (Hr)
Department of assessment of nuclear installations safety	2/2	3400	-	-	2/2	3400
Department of Radwaste Management	1/1	850	-	-	1/1	850
State Inspectorate at KhNPP	-	-	1/1	170	1/1	170
State Inspectorate at ChNPP	8/7	7570	3/3	680	11/10	8250
State Inspectorate at SU NPP	1/1	510	6/6	2380	7/7	2890
North State Inspectorate	10	1870	10	1700	20	3570
North-West State Inspectorate	-	-	17	2720	17	2720
West State Inspectorate	2	340	1	170	3	510
South State Inspectorate	2	510	8	3230	10	3740
South-East State Inspectorate	32/31	3740	9	1530	41/40	5270
Central State Inspectorate	18/16	2960	8	1530	24	4490
East State Inspectorate	5	1020	7	1530	12	2550
Crimean State Inspectorate	6	1020	2	340	8	1360
Total	**87/83**	**23 790**	**72**	**15 980**	**159/155**	**39 770**

- *Organisation and management of state accounting of nuclear materials, radioactive waste, other sources of ionizing radiation, to ensure their proper storage, and prevention of unauthorized circulation, etc.;*
- *Supervision over implementation of measures aimed at prevention of accidents at nuclear facilities, radioactive waste management facilities, and uranium objects, during production and use of ionizing radiation sources, and also inspecting preparedness of enterprises, institutions and organizations to mitigate accident consequences.*

State supervision is performed in the form of scheduled and ad hoc inspections of the safety of routine operations, and in the form of inspection surveys.

Scheduled inspections are performed according to supervisory activity plans that are composed for the whole year. Such inspections shall determine and assess compliance of the licensees' activity in the area of nuclear energy use with the established safety requirements. Scheduled inspections depending on the purpose and scope of inspection can be comprehensive, special, and operative. Ad hoc inspections are performed when scheduled inspections reveal directions of a licensee's activity or particular works, in which safety deficiencies are found, and which require more detailed or more frequent inspections. Ad hoc inspections can be of reaction type and task-force type.

inspectors of the State Nuclear Regulatory Committee of Ukraine. Independent technical experts can be involved in work of inspection commissions if necessary.

In 2008 respective structural divisions of SNRCU performed 441 scheduled inspections, 380 ad hoc inspections, and 286 inspective examinations.

As a result of activity of inspection divisions of the State Nuclear Regulatory Committee of Ukraine, 3235 violations were revealed, 728 prescripts, 94 inspection reports and 286 inspective examination acts were issued.

Administrative sanctions were applied to persons guilty for violation of law on nuclear energy use.

For the activity on nuclear energy use without appropriate license the SNRCU Central State Inspection submitted two cases to the Office of Public Prosecutor.

Interaction with the public and mass media – is an integral part of the SNRCU activity. The SNRCU top management arranges meetings with individuals during reception hours on every week, and answers the questions that worry them. Besides, two times a month SNRCU managers take part in "hot" telephone lines on the issues of nuclear and radiation safety.

Reception hours and schedule of "hot" telephone lines can be found at the SNRCU website www.snrc.gov.ua in the section "Internet reception office".

Annual International Topical Meeting of Nuclear and Radiation Safety

Inspective examinations are the inspections of an applicant that are performed prior to issuing licenses or permits for the activity on nuclear energy use, work or operations. The purpose of inspective examinations is to check compliance of the actual status with the information submitted by the applicant to SNRCU for obtaining a license or permit, as well as check availability of conditions to perform the declared activity (either work or operations).

To perform inspection measures inspection commissions are created, which are composed of state

Each year the State Nuclear Regulatory Committee of Ukraine issues the Status Report on Nuclear and Radiation Safety in Ukraine. This document presents the results of implementation of the state policy on safe use of nuclear energy and ensuring observance of the nuclear and radiation safety requirements in Ukraine. The Status Report is issued in Ukrainian, Russian and in English.

Special attention is paid to the development of the official website of the State Nuclear Regulatory Committee of Ukraine (www.snrc.gov.ua). Here the

current and objective information on different issues is placed: daily reports on the status of NPP power units and failures in their operation; brief weekly reports about the status of operational safety of the NPP units. The site contains also the information about all areas of SNRCU activity, the SNRCU reports and plans, regulatory documents, etc. Due to special services the site visitors can participate in discussion of draft documents placed on the site, express their opinion on top-listed issues of nuclear and radiation safety. The SNRCU site is visited not only by Ukrainian citizens, but also by people from many countries of the world.

Striving to improve interaction with the public, the State Nuclear Regulatory Committee of Ukraine regularly conducts sociological surweys. In 2008 the first stage was completed of sociological surways "Vision of the main nuclear and radiation safety problems, information awareness and needs of citizens of different regions of Ukraine". The surways is planned to be completed next year, and its results will be included to the Status Report on Nuclear and Radiation Safety in Ukraine in 2009.

In 2008 on its 8th anniversary the State Nuclear Regulatory Committee of Ukraine held a traditional International Topical Meeting of Nuclear and Radiation Safety. Participants of this Meeting could take part in 4 topical sessions:

- *Legislation and regulatory basis of nuclear and radiation safety;*
- *Radiation safety in everyday life;*
- *Radioactive waste management safety;*
- *Experience and possibilities of public organizations in ensuring nuclear and radiation safety.*

This year's International Atomic Energy Agency (IAEA) participation in the Meeting was extended. Eliana Amaral, Vladymir Berkovsky, and John Frazer Preston became the Meeting participants from IAEA .

In addition, the reports were presented by Swiss regulatory authority representative Mr. Klaus Linberg, and expert from the Association for Technical and Nuclear Safety (GRS) of Germany Dr. Rolf Janke.

From SNRCU the reports were presented by Chairperson of the State Nuclear Regulatory Committee of Ukraine Olena Mykolaichuk, and her Deputies Sergyi Bozhko and Olga Makarovska.

The invitation to participate in the seminar was responded by experts of state enterprises subordinated to SNRCU, representatives of institutions and organizations acting in the area of nuclear energy use, foreign experts on nuclear and radiation safety, the public and mass-media representatives.

The reports were made by: Head of the Reactor Safety Council Mykola Shteinberg, Head of the Green Party of Ukraine and Head of the Public Council to SNRCU Sergiy Kurykin, Director of the Grigoryev Institute for Medical Radiology Mykola Pylipenko, Head of laboratory of the Marzeyev Institute for Hygiene and Medical Ecology, Tatiana Pavlenko, leading expert oft the Institute for National Security at the National Security and Defence Council of Ukraine, Olga Kosharna, expert of the State Scientific and Technical Center for Nuclear and Radiation Safety (SSTC NRS) Stanislav Sholomitsky, representatives from the Design Bureau "Pivdenne" and National Airspace Agency of Ukraine, Oleksandr Kashanov and Aleksandr Berdnik, and Olga Lyaschuk active member of the public organization "Ecoclub-Rivne".

Materials of the Second International Meeting are available at SNRCU web-site www.snrc.gov.ua at the page with the same name.

SCIENTIFIC AND TECHNICAL SUPPORT OF THE STATE REGULATION IN THE AREA OF NUCLEAR ENERGY USE

The State Nuclear Regulatory Committee of Ukraine actively use expert support and interacts with leading Ukrainian scientific organizations, which are competent in issues of nuclear and radiation safety. These organizations, among others, are "Grigoryev Institute for Medical Radiology" (Kharkiv), Kharkiv Physics and Technical Institute, Institute for Nuclear Reseaches of NASU, "Marzeyev Institute for Hygiene and Medical Ecology" of the Academy for Medical Sciences of Ukraine (AMSU), Taras Shevchenko State National University, Kiev, Scientific and engineering Center for Radio-hydro-ecological Field Researches of NASU, Institute for Geochemistry of the Environment of NASU and the Ministry of Emergencies, Institute for NPP safety problems of NASU, and others.

As a part of this activity, on February 8, 2008 the State Nuclear Regulatory Committee of Ukraine and Marzeyev Institute for Hygiene and Medical Ecology of the Academy for Medical Sciences of Ukraine signed a Memorandum on cooperation, partnership and interaction on radiation safety and radiation protection.

In 2008 scientific institutions performed a number of R&D works. In particular, specialists of the Taras Shevchenko State National University, Kiev developed a regulation "Requirements on Quality Management System to perform diagnostics and therapy with the use of ionizing radiation sources", which was approved by SNRCU Order and registered in the Ministry of Justice of Ukraine.

The Grigoryev Institute for Medical Radiology performed R&D work "Analysis of practice of the legislation of Ukraine and EC countries on radiation protection at medical applications of ionizing radiation sources, and development of respective proposals".

Specialists of the Marzeyev Institute for Hygiene and Medical Ecology" of AMSU completed R&D work "Statistical and Technological analysis of radiation accidents related with loss of control over ionizing radiation sources at the territory of Ukraine.

Besides, three state scientific and technical support organizations (TSO) are subordinated to the State Nuclear Regulatory Committee of Ukraine.

State enterprise "State Scientific and Technical Center for Nuclear and Radiation Safety" (SSTC NRS) performs analytical, scientific, expert, technical, informational, consultative, and methodology support of the nuclear regulatory authority. Scientific and technical activity of SSTC NRS is accompanied by studying and analyzing the state-of-art international experience in the area of regulating and ensuring safety of nuclear energy use. The result of this activity is development and harmonization of national system of NRS regulation, regulatory practice, and safety assurance with the best international practice.

With the purpose of development of joint decisions on key safety problems 70 SSTC employees co-worked in 77 special advisory and consultative bodies, commissions, working groups, and committees.

Signing of a Memorandum on cooperation, partnership and interaction on radiation safety and radiation protection

The important event for SSTC was obtaining of the status of double subordination both to the SNRCU and NASU, which was formalised by the special Order of 25 November 2008. Now SSTC obtained a good basis for sustainable development and effective use of creative potential of its staff, for expanding its capabilities concerning scientific cooperation with the leading scientific institutions of NASU.

State enterprise "State Center for Regulation of Quality of Supplies and Services" (DP "DerzhcenterYakosti") provides technical support to the State Nuclear Regulatory Committee of Ukraine, methodology and consultative support at improvement of regulatory requirements on ensuring the quality of equipment and services for the nuclear power facilities.

The main task of the DP "DerzhcenterYakosti" is independent confirmation of compliance of the products with the established national codes and standards on nuclear and radiation safety, Derzhcenteryakosti renders its services in the area of assessment and confirmation of compliance of the equipment and components used in the systems important for safety of the nuclear power installations of Ukraine and Russian Federation.

By the Decision of the State Committee of Consumer Standards (Derzhspozhivstandart) of Ukraine the Derzhcenteryakosti – OS SERTATOM was assigned as a body that confirms compliance of containers for storage and disposal of radioactive waste and sealed sources of ionizing radiation with the requirements of technical specifications.

State Enterprise "Center for Information Technologies on Nuclear Energy Use" ("Infoatom") is a scientific enterprise of branch level. It is aimed to provide information and analytical support to the State Nuclear Regulatory Committee of Ukraine, take part in informing the public on the status of nuclear and radiation safety, as well as designing, creating, implementing and supporting computer networks and automated databases related to the status of nuclear and radiation safety, and necessary for supporting the SNRCU activity.

Safety Of Nuclear Energy In Ukraine

NUCLEAR ENERGY IN FUEL AND POWER COMPLEX OF UKRAINE

Nuclear Power Industry is one of the leading branches of the Ukrainian economics and it provides for the important aspect of the national safety – nuclear energy.

Upon closure of the Chornobyl NPP, four nuclear power plants with WWER reactors remained in operation in Ukraine: Zaporizhya NPP, South Ukraine NPP, Rivne NPP and Khmelnitsky NPP that operate 15 nuclear power units with the total installed capacity of 13,835 MW.

Ukrainian NPPs operate reactor installations that are mostly of WWER-1000 (V-320) type – 11 reactor facilities, two of which were put into commercial operation in 2005 and 2006 at Khmelnitsky NPP and Rivne NPP.

Except this, two WWER-440 (V-213) units at Rivne NPP, one WWER-1000 (V-302) unit and one WWER-1000 (V-338) unit at South Ukraine NPP are in operation.

Since 1996, Zaporizhya NPP, South Ukraine NPP, Rivne NPP, and Khmelnitsky NPP have been operated by the National Nuclear Energy Generating Company Energoatom (hereinafter - NAEK Energoatom).

Since 2002, in accordance with the Law of Ukraine "On Authorizing Activity in Nuclear Energy Use" and based on a comprehensive safety assessment of nuclear installations and assessment of the operator's capability to take all safety measures, the State Nuclear Regulatory Committee of Ukraine has issued licenses to the NAEK Energoatom to operate nuclear installations at the South Ukraine NPP (SUNPP), Zaporizhya NPP (ZNPP), Rivne NPP (RNPP) and Khmelnitsky NPP (KhNPP).

The licenses establish conditions and restrictions on the above activity and specify process systems and boundaries of the sites they apply to. The licenses authorize the NAEK Energoatom to conduct all operations at nuclear installations on its own or jointly with contractors. Therefore, according to the Law of Ukraine "On Nuclear Energy Use and Radiation Safety", all the responsibility for the operational safety of nuclear installations rests with the operating organization which fulfills financial obligations for nuclear damage at the rate and on terms established by the Ukrainian legislation. The licenses also identify activities or operations that may be undertaken only under an individual SNRCU permit.

Permits to start up power units after scheduled repair outage involving core reloading (PPR) are issued to the NAEK Energoatom only provided that measures identified in the previous permit and terms of valid licenses, in particular safety enhancement measures, have been implemented completely.

The SNRCU permanently supervises the compliance with the NPP operational licenses by:

- *Reviewing and assessing the NAEK Energoatom reporting documents on compliance with licensing requirements;*
- *Inspecting each NPP, with direct control over fulfillment of measures set by the licenses;*
- *Holding meetings prior to completion of planned outages and making decisions to permit transfer to hot zero power;*
- *Conducting the SNRCU Board meetings to discuss the licensee's adherence to licensing terms;*
- *Conducting the SNRCU Board meetings to discuss the status of the licensee's adherence to the state and branch programs on safety enhancement of the operating NPP power units.*

The SNRCU pays special attention to measures provided for by a number of safety improvement programs for operating NPPs and to the development of safety analysis reports for NPP units.

Funding termination of operation and decommissioning, including the development of design documentation, is one of the key aspects in safe decommissioning of NPP units. A decommissioning fund for nuclear installations is to be established pursuant to national legislation and international obligations of Ukraine. Thus, the requirement of the national Ukrainian legislation is to observe the Law of Ukraine "On Settlement of Nuclear Safety Issues" of 24 June 2004 and Resolution of the Cabinet of Ministers of Ukraine No. 594 of 27 April 2006 "Establishment, Accumulation and Use of Decommissioning Fund for Nuclear Installations".

Structure and amounts of electric power generation at Ukrainian NPPs

GENERATION SOURCES	Output (million kW*t)		
	plan 2008	fact 2008	fact 2007
Nuclear power Plant	89 287,0	89 841,4	92 542,4
Thermal Power Plant & Heat-Electric Generating Plant	86 242,0	82 346,9	84 253,9
Hydroelectric Power Plant & Hydroelectric Pumped Storage Power Plant	9410,0	11 345,6	10 098,3
Diesel-Generator Stand-by Set	8350,2	8149,9	8226,3
electric energy by alternative energy sources (wind engines)	8,9	4,2	5,7
Total	**193 298,1**	**191 688**	**195 126,6**

RADIATION SAFETY AND RADIATION PROTECTION OF NPP PERSONNEL

NPP impact on personnel, the public and the environment is assessed based on analyzing dose burgen on individuals, levels of radioactive releases into the atmosphere and radioactive discharges in water bodies according to the following parameters:

- *Exposure doses of personnel obtained during a calendar year (individual and collective exposure doses of personnel are the main quantitative and qualitative indicators of radiation safety and radiation protection of NPP personnel);*
- *Levels of daily releases of inert radioactive gases – IRG (xenon, krypton, argon);*
- *Levels of daily releases of long-lived nuclides (LLN);*
- *Levels of daily releases of radioactive iodine radionuclides (radioiodines).*

Nuclear Safety – Is The Priority!

In addition to the above, the following parameters are monitored at all NPPs:

- *Monthly releases of manganese-54, cobalt-60, zirconium-95, iron-59 (activation and corrosion*

General characteristics of the NPPs in operation in Ukraine

NPP	Unit number	Reactor type	Electric capacity, MW	Date of commissioning	End of designed lifetime
Zaporizhya	1	WWER-1000/B-320	1000	December 1984	2014
	2	WWER-1000/B-320	1000	July 1985	2015
	3	WWER-1000/B-320	1000	December 1986	2016
	4	WWER-1000/B-320	1000	December 1987	2017
	5	WWER-1000/B-320	1000	August 1989	2019
	6	WWER-1000/B-320	1000	October 1995	2025
Rivne	1	WWER-440/B-213	420	December 1980	2010
	2	WWER-440/B-213	415	December 1981	2011
	3	WWER-1000/B-320	1000	December 1986	2016
	4	WWER-1000/B-320	1000	October 2004	2034
South Ukraine	1	WWER-1000/B-302	1000	December 1982	2012
	2	WWER-1000/B-338	1000	January 1985	2015
	3	WWER-1000/B-320	1000	September 1989	2019
Khmelnitsky	1	WWER-1000/B-320	1000	December 1987	2017
	2	WWER-1000/B-320	1000	August 2004	2034

Zaporizhya NPP

Rivne NPP

products of process equipment metal), cesium isotopes -134,137 (nuclear fuel decay products);

- *Quarterly releases of strontium-89, 90;*
- *Discharges of radionuclides in open water bodies (discharges are monitored by 15 radionuclides).*

One of the safety criteria for NPP safe operation is the non-exceeding of reference levels of radioactive releases and effluents appropriately established and endorsed by the regulatory bodies. This criterion sets the achieved level of radiation safety at an NPP and the permissible level whose exceeding implies initiation of an emergency.

"ZAPORIZHYA NPP"

During 2008 there were no cases of exeeding both individual and collective exposure dose limits. The distribution of dose loads is presented below.

The index of radioactive releases into the atmosphere in 2008 was 0.14% of the permissible value. The greatest contribution to the permissible release index is made by IRG, radioiodines, Co-60 and radiocesium. The contribution of other radionuclides does not exceed 1%.

During 2008 no exceeding of the permissible and reference levels of discharges into open water bodies was recorded at ZNPP. The actual levels of radionuclide release were from 4% (for caesium-134) to 67% (for tritium) of the reference levels and 4.72% of the permissible levels.

"RIVNE NPP"

During 2008 no exceeding of individual and collective exposure dose limits was recorded at RNPP. The distribution of dose burgen is presented below.

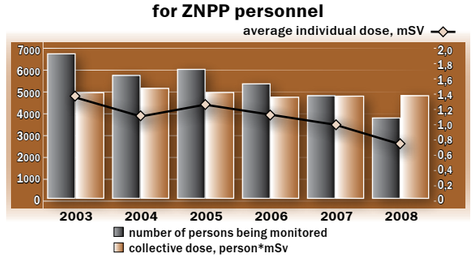
During 2008 the actual radioactive releases into the atmosphere were from 0.2% (for zirconium-95) to 9% (for strontium-90) of the reference levels and 2% of the permissible levels.

During 2008 no exceeding of the permissible and reference levels of discharges into open water bodies

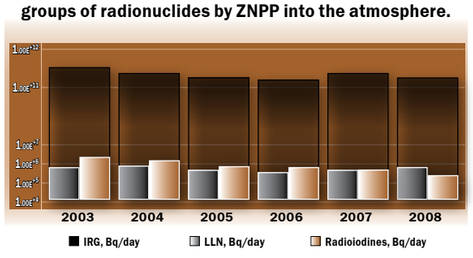
The distribution of dose loads for ZNPP personnel

Number of persons being monitored	Number of persons who received a dose for the last 12 months								
	<1 mSv	1-2 mSv	2-6 mSv	6-10 mSv	10-15 mSv	15-20 mSv	20-30 mSv	30-50 mSv	>50 mSv
4803	3960	294	364	137	47	1	0	0	0
	Exposure dose for 2008								
	Collective dose, person*Sv				Average individual dose, mSv				
	3,8				0,78				

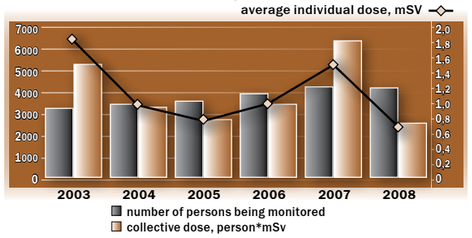
Dynamics of exposure doses for ZNPP personnel



Dynamics of the average daily releases of the main groups of radionuclides by ZNPP into the atmosphere.



Dynamics of exposure doses for RNPP personnel



The distribution of dose loads for RNPP personnel

Number of persons being monitored	Number of persons who received a dose for the last 12 months								
	<1 mSv	1-2 mSv	2-6 mSv	6-10 mSv	10-15 mSv	15-20 mSv	20-30 mSv	30-50 mSv	>50 mSv
4160	3444	276	355	65	20	0	0	0	0
	Exposure dose for 2008								
	Collective dose, person*Sv				Average individual dose, mSv				
	2,8				0,67				

was recorded at RNPP. The total index of radioactive discharges into the Styr river was 2.71% of the permissible level taking into account the contribution of tritium. The discharge of reference cobalt-60 made up 83% as compared with 2007, the discharge of reference caesium-137 was reduced and made up 54% of its discharge in the last year. The contribution of tritium to the index of the permissible discharges constituted 18.6%.

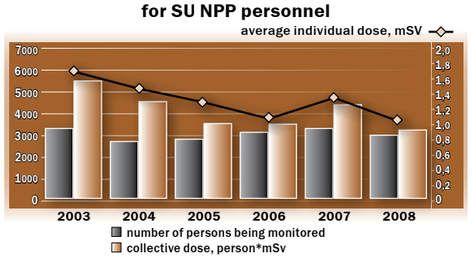
"SOUTH UKRAINE NPP"

In 2008 no exceeding of individual and collective exposure dose limits was recorded.

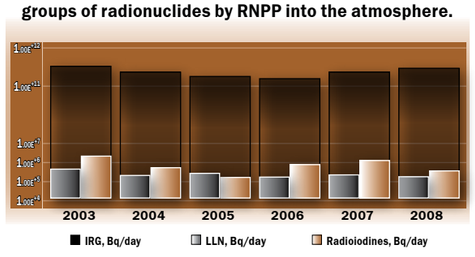
The actual radioactive releases into the atmosphere were 10-20% of the reference levels and 1-3% of the permissible levels.

During 2008 no exceeding of the permissible and reference level of discharges of radionuclides into open water bodies was recorded.

Dynamics of exposure doses for SU NPP personnel



Dynamics of the average daily releases of the main groups of radionuclides by RNPP into the atmosphere.



"KHMELNITSKY NPP"

In 2008 no exceeding of individual and collective exposure dose limits was recorded.

The bar charts demonstrate systematic decrease in collective exposure doses of personnel.

In January and July-August 2008 the levels of releases for all groups of radionuclides increased because of planned outages at KhNPP power units.

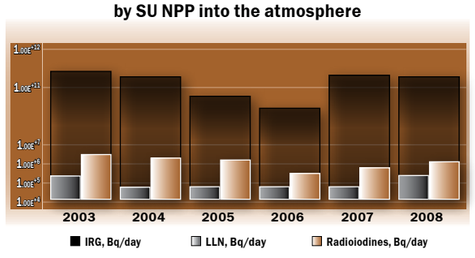
During 2008 the actual radioactive releases into the atmosphere constituted from 2.7% (for radioactive iodine) to 10% (for long-lived radionuclides) of the reference levels and from 0.08% for inert radioactive gases to 0.23% for long-lived radionuclides of the permissible levels.

During 2008 no exceeding of the permissible and reference discharge levels into open water bodies was recorded. The actual discharges, for example caesium-137, made up 70% of the reference levels and 0.0034% of the permissible levels, for tritium 85% of

The distribution of dose loads for SUNPP personnel

Number of persons being monitored	Number of persons who received a dose for the last 12 months								
	<1 mSv	1-2 mSv	2-6 mSv	6-10 mSv	10-15 mSv	15-20 mSv	20-30 mSv	30-50 mSv	>50 mSv
3025	2296	284	298	94	53	0	0	0	0
	Exposure dose for 2008								
	Collective dose, person*Sv				Average individual dose, mSv				
	3,2				1,06				

Dynamics of releases of the main groups of radionuclides by SU NPP into the atmosphere



South Ukraine NPP

Khmelnitsky NPP

the reference levels and 4% of the permissible levels. This means that tritium is the main contributor to the activity of liquid discharges.

NPP OPERATIONAL EVENTS

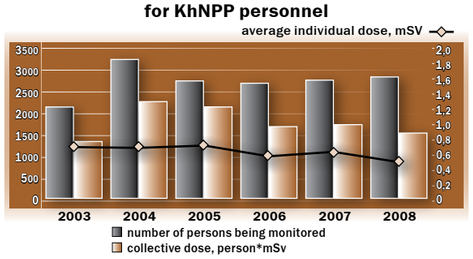
Strict accounting of incidents and other events that occur in NPP operation, thorough investigation of their causes and implementation of corrective measures to eliminate the drawbacks revealed and prevent similar events in the future are major instruments to maintain a proper level of operational safety. All this issues are regulated by the "Provisions on the Procedure for Investigation and Record of Operational Events at Nuclear Power Plants".

In 2008, 22 operational events occurred at Ukrainian NPPs, including 5 at ZNPP, 7 at RNPP, 5 at KhNPP and 5 at SU NPP.

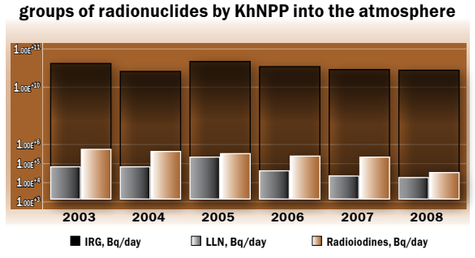
The distribution of dose loads for KhNPP personnel

Number of persons being monitored	Number of persons who received a dose for the last 12 months								
	<1 mSv	1-2 mSv	2-6 mSv	6-10 mSv	10-15 mSv	15-20 mSv	20-30 mSv	30-50 mSv	>50 mSv
2845	2406	228	190	17	1	0	0	0	0
	Exposure dose for 2008								
	Collective dose, person*Sv					Average individual dose, mSv			
	1,6					0,56			

Dynamics of exposure doses for KhNPP personnel



Dynamics of the average daily releases of the main groups of radionuclides by KhNPP into the atmosphere



The International Nuclear Event Scale (INES) is widely used to assess the safety significance of events in world nuclear energy and was specially developed as a tool for informing the public. All events that occurred at Ukrainian NPPs in 2008 were ranked as "deviation" or "out of scale" by INES. The latter level includes events that have no nuclear and radiation safety relevance and, thus, are out of scale. INES rating of events at operating NPPs is shown in the Table below.

Based on the results of the SNRCU Board meeting held in February 2008, the operating organization has developed the Program (Action Plan) for preventing recurrence of operational events at same type units, improving quality of investigations and determining root causes.

UPGRADING AND SAFETY IMPROVEMENT OF NPP UNITS

In order to bring target safety indicators of Ukrainian power units to internationally recognized standards, rules and regulations on nuclear and radiation safety, implementation of the measures under the "Concept for Safety Improvement of Operating NPPs" (hereinafter referred to as the Concept) approved by Resolution of Cabinet of Ministers of Ukraine No.515-r of 13 December 2005 were underway in 2008. All safety measures of the Concept are to be implemented by 2010, including activities under pilot projects, till the end of 2008, in the following areas:

1. Control of primary-to-secondary leak with equivalent diameter up to 100 mm.
2. Limiting of equipment dependant failures and common-cause failures resulting from internal events.
3. Enhance improvement of heat removal through the secondary circuit.
4. Enhance primary overpressure protection in a cold state and protection against thermal shock.
5. Enhance heat removal and primary pressure control.
6. Enhance confining radioactive materials inside the containment.
7. Enhance emergency power supply.
8. Improvement of accident management.
9. More profound NPP safety analysis and substantiation.

In order to comply with the Concept, the State Nuclear Regulatory Committee of Ukraine and the Ministry for Fuel and Energy of Ukraine prepared Joint Order "On Arranging Safety Improvement Activities for Operating NPP Units" No.19/10 dated 25 January 2006, which agrees upon a List of administrative and technical measures to implement the Concept (hereinafter referred to as the List). The List describes in brief the existing issues or safety deficiencies at operating NPP units and safety enhancement measures in compliance with areas identified in the Concept. In accordance with the Joint Order, all measures identified in the List are to be performed by 2010. Therefore, all pilot projects in all nine safety improvement areas are to be completed by the end of 2008.

At SNRCU Board meetings the annual status of measures to implement the Concept are periodically reviewed. Thus, the results of the measures under the Concept for 2006 were considered at the meeting of the SNRCU Board on 25 January 2007. The activities of the NAEK Energoatom was considered insufficient.

On 24 January 2008 the SNRCU Board considered the status of measures implementation under the Concept in 2007. The Board noted that the measures related to upgrading systems and components of pow-

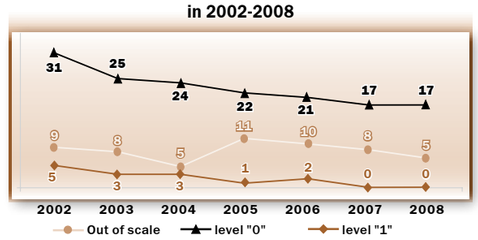
Assessment of events occurred at Ukrainian NPPs in 2008 by INES

NPP	EVENT LEVEL BY INES*					
	–	0	1	2	3	4-7
Zaporizhya	1	4	–	–	–	–
Rivne	1	6	–	–	–	–
South Ukraine	2	3	–	–	–	–
Khmelnitsky	1	4	–	–	–	–
Total:	**5**	**17**	**–**	**–**	**–**	**–**

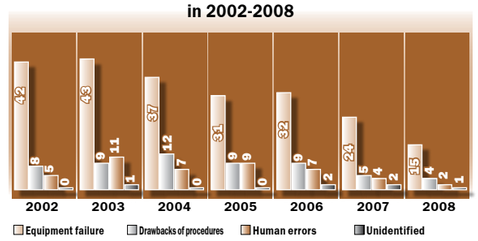
During 2008 there were no reported events at Chornobyl NPP.

** – (-) Out of scale; (0) Deviation; (1) Anomaly; (2) Incident; (3) Severe incident; (4-7) Accidents*

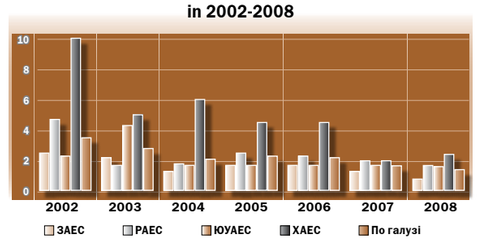
INES Rating of Operational Events at Ukrainian NPPs in 2002-2008



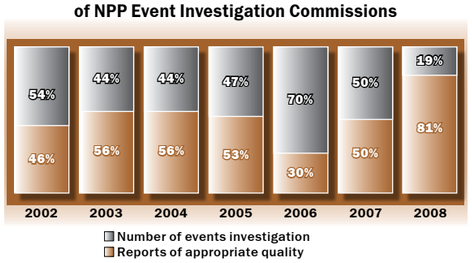
Distribution of root causes of events in 2002-2008



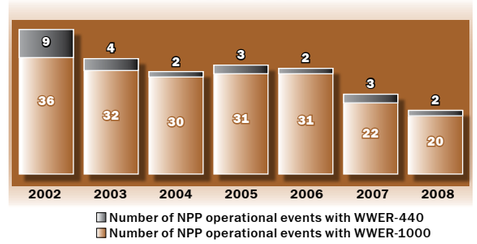
Average Number of NPP Operational Events per Unit in 2002-2008



Analysis of efficiency of NPP Event Investigation Commissions



Distribution of Operational Events by Reactor Type in 2002-2008



er units were performed satisfactory. At the same time, analyses and calculations to identify ways to eliminate safety deficiencies were not performed in a prompt manner, which is critical in viewpoint of prospects to bring the operating units into compliance with international standards on nuclear and radiation safety. In spite of certain positive progress in implementation of measures under the Concept as compared with previous years, there were:

- *a certain number of problematic measures that provided for analyses and calculations to identify ways to eliminate safety deficiencies, which were planned for implementation in 2006-2007, but the operator had no technical decisions for their implementation;*
- *risks that certain equipment at some pilot power units would not be replaced by the end of 2008 since producers could not manufacture and deliver it on time;*
- *delays in submitting chapters of Safety Analysis Reports (SARs) that may result in risks in adaptation of SARs of NPP units for non-pilot units by the end of 2009.*

In order to perform all pilot projects according to the Concept in 2008, the Board recommended to NAEK Energoatom undertake measures to involve all possible resources to solve the problems and to improve the system of engineering and technical support to identify ways to eliminate safety deficiencies and substantiate the safety while developing technical decisions.

Additionally, in April-May 2008 meetings of the SNRCU management were held at RNPP, SU NPP, ZNPP, and KhNPP sites as a part of systematic supervision and control over implementation of safety enhancement measures under the Concept.

On 9 September 2008 under the chairmanship of the Minister for Fuel and Energy of Ukraine a meeting was held jointly with the State Nuclear Regulatory Committee of Ukraine and NAEK Energoatom to analyze the current status of the Concept, individual pilot measures scheduled for 2008, which could not be timely implemented in full scope, causes of delays and ways to solve the problem. The following factors caused delays:

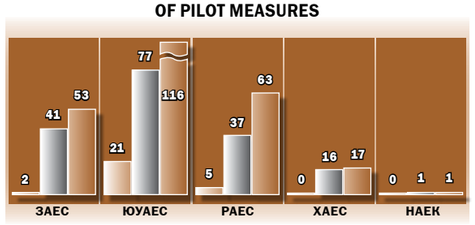
- *technical complexity in solving certain safety issues under some measures implemented for the first time;*
- *duration of tender procedures and terms to equipment manufacte;*
- *inter-relation with implementation of other problematic issues.*

Resulting from the discussion of the abovementioned information, the Ministry for Fuel and Energy of Ukraine and the State Nuclear Regulatory Committee of Ukraine were obliged to agree upon the extension of the pilot measures to be then absolutely implemented by the end of 2009.

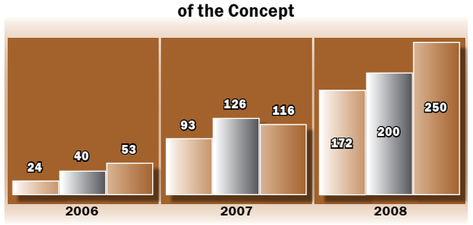
By the end of 2008 the State Nuclear Regulatory Committee of Ukraine confirmed implementation of 171 of the 250 measures planned for implementation in 2008. Its constituted 68% of the total number. Except this, 24 reports on implementation of measures submitted by NAEK Energoatom to the State Nuclear Regulatory Committee of Ukraine at the end of 2008 and they are under consideration now, 4 reports were returned for revision. In 2008 the pilot measures submitted to and accepted by the State Nuclear Regulatory Committee of Ukraine constituted 95% and 82%, respectively.

According to the Concept area 9 – "Extension of NPP Safety Analysis and Substantiation" – NAEK Energoatom accomplished more than ten-year effort on developing materials of Safety Analysis Report for pilot NPP units (except Level 2 Probabilistic Safety Assessment for SUNPP-1 and Integrated Safety Analysis Reports). Pursuant to the established procedure, the State Nuclear Regulatory Committee of Ukraine conducted the state review on nuclear and radiation safety (NRS) of the materials and informed NAEK Energoatom of its results. In order to organize activities to make corrections taking into account SNRCU comments, NAEK Energoatom, upon consent of the State Nuclear Regulatory Committee of Ukraine, approved a procedure which establishes procedure for interaction and set. It should be noted that NAEK Energoatom did not comply with procedure that caused significant delays in correction of SAR materials resulting from the review and in failure to perform pilot measures under the Concept in 2008. Adaptation of SAR materials

NUMBER OF PILOT MEASURES



Current status of the Concept



for pilot units at non-pilot units was performed with delays.

During 2006-2008 NAEK Energoatom submitted 199 reports on pilot measures and 133 reports on measures to be adapted to the State Nuclear Regulatory Committee of Ukraine. 171 and 115 reports, respectively, were accepted by the State Nuclear Regulatory Committee of Ukraine by the end of 2008.

By the late 2008, reports on 13 pilot measures have not been submitted to the State Nuclear Regulatory Committee at all, that demonstrates NAEK Energoatom is serious shortcomings in planning of the implementation of safety enhancement measures.

In 2008 the status of measures under the Concept was considered by the State Nuclear Regulatory Committee of Ukraine and the Ministry for Fuel and Energy of Ukraine during the joint Board meeting held on 22 January 2008. The following was noted at the Board meeting:

- *while performing measures under the Concept, the NAEK Energoatom did not set priorities to the measures with dominant impact on NPP safety;*
- *as in 2007, the measures at "adapted" units were implemented ahead of the schedule;*
- *improper status of developing SARs for Ukrainian NPP units was caused by long-term inactivity and insufficient level of safety culture of NAEK Energoatom officials.*

The Joint Board recognized that the NAEK Energoatom inadequately complied with the Schedule for administrative and technical measures for 2008 to implement the Concept for safety improvement of operating NPP units. The decision was made to revise and endorse the Schedule for administrative and technical measures for 2009 relative to the extension of deadlines for pilot projects till 2009 without changing deadlines of the Concept as a whole.

In 2008 the measures of branch programs on improvement of the safety and operational reliability were also included in PPR of NPP power units.

POST-COMMISSIONING UPGRADING MEASURES AT KHMELNITSKY-2 AND RIVNE-4

In order to comply with the Law of Ukraine "On the Ratification of the Guarantee Agreement between Ukraine and the European Atomic Energy Community" (No. 2818-IV of 7 September 2005), post-commissioning safety enhancement measures at Khmelnitsky-2 and Rivne-4 are to be implemented during the three fuel campaigns in accordance with the implementation schedules agreed by the SNRCU. Eighty post-commissioning measures are to be implemented at Khmelnitsky-2, and 81 measures - at Rivne-4.

The safety enhancement measures under the Khmelnitsky-2/Rivne-4 upgrading program will ensure the compliance of safety with international standards and eliminate a number of deviations from current safety rules.

Pursuant to the schedule of "post-commissioning" measures:

80 measures are to be implemented at KhNPP-2 (16 – in the first, 17 – in the second and 47 – in the third fuel campaign);

81 measures are to be implemented at RNPP-4 (17 – in the first, 13 – in the second and 51 – in the third fuel campaign).

The third fuel campaign at KhNPP-2 has been completed, and SNRCU confirmed that 41 measures were implemented as of the end of 2007.

The third fuel campaign started only on 25 July 2007 at RNPP-4, and the SNRCU confirmed that 43 measures were implemented as of the end of 2007.

In December 2007 NAEK Energoatom informed the SNRCU that 18 measures for KhNPP-2 and 6 measures for RNPP-4 could not be implemented in full scope by the end of the third fuel campaign. This was caused by delay in credit arrangement and mainly by a considerable amount of time needed to manufacture equipment. Conceptual decisions and technical specifications were developed and agreed for these measures, tenders were conducted and contracts for equipment supply and development of design were concluded or on signing stage.

Experts of Khmelnitsky and Rivne NPPs, NAEK Energoatom Directorate and KhNPP-2/RNPP-4 project management unit analyzed the status of each measure that could not be completely implemented by the end of the third fuel campaign. The analysis demonstrated that current safety would not be significantly affected if the measures in question will be carried over from the third to fourth scheduled outage. Experts of the SNRCU (SSTC NRS) and Euratom (Riskaudit) have agreed that the measures can be carried over to the fourth scheduled outage without an adverse effect on safety.

Taking into consideration the expert conclusion, in 2008 SNRCU has informed the Department of EC Economic and Financial Directorate and NAEK Energoatom about its consent on implementation of 17 measures for KhNPP-2 and 6 measures for RNPP-4 in the fourth fuel campaign. In April 2008 the EC Directorate General on Economic and Financing informed the NAEK Energoatom on agreeing upon extension of the Credit Agreement for the fourth fuel campaign of KhNPP-2 and RNPP-4.

At the beginning of 2009 the State Nuclear Regulatory Committee of Ukraine confirmed implementation of 59 measures at KhNPP-2 and 69 measures at RNPP-4 at which the fourth fuel campaign will be completed in 2009.

In 2008 the SNRCU (SSTC NRS) and Euratom (RISKAUDIT) experts carried out the safety assessment of the implemented "post-commissioning" measures at KhNPP-2 and RNPP-4.

In the framework of the "Memorandum of Understanding on Cooperation in the Field of Energy between Ukraine and the EU" as of "Nuclear Safety" on October 13-24, 2008 the IAEA Mission on design safety was carried out at Khmelnitsky NPP unit 2. Western experts verified the compliance of the power unit state with the IAEA Standard "Safety of Nuclear Power Plants: Design", NS-R-1. In a result of the mission, the IAEA experts noted that KhNPP-2 meets, in whole, provisions of this IAEA standard. There are certain inconsistencies in equipment qualification, seismic safety and severe accident analysis which have been taken into account.

EXTENSION OF NPP POWER UNITS OPERATION BEYOND THE DESIGN LIFETIME

Rivne NPP-1,2 and South Ukraine NPP-1 were identified as pilot power units for lifetime extension beyond the designed period. Their designed lifetime expires in 2010, 2011 and 2012, respectively.

Activities on extension the NPP units operation beyond the design lifetime are carried out in compliance with the "Comprehensive Program for Lifetime Extension of Operating Nuclear Power Units" approved by the Resolution of the Cabinet of Ministers of Ukraine No. 263-r of 29 April 2004, "Action Plan of NAEK Energoatom to implement the "Comprehensive Program for Lifetime Extension of Operating Nuclear Power Units" PN-D.0.08.341-04, and the appropriate schedule.

Resulting from scheduled repair outages of Rivne NPP-1,2 conducted in 2007, positive prospects appeared at early 2008 to extend operation of the unit above beyond the design lifetime in compliance with the schedules agreed upon with the SNRCU.

However, in the middle 2008 the tendency to violate deadlines for the implementation of main measures on Rivne NPP-1 lifetime extension was evident.

By the end of the year a number of problem areas were identified at Rivne NPP-1, namely:

- *assessment of technical condition and resource reassignment of buildings and structures has not been completed;*
- *substantiation of safety operation beyond the design lifetime of such critical components as reactor pressure vessel, upper unit, reactor internals, steam generators has not been completed;*
- *only 34 of 60 safety enhancement measures envisaged by the "Concept on Safety Improvement of Operating NPP Power Units" approved by the Resolution of the Cabinet of Ministers of Ukraine No.515-r of 13 December 2005 have been implemented;*
- *there is a delay in equipment qualification;*
- *heat-mechanic equipment and piping have not been brought into compliance with the requirements of the current standards, rules and regulations on nuclear and radiation safety on strength calculations;*
- *beginning of the activities related to pressurization of the power unit tight barrier was delayed.*

This caused delays in preparing the Report on periodic safety re-assessment. Based on the Report results, the SNRCU will take a decision on possibility and conditions to extend Rivne NPP-1 operation beyond the design lifetime.

Based on the mentioned above a possibility still exists for Rivne NPP-1 shutdown after expiration of its design operation lifetime to implement the aforesaid measures in full scope.

At the end of 2008, Rivne NPP-1,2 were taken out of operation for long outage to implement the activities envisaged by the schedules.

Similar issues have to be solved, while extending Rivne NPP-2 operation beyond the design lifetime with the only difference that there is one more year available for this purpose.

Activities on extension of South Ukraine NPP-1 operation beyond the design lifetime are being developed and programs and guidelines are being agreed upon now. However, even now there is failure to comply with the schedule at this power unit, namely:

- *Measures provided for by the Concept on Safety Improvement of Operating NPP Power Units approved by the Resolution of the Cabinet of Ministers of Ukraine No.515-r of 13 December 2005.*
- *Development of programs on technical conditions assessment and substantiation of safe operation for power unit crucial elements (reactor pressure vessel, upper unit, reactor internals and support elements, the containment system).*
- *Equipment qualification;*
- *Extension of Zaporizhya NPP-1 (pilot unit in viewpoint of lifetime extension of power units with WWER-1000) operation beyond the design lifetime is at the initial stage.*

Important measures of branch programs implemented under PPR-2008

АЭС	Unit number	Содержание мероприятия
Zaporizhya	1	• *Installing additional sensitive protection against phase-to-phase short circuits in 0.4 kV power circuit.*
	2	• *Replacing equipment of the systems for group and individual control of control rods and reactor facility emergency protection, as well as software upgrading of the neutron flux monitoring system relative to reactor calculation period;* • *Installing additional sensitive protection against interface short circuits in 0.4 kV*
	3	• *Reconstructing low level of information-calculating system relative to one group of trains of the control safety system;* • *Replacing double-flow mixed bed demineralizers by one-flow mixed bed demineralizer at unit condensate demineralizer;* • *Replacing control valves in steam generator power centers*
	4	• *Replacing interlocking cabinets of turbine compartment normal operation systems* *Replacing radiation monitoring equipment of 1,2,3 safety system trains*
	5	• *Installing additional sensitive protection against interface short circuits in 0.4 kV power circuit;* • *Upgrading full-scale simulator hardware components*
	6	• *Implementing automatic gas fore-extinguishing in rooms with electric and electrons equipment*
Rivne	3	• *Replacing equipment, cables and software and hardware complex of the first safety system train;* • *Implementing measurement channels GIM-206 to monitor dose rate of gamma-radiation in the unit containment;* • *Modernizing the secondary automatic chemical monitoring;* • *Improving software of the neutron flux monitoring equipment relative to calculation of reactor period;* • *Implementing the seeping method for monitoring tightness of fuel assemblies;* • *Upgrading the operation algorithm of the reactor power limitation controller*
South Ukraine	1	• *Replacing control valves in the essential service water supply system;* • *Replacing safety valves in the emergency low pressure cooldown system*
	2	• *Reconstructing the air conditioning system in the control safety room;* • *New software and hardware complexes of the reactor facility emergency and preventive protection system*
	3	• *Reconstructing polar crane electric components*
Khmelnitsky	1	• *New software and hardware complexes of the reactor facility control rods control and protection system: emergency and preventive protections; neutron flux monitoring system; power limitation controller and accelerated preventive protection.**

** The International experts of Riskaudit during a visit to the Khmelnitsky NPP noted the high technical level and quality of the upgraded equipment that was manufactured and supplied at KhNPP No.1 by the national manufacturer - Closed Joint-Stock Company "Radii" (city of Kirovograd) and Closed Joint-Stock Company "Impul's" (city Severodonets'k).*

Spent Fuel Management

SPENT FUEL MANAGEMENT AT OPERATING NPP

Spent nuclear fuel (SNF) resulting from the production of energy in nuclear reactors is one of the most important components of the NPP process cycle.

After its use in the reactor core, nuclear fuel is moved to reactor cooling pools to be stored during 4-5 years to decrease residual energy release.

Residual energy release is a process induced by radioactive decay of fission products. After cooling in the reactor pools, spent fuel is loaded into special containers that ensures its safety during transportation and is sent to a spent fuel storage facility.

The state of the world nuclear energy under the up-to-date level of development in sciences and techniques does not allow making final conclusions on subsequent management of spent fuel. There are several approaches to subsequent management of spent fuel in the world:

1. **Deferred decision** is provided for long-term spent fuel storage that allow moving a decision on subsequent spent fuel management taking into account future technologies and economic factors. The deferred decision is applied by Argentina, Denmark, Spain, Canada, Lithuania, Germany, Norway, South Korea, Poland, Slovakia, Hungary, Czech Republic, and Croatia.
2. **Processing of spent fuel**. There are two types of processing – domestic or abroad:
   - *Local processing – processing of spent fuel to obtain components and substances which usage is economically justified (Great Britain, India, Russia, France, Japan);*
   - *Processing in other countries – processing of spent fuel with return of light-level waste back to a country – owner (Australia, Bulgaria, Greece, the Netherlands, Switzerland);*
3. **Disposal** – spent fuel cooling and burial in deep geological formations (USA, Finland, and Sweden).

Nowadays spent fuel from Rivne, Khmelnitsky and South Ukraine NPPs is transported to Russia. WWER-1000's spent fuel is transported for storage and WWER-440's spent fuel (RNPP-1,2) - for processing.

Taking into account a substantial concentration of power at Zaporizhya NPP-6 with WWER-1000, in 1998 the decision was made to construct a spent fuel storage facility within the NPP site.

In 2001, Zaporizhya NPP commissioned a dry spent fuel storage facility (DSFSF) which service life constitutes 50 years. The DSFSF design is based on the proven technology of the US Duke Engineering & Services Company and meets standards, rules and regulations on nuclear and radiation safety. The spent fuel storage site is designed to accommodate 380 containers to hold over 9000 spent fuel assemblies. Nowadays, 74 containers with spent nuclear fuel are stored in the storage facility.

All components for containers manufacturing are produced at plants located in the immediate vicinity to ZNPP.

The experience in storage of spent nuclear fuel in "dry" containers gained by Ukrainian experts at the ZNPP site allowed the operating organization NAEK Energoatom to sign an Agreement with the American company "Holtec International" to construct a centralized dry-type spent nuclear fuel storage facility (CSFSF) for Rivne, Khmelnitsky and South Ukraine NPPs.

The Resolution of the Cabinet of Ministers of Ukraine No.131 of 4 February 2008 approved the CSFSF feasibility study.

SPENT FUEL MANAGEMENT AT CHORNOBYL NPP

As of 2009 units No.1,2,3 cooling pools store 3735 spent fuel assemblies (henceforth – SFA). 1275 SFA are stored in unit No.1 cooling pools, 1057 SFA – in unit No.2 cooling pools, and 1403 – in unit No.3 cooling pools.

It is difficult to remove all spent nuclear fuel (SNF) from Chornobyl NPP units No.1,2,3 until the ISF-2 project is implemented. Considering the abovementioned and existing radioactive waste at power units, ChNPP had been performing during the last years the activities on extension of units No.1,2 system and elements' lifetime related to SNF storage and radioactive waste management.

CHORNOBYL NPP WET-TYPE SPENT NUCLEAR FUEL STORAGE FACILITY (CHNPP ISF-1)

As of early 2009, ISF-1 cooling pools housed 17549 spent fuel assemblies. During 2006-2007 Chornobyl NPP carried out the activities to establish and justify duration and conditions for further ISF-1 operation.

After completion of these activities, in November 2007 Chornobyl NPP submitted the application with a package of documents needed to obtain a ChNPP ISF-1 operational license to the SNRCU .

On 26 June 2008 based on the comprehensive assessment of ISF-1 safety, review of materials on substantiation of nuclear and radiation safety, positive results of ISF-1 inspections, the SNRCU Board sets that the ISF-1 safety level and the ability of the Chornobyl NPP to perform all the measures to ensure safe operation allow issuing a license to operate ChNPP ISF-1.

Nowadays, in accordance with the conditions of SNRCU License EO No.000859 "Operation of a nuclear facility – Chornobyl NPP ISF-1", Chornobyl NPP is carrying out the activities according to the "Plan of ISF-1 Safety enhancement measures".

DESIGN FOR COMPLETION OF THE CONSTRACTION OF THE CHORNOBYL NPP DRY-TYPE SPENT NUCLEAR FUEL STORAGE FACILITY (CHNPP ISF-2)

Terms of license EO No.000124 "Construction of a Nuclear Facility" issued by the SNRCU on 13 May 2003 provides for construction of ISF-2 only after SNRCU approves the revised ISF-2 Construction Design according to the established procedure and agrees upon the ISF-2 Preliminary Safety Analysis Report.

In compliance with the schedule for 2008 after positive results of the state review on nuclear and radiation safety, the SNRCU approved the "Concept for the Comparative Analysis in Chornobyl NPP ISF-2 Design".

The SNRCU together with Riskaudit experts carried out the technical assessment of the "Conceptual Decision on Modification of ISF-2 Design".

Moreover, ChNPP submitted the "Conceptual Design on Modification of a Nuclear Facility. Handling of Damaged Spent Nuclear Fuel at Chornobyl NPP" to the SNRCU.

ChNPP considers two options for management of SNF and spent additional absorbers (henceforth – SAA), namely:

- *First option (based on the "Conceptual Decision on ChNPP ISF-2 Modification"): to divide a spent fuel assembly (SFA) into two parts and store them in horizontal canisters in concrete storage modules (henceforth – CSM), SAA are stored in an ISF-2 special room;*
- *Second option (based on the "Conceptual Decision on "Modification of a Nuclear Facility. Handling of Damaged Spent Nuclear Fuel at Chornobyl NPP": SFA and SAA are stored in vertical canisters, SFA division is not envisaged.*

The SNRCU notes the acceptability of both options for SNF and SAA management and their compliance with the current regulatory and other acts on safety.

While comparing both options for SNF and SAA management, the SNRCU noted the advantages of the second option relative to handling operations to prepare SNF and SAA for transport because:

- *SFA division is not envisaged and there is possibility less number of handling operations with fuel that results in decrease of SFA damage and dose burgen on the personnel involved in operations with SNF and SAA;*
- *The issue on SAA long-term storage is solved, as well as the problem of storing damaged SNF;*
- *Progress of the existing cracks and new defects in CSM doubts the possibility of safe long-term storage of SNF.*

The SNRCU notes that ChNPP has not determined a final option for SNF and SAA management.

Taking into account the approaches identified in these conceptual decisions to SNF and SAA management, the SNRCU returned to the applicant the "Conceptual Decision on Modification of ISF-2 Design" and the "Conceptual Decision on "Modification of a Nuclear Facility. Handling of Damaged Spent Nuclear Fuel at Chornobyl NPP" for correction.

At the same time, the SNRCU suggested to the Ministry for Emergencies and Public Protection against Consequences of the Chornobyl Disaster of Ukraine, as a state management body and ChNPP, as an operating organization, carry out a comprehensive analysis of all aspects (safe management of SNF and SAA, international and financial aspects) of the SNF and SAA management options. This analysis will result in determination of the most optimal option for SNF and SAA management to implement ISF-2 project in the future.

Radioactive Waste Management

RADIOACTIVE WASTE MANAGEMENT AT OPERATING NPPS

RADIOACTIVE WASTE MANAGEMENT AT ZNPP

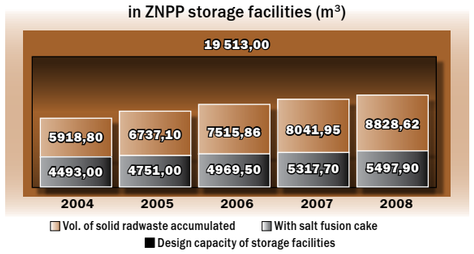
Solid and liquid radioactive waste are created during operation of ZNPP units and planed outages.

Before reuse liquid radioactive waste is treated in water treatment systems, then water returns to the technological process and final treatment products (secondary radioactive waste – vat residue (evaporation concentrate), slurry, used sorbents, salt fusion cake etc.) are transferred to liquid radioactive waste storage facilities for cooling and temporary storage.

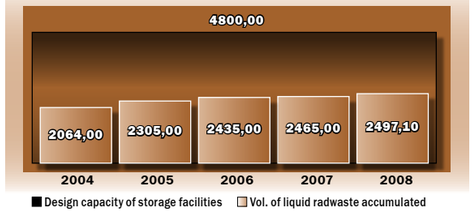
Volumes of Liquid Radwaste Generated at ZNPP in 2008:
- Salt fusion cake – 15,0%;
- Vat residue – 83,8%;
- Slurry – 0,4%;
- Used sorbents – 0,8%

Volumes of Solid Radwaste at ZNPP in 2008 :
- low-level waste – 98,0%;
- intermediate-level waste – 1.7%;
- high-level waste – 0,3%

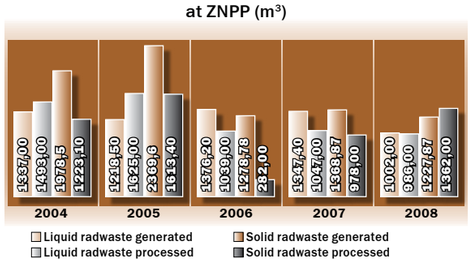
Accumulation of solid radwaste in ZNPP storage facilities (m³)



Accumulation of liquid radwaste in ZNPP storage facilities (m³)



Dynamics of Radwaste Generated and Processed at ZNPP (m³)



Nowadays ZNPP operates the following radwaste processing facilities:
- *2 deep evaporators (processing of vat residue (evaporation concentrate);*
- *Solid radwaste incinerators;*
- *Solid radwaste compaction unit;*
- *Solid radwaste sorting unit.*

In the framework of the international assistance it is planned that a radwaste processing complex will be commissioned at ZNPP in 2011. This complex will include an incinerator, a supercompacting unit, and a fragmentation unit. Appropriate tenders were carried out in the European Commission and organizations were determined that would manufacture and supply relevant equipment in 2008.

To receipt and store temporarily liquid radwaste, ZNPP operates iron reservoirs from 100 to 750 m³ in volume that are placed in separate rooms of active water treatment buildings.

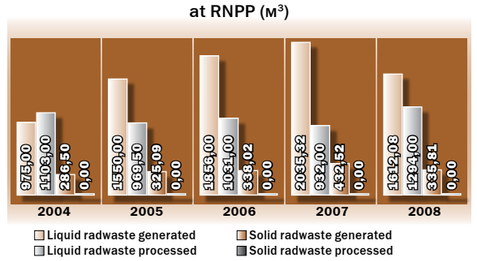
To collect and store solid radioactive waste resulting from units' operation, there are special storages that are also located in active water treatment buildings. These storages are cells closed with lockable hatches to prevent the spread of radioactive contamination and limit exposure to personnel, release of radionuclides into the environment. The dynamics of radwaste accumulation in NPP storage facilities is presented below.

RADIOACTIVE WASTE MANAGEMENT AT RNPP

Floor drains from power units, active water treatment buildings and laundries remain the main sources of liquid radwaste at RNPP in 2008.

Generation sources of so-called "secondary" liquid radwaste (vat residue (evaporation concentrate), slurry, used sorbents, etc.) are similar to other operating NPPs.

Dynamics of Radwaste Generated and Processed at RNPP (м³)



The main volumes of solid radioactive waste at RNPP are generated during scheduled repairs (replacement of heat insulation, repair of equipment, decontamination activities, etc.).

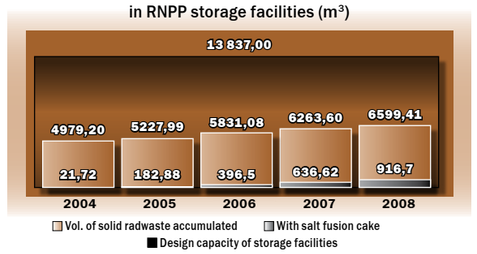
Volumes of Liquid Radwaste Generated at SS RNPP in 2008:
- Salt fusion cake – 11,8%;
- Vat residue – 83,0%;
- Used sorbents – 0,2%

Volumes of solid radwaste generated at SS RNPP in 2008 :
- low-level waste – 94,0%;
- intermediate-level waste – 4,0%;
- high-level waste – 2,0%

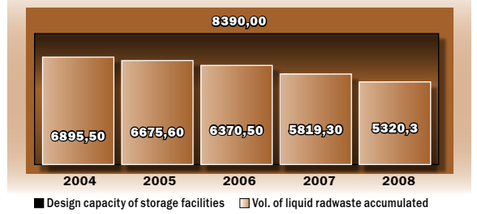
SS RNPP operates the following radwaste processing facilities:
- *Centrifugation facility (flood drains processing);*
- *Two deep evaporation facilities (processing of vat residue (evaporation concentrate).*
- *In 2012 under the international assistance it is planned to commission the solid radwaste processing plant which includes:*
- *Retrieval facilities;*
- *Fragmentation and sorting facilities;*
- *Supercompactors;*
- *Radiation monitoring systems for the radioactive waste management.*

Based on results of the tender carried out by the European Commission, contracts on manufacture and supply of appropriate equipment were signed with organizations-winners of tenders.

Accumulation of solid radwaste in RNPP storage facilities (m³)



Accumulation of liquid radwaste in RNPP storage facilities (m³)



For receipt and temporary storage of liquid radwaste RNPP operates iron reservoirs from 100 to 750 m³ in volume that are placed in separate rooms of active water treatment buildings.

In order to collect and store solid radioactive waste resulting from units' operation, there are special storages that are also located in active water treatment buildings. These storages are cells closed with lockable hatches to prevent the spread of radioactive contamination and limit exposure to personnel, release of radionuclides into the environment. The dynamics of radwaste accumulation in NPP storage facilities is presented below.

RADIOACTIVE WASTE MANAGEMENT AT SUNPP

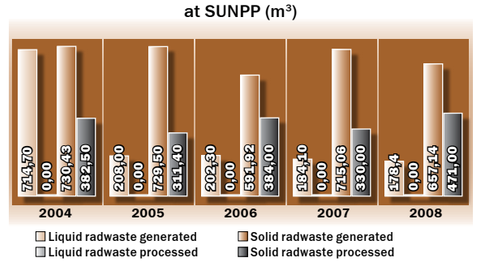
Laundries, floor drains from power units are the main sources of liquid radwaste at SU NPP in 2008.

The main types of "secondary" liquid radioactive waste are vat residue (evaporation concentrate) and used sorbents resulting from active waste treatment building, they are temporary stored in appropriate storage facilities to be cooldonw and prepared for their transformation into a solid state and transported to specialized enterprises for disposal are.

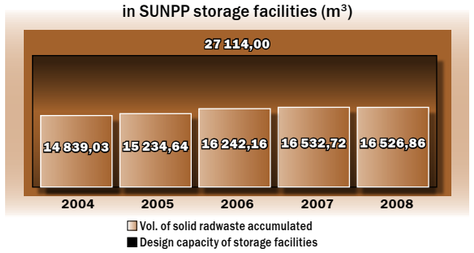
Volumes of Liquid Radwaste Generated at SU NPP in 2008 :
- Vat residue – 94,0%;
- Used sorbents – 6,0%

Volumes of Solid Radwaste Generated at SU NPP in 2008:
- low-level waste – 98,0%;
- intermediate-level waste – 1.7%;
- high-level waste – 0,3%

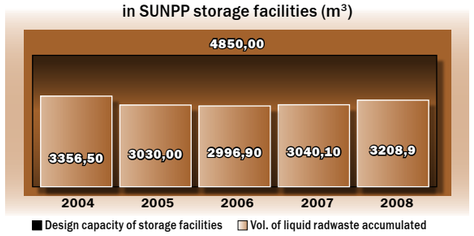
Dynamics of Radwaste Generated and Processed at SUNPP (m³)



Accumulation of solid radwaste in SUNPP storage facilities (m³)



Accumulation of liquid radwaste in SUNPP storage facilities (m³)



The main volumes of solid radioactive waste at RNPP are generated during scheduled repairs (replacement of heat insulation, repair of equipment, decontamination activities, etc.).

The Figure shows that the volume of solid radwaste generated was reduced at SU NPP under implementation of certain measures for minimizing radwaste generation levels

SU NPP operates the solid radwaste compaction unit.

For receipt and temporary storage of liquid radwaste SU NPP operates iron reservoirs from 190 to 500 m³ in volume that are placed in separate rooms of active water treatment buildings.

In order to collect and store temporary solid radioactive waste resulting from units' operation, there are special storages that are also located in active water treatment buildings. The dynamics of radwaste accumulation in NPP storage facilities is presented below.

RADIOACTIVE WASTE MANAGEMENT AT KHNPP

Floor-drain water from the power units and special storage buildings remains the main source of liquid radioactive waste at KhNPP.

Similarly to other NPPs, end products of liquid radwaste processing – so-called "secondary" liquid radwaste (vat residue (evaporation concentrate), sludge, used sorbents and etc.) are sent to liquid radwaste storage facilities for cooling and temporary storage.

Volumes of Liquid Radwaste Generated at KhNPP in 2008:
- Salt fusion cake – 14,0%;
- Vat residue – 85,0%;
- Oil – 1,0%

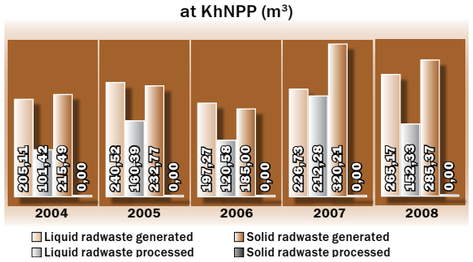
Volumes of Solid Radwaste Generated at hNPP in 2008:
- low-level – 99,2%;
- intermediate-level – 0,6%;
- high-level – 0,2%

The main volumes of solid radwaste at KhNPP are generated during the scheduled and preventive maintenance (replacement of heat isolation, equipment repair, decontamination activities etc).

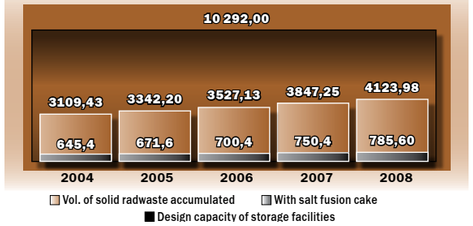
The following radwaste management facilities are operated at KhNPP:
- *deep evaporation facility (processing of vat residue);*
- *radioactive oil incineration facility;*
- *centrifugation facility (processing of floor-drain water).*

Storage facilities in the form of metal tanks of 100 to 400 m³ located in separate rooms of waste storage buildings are used for acceptance and temporary storage of liquid radwaste at KhNPP. A site for module radwaste storage (salt fusion cake) in containers is operated separately.

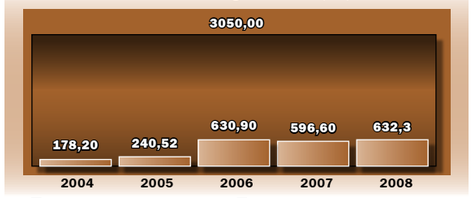
Dynamics of Radwaste Generated and Processed at KhNPP (m³)



Accumulation of solid radwaste in KhNPP storage facilities (m³)



Accumulation of liquid radwaste in KhNPP storage facilities (m³)



Special storage facilities located also in the rooms of the waste storage buildings are designed to collect and store temporarily solid radwaste resulting from power units operation. The disposal facilities are constructed in the form of cells closed with hatches to prevent distribution of radioactive contamination, and limit the personnel exposure. Dynamics of radwaste accumulation in the storage facilities is presented below.

MANAGEMENT OF RADWASTE FROM IONIZING RADIATION SOURCES

The use of ionizing radiation sources (IRS) in the national economy provides generation of radioactive waste. Radwaste should be transferred to the state inter-regional specialized plants (SISP). The waste producers are responsible for the safety of the generated radwaste until the moment of its transfer.

Six state inter-regional specialized plants: Kyiv (KSISP), Odessa (OSISP), Kharkiv (KhSISP), Dnipropetrovsk (DnISP), Lviv (LSISP), and Donetsk (DonISP) are incorporated into the state corporation Ukrainian State Radon Association UkrDO "Radon".

Each specialized plant has its own service area.

Solid radwaste, biological waste contaminated with radioactive materials and disused ionizing radiation sources are transferred to the specialized plants.

The specialized plants do not accept liquid radwaste. The waste is preliminary solidified and then stored as solid radwaste. The liquid radwaste produced by specialized plant is stored in the dedicated tanks.

Solid radwaste is stored in the containers in the storage facilities for solid radwaste.

Biological radwaste is placed separately from solid radwaste in special storage facilities with the use of layered concreting technology.

Spent ionizing radiation sources are stored biologically shielded in the storage facilities for solid radwaste as the ordinary solid radwaste, or without biological shielding in special disposal boreholes.

As of 02 January 2009 the storage facilities of the specialized plants contained:
- *solid low- and intermediate-level radwaste with total mass about 8240 t and total activity about 1.22E^{+16} Bq;*
- *liquid low- and intermediate-level radwaste with total volume about 620 m³ and total activity about 1.94 E^{+12} Bq;*
- *spent IRS in biological shielding 288830 units with total activity about 3,10E^{+16} Bq;*
- *spent IRS without biological shielding 46351 units with total activity about 5,84E^{+14} Bq.*

Dynamics of loading solid radwaste, spent shielded and unshielded IRS into storage facilities of the specialized plants within 2000-2008 is presented in Figure 1-3.

The specialized plants perform their activity based on licenses of the State Nuclear Regulatory Committee of Ukraine issued for radwaste collection, transport, processing and storage. To make a decision on

Figure 1.
Dynamics of solid radwaste loading in storage facilities of the specialized plants

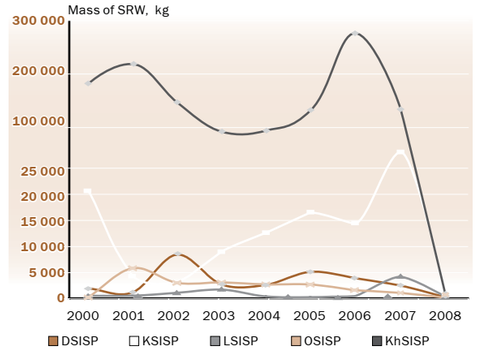


Figure 2.
Dynamics of shielded spent IRS loading in storage facilities of the specialized plants

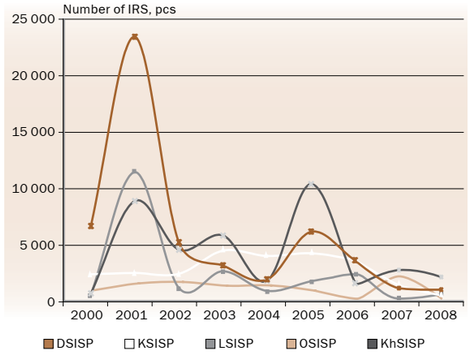
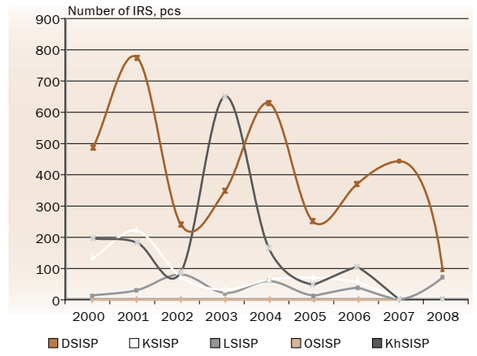


Figure 3.
Dynamics of unshielded spent IRS loading in storage facilities of the specialized plants



further management of "historical radwaste" located in the facilities of the specialized plants, the licensees should make safety assessment of existing facilities.

Reference levels of individual doses for personnel of category A, reference levels of permissible radionuclides concentration in the air of working areas, and reference levels of radiation monitoring parameters for category B were not exceeded in 2008 at the specialized plants.

RADIOACTIVE WASTE MANAGEMENT IN THE EXCLUSION ZONE

The Chornobyl Exclusion Zone is a part of Ukrainian territory contaminated with radionuclides as a result of Chornobyl accident. This radwaste varies greatly on its radionuclide composition and specific activity levels.

Total radwaste volume (Shelter excluded) is about 2.8 million m^3; over 2.0 million m^3 of it with total activity of about $7x10E^{+15}$ Bq is located at radwaste disposal sites (RWDS) and radwaste interim confinement sites (RICS).

The main radwaste management enterprises in the Exclusion Zone are State Specialized Enterprises "Complex" and "Technocenter" which are the operating organizations of radwaste disposal facilities and have appropriate licenses of the State Nuclear Regulatory Committee of Ukraine.

signed capacity of 15 000 m^3 was increased as agreed with the regulator) is about 40 000 m^3. In this regard the Ministry for Emergencies, as a state body responcible for radwaste management, has made a decision to reconstruct the "Buryakivka" RWDS by constructing six additional trenches to place 120k m3 of radwaste.

At the **"Pidlisny" RWDS** (operated from December 1986 to 1988) modules A-1 and B-1 with total capacity 22880 m^3 are partially filled with long-lived high-level radwaste (volume - 3960 m^3, activity - 1,0 E^{+15} Bq) and low- and intermediate-level radwaste (volume – 7040 m^3, activity - 2,5 E^{+12} Bq).

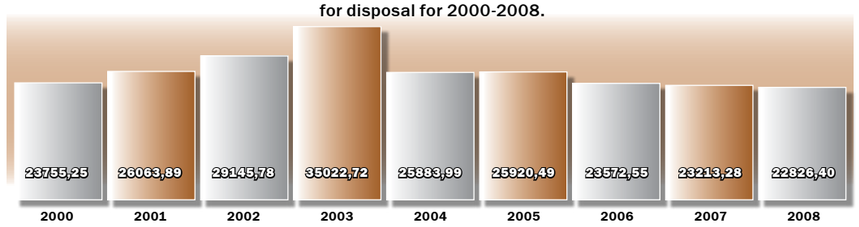
At the **"ChNPP Stage III" RWDS** (operated till the end of 1986) radwaste with total volume of about 26200 m^3 and activity $3,91E^{+14}$ Bq is placed.

The "Pidlisny" and "ChNPP Stage III" RWDS are not operated; "Complex" performs routine safety activities at the sites. Radiation and environmental monitoring of the RWDS environment detected no exceeding of reference levels for radionuclide contamination of air and soil.

In 2008 "Complex" analyzed the safety of the "ChNPP Stage III" RWDS and disposal facilities of the "Pidlisny" RWDS. The mentioned work was performed within the development of the projects for closure of the "ChNPP Stage III" RWDS and the "Pidlisny" RWDS to comply with the special conditions of license.

RICS is composed of trenches and clamps with radioactive waste. Total number of the revealed trenches is about 1000 units. "Complex" performs activities

Figure 4. Dynamics of solid radwaste transfer to the Buryakivka RWDS for disposal for 2000-2008.



The "Complex" collects, processes and transports radwaste in the Exclusion Zone, operates the Buryakivka RWDS, monitors conservated Pidlisny RWDS and ChNPP Stage III RWDS, monitors RICS.

RWDS and RICS in the Exclusion Zone were formed under the extreme post-accident conditions in 1986. That is why the first-priority directions of the licensed activity of Complex is maintaining of RWDS and RICS in the safe condition.

"Buryakivka" RWDS was constructed in 1986 right after the Chornobyl accident and has been operated since 1987.

As of 01 January 2009 radwaste with total mass of about 1130.5 thousand tons and total activity $2.47x10E^{+15}$ Bq (estimated value) was located in the "Buryakivka" RWDS. Design capacity of the Buryakivka RWDS is about to be exhausted – the remained free volume of 30 design trenches of 22 000 m^3 each (depon RICS examination, certification and radwaste redisposal from them. In particular, research and industrial work on radwaste re-disposal from the trench "Naftobaza RICS" has been performed.

Despite the fact that in 2008 the costs provided for closure of the "Buryakivka" RWDS trenches No. 25, 27 and 28 (completely filled with radwaste) were allocated in full scope, "Complex" did not provide isolation of the trenches and appropriate control of compliance with the closure technologies in due time. As a result of violation of rules and standards on nuclear and radiation safety the Director of "Complex" was penalized according to law.

"Technocenter" has the appropriate license and carries out the activity on design and construction of three radwaste disposal facilities (TRO-1, TRO-2 and ENSDF) and the facilities technologically related to them at the "Vector" site ("Vector" – Industrial Complex on Radwaste Decontamination, Transport, Processing and Disposal).

According to the feasibility study the Complex "Vector" should be constructed in two stages. Stage I is intended for disposal of short-lived radwaste resulted from Chornobyl accident. The design provides for construction of 13 disposal facilities of TRO-1 type, and 40 disposal facilities of TRO-2 type within Stage I.

To speed up the "Vector" commissioning, the Startup complex was separated from the design of Stage I; it includes the infrastructure facilities and one radwaste disposal facility of each type (TRO-1 – for radwaste disposal in ferroconcrete containers, TRO-2 – module – for radwaste disposal in bulk). The infrastructure facilities of the Startup complex should also provide operation of the engineered near-surface disposal facility for solid radwaste ENSDF (LOT-3 ICSRM) constructed at the "Vector" site and funded by the European Commission within the ChNPP decommissioning program.

In 2008 the following documents submitted within the licensing process on the Complex "Vector" Stage I radwaste disposal facilities operation were considered for disposal facilities TRO-1 and TRO-2:

- *safety analysis report for disposal facilities TRO-1, and TRO-2 taking into consideration the design documents related to amending the design of the Complex "Vector" Stage I: "Main amendments and technical decisions on design", "Main amendments to technical decisions", "Main amendments to construction decisions";*
- *emergency plan of the Complex "Vector" (common for TRO-1, TRO-2 and ENSDF),*
- *design document as regards the Complex "Vector" dose monitoring system.*

One of the main issues to be solved in the licensing process as regards operation of the radwaste disposal facilities – ENSDF and TRO-1, TRO-2 – is to assess total long-term impact of these and other facilities planned at the "Vector" site.

ChNPP is a radwaste supplier to ENSDF. To fill TRO-1 and TRO-2 disposal facilities the operating organization should cooperate with the suppliers who will collect, remove, certify, sort, process and condition radwaste from Exclusion Zone in order to prepare it for disposal in the Complex "Vector" Stage I disposal facilities.

Vector complex Stage II is constructed for:

- *processing and long-term storage of long-lived radioactive waste resulting from Chornobyl accident;*
- *disposing short-lived radioactive waste resulting from the Shelter operation and waste to be generated during the Shelter transformation into an ecologically safe system;*
- *disposing short-lived radioactive waste resulting from NPP operation and waste to be generated at decommissioning of all NPPs;*
- *disposing or long-term storage of radwaste generated at industrial enterprises, medical, research and other institutions;*
- *disposing high-level radioactive waste produced as a result of processing spent nuclear fuel of Ukrainian NPPs in the Russian Federation.*

In 2008, the feasibility study of the Complex "Vector" Stage II investment was endorsed by stakeholders in order to submit it to the Cabinet of Ministers of Ukraine for approval as a basis for designing and constructing the radwaste management facilities.

Before designing specific facilities within Stage II, Technocenter should develop and endorse by the State Nuclear Regulatory Committee of Ukraine the following documents:

- *implementation strategy for the Complex "Vector" Stage II which, in particular, will determine an optimized radwaste management scheme, priority of the facilities design and construction, their capacity, lifetime, appropriate technologies etc., based on the more accurate assessment of radwaste volumes and characteristics;*
- *document with integral system of permissible (design) levels as regards limitation of Stage II facilities radiation impact for their operation period and after closure of the radwaste disposal facilities.*

Shelter Transformation Into Ecologically Safe System. Chornobyl Npp Decommissioning

SHELTER SAFETY STATE

To improve the Shelter safety and transfer it into an ecologically safe system in 2008:

- *Urgent stabilization measures were completed;*
- *Light cover over the Shelter central hall was repaired;*
- *Development of the "Document on Safety under the Concept of the First Startup Complex of New Safe Confinement"(DBKP) was completed;*
- *Working design for new ventilation piping of ChNPP II stage was agreed upon;*
- *Activities were started within the agreed projects on preparatory work for new safe confinement (NSC) construction: cleaning of territory, dismounting and transfer of buildings, excavation for construction of NSC foundations at the Shelter site;*
- *Practical activities were continued on creation of the Shelter integrated automated monitoring system;*
- *Measures were taken on Shelter physical protection upgrading;*
- *Working design on the Shelter fire protection system was endorsed.*

URGENT STABILIZATION MEASURES WERE COMPLETED ON SHELTER

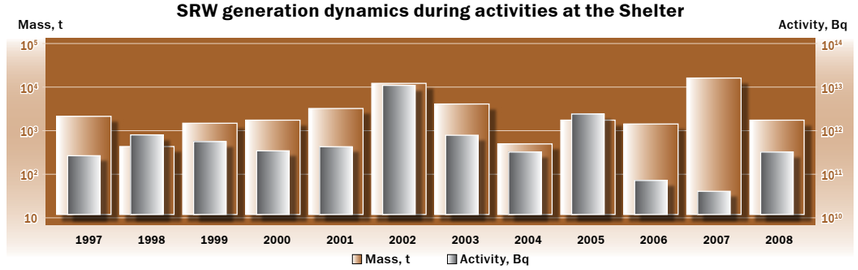
Shelter activities are carried out under License EO No. 000033 issued by the State Nuclear Regulatory Committee of Ukraine to Chornobyl NPP in December 2001. The license established the scope of authorized activity, its conditions for Shelter transformation into an ecologically safe system within the Shelter Implementation Plan (SIP).

Shelter nuclear safety is ensured through a system of administrative and technical measures and routine monitoring of fuel-containing materials (FCM), which must be remained sub critical and a self-sustained chain fission reaction must be prevented by introducing neutron-absorbing mixtures.

The Shelter safety is permanently assessed through routine measurements of FCM monitoring parameters (exposure dose rate of γ-radiation, neutron flux density).

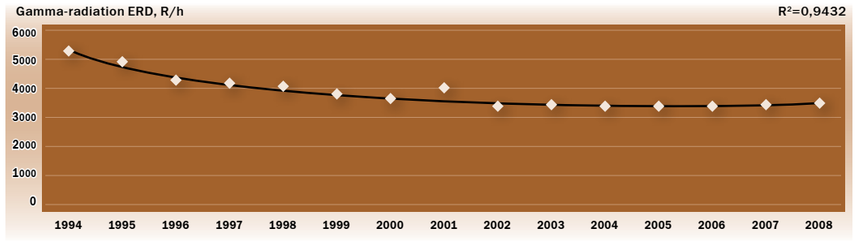
In 2008, monitoring systems recorded no incidents caused by changes in the above FCM parameters. Exposure dose rate of γ-radiation and neutron flux density in FCM accumulations have not essentially changed and remain within the indicators for previous years.

SRW generation dynamics during activities at the Shelter



In 2008, radiation indicators tended to be stable. Reference levels of γ-radiation exposure dose rate and radioactive contamination were not exceeded at off-site facilities, site and Shelter attended and periodically attended premises. Shelter releases and radioactive airborne concentrations in Shelter premises and on adjacent territories did not exceed reference levels.

Dynamics in the registered maximum values of γ-radiation EDR in cooling pool.



Observation of dynamics in concentration of radionuclides in water accumulations inside the Shelter was continued. This is due to the destruction of lava-like FCM and leaching of uranium and plutonium from them. Uncontrolled accumulation of such water (liquid radioactive waste (LRW)) leads to greater migration of radionuclides in Shelter premises and outside it. In order to decrease the volume of water penetrating inside the Shelter, in the second half of 2008 the ChNPP completed repair of the light roof over the Shelter central hall.

Mixed construction waste resulted from dismounting of Pilot Wall Berm, preparation of the territory for construction of the Shelter new safe confinement, and upgrading of the physical protection system is the source of solid radwaste generation source during the Shelter activity.

As compared with 2007, the total amount of solid radwaste resulting from Shelter operation and SIP activities increased by 549 tons and made up 1383 tons with total activity 2,51E^{+11} Bq that is by 1,93E^{+11} Bq higher than in 2007. This is conditioned by fulfillment of large scope of preparatory activities for NSC design.

Shelter liquid radwaste is generated in the decontamination of rooms, equipment and tools, dust suppression, operation of check points and results from natural factors: penetration of precipitation into the Shelter through loose places and moisture condensation.

As compared with 2007, the volume of liquid radioactive waste removed from the Shelter in 2008 decreased by 20 m^3 and made up 2818 m^3 with total activity 7,54E^{+10} Bq that is by 1,45E^{+9} Bq higher than in 2007.

During Shelter activities, radiation and dosimetric monitoring is ensured, as well as accounting for dose loadings of ChNPP personnel and subcontracting organizations.

In 2008 the average individual dose of ChNPP personnel worked at the Shelter did not exceed previous year values and is 2,05 mSv, that is 73% of the level in 2007.

The average individual doses of subcontracting personnel were reduced by about 23% as compared with previous year and made up 4,50 mSv.

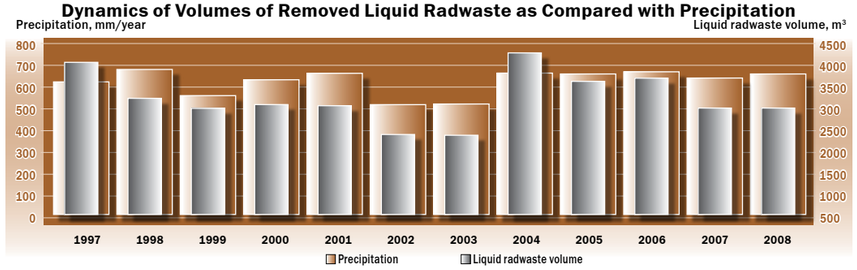
Representatives of the ChNPP State Nuclear Safety Inspectorate and SNRCU Department on Radwaste Safe Management and Decommissioning supervise the safety of Shelter-related activities.

SHELTER NEW SAFE CONFINEMENT

The New Safe Confinement for the Shelter (NSC) is one of the main SIP designs.

In 2008 ChNPP continued preparatory activities under construction of the first start-up complex of the

Dynamics of Volumes of Removed Liquid Radwaste as Compared with Precipitation



Shelter New Safe Confinement (NSC SC-1). In May the Pilot Wall Berm was removed to prepare the southern area of the Shelter territory for NSC foundations. In the second part of 2008 ChNPP started practical activities to clean the territory, transfer buildings and structures, perform excavation within the Shelter site to construct NSC foundations.

In December 2008, the SNRCU under comprehensive state review considered and endorsed the construction design for a new ventilation pipe of ChNPP II stage. The existing pipe prevents from construction of NSC and is to be dismantled. A new ventilation pipe is to be installed before new safe confinement shifting to the designed position.

In the framework of its activity the SNRCU considered the compliance with safety requirements during NSC construction to be the priority task to protect personnel, the public and the environment against ionizing radiation impact.

The SNRCU carries out nuclear and radiation safety review of designs for NSC construction, state supervision over compliance with safety requirements at practical activities, involvement of other regulatory bodies into the review of designs in appropriate safety areas: the Ministry of Health of Ukraine, the Ministry for Regional Development and Construction of Ukraine (Minregionbud), the Ministry of Environmental Protection of Ukraine, the State Committee of Ukraine on Industrial Safety, Labor Protection and Mining Supervision (Derzhgirpromnahlyad) and the State Fire Safety Department of the Ministry of Internal Affairs of the Ministry of Emergencies of Ukraine (Derzhpozhbezpeky).

The SNRCU implemented and carried out regular meetings between the Joint Coordination Team with the participation of ChNPP and NSC –SC-1 Contractor– "Novarka" to improve effectiveness of the state regulation on nuclear and radiation safety under NSC SC-1 activity and to reduce regulatory risks under this design.

In January 2009 the SNRCU endorsed the Document on safety developed by the Consortium Novarka under the Concept of NSC SC-1 (DBKP) that showed the minimal compliance with the tasks aimed at reduction of regulatory risks under this design.

Further decrease in regulatory risks has to be ensured at subsequent stages of the design through consideration of comments of expert conclusions to DBKP, interaction of ChNPP, Contractor of the NSC first startup complex, regulatory bodies and their support organizations.

SHELTER STRUCTURAL STABILIZATION

The Shelter containment is a combination of "old" structures of the destroyed Chornobyl NPP unit No. 4 and "new" structures erected after the accident. In 2008 the stabilization design of the Shelter building structures (containment) was completed.

Structures of this unique construction serve as a physical barrier against radioactive and ionizing radiation releases into the environment and limit atmospheric impact on internal structures, accumulation of fuel containing materials, other radioactive waste inside the Shelter. Durability and lifetime of these structures is very urgent to ensure the Shelter nuclear and radiation safety.

There were carried out 7 urgent stabilization measures, and in 2008 also the light roof over the Shelter central hall was repaired. The activities performed were aimed at stabilizing beams B1/B2 support areas (strengthening of the Shelter western fragment), deaerator stack framework, northern and southern shields, southern shields - "rabbles", supporting areas of the Mamont beam.

At the end of October 2008 resulting from urgent stabilization measures and repair of the light roof, the State acceptance commission accepted the facility into operation after the activities carried out.

Safe operation life of the stabilized Shelter structures is 15 years. It is planned that a new safe confinement will be constructed which will allow dismounting of the Shelter non-stable structures and carry out efforts to remove fuel containing materials from it.

CHORNOBYL NPP DECOMMISSIONING

ChNPP units 1, 2 and 3 are in the stage of operation termination. Unit 1 was shut down in November 1996, unit 2 in October 1991 and unit 3 in December 2000.

For reference: operation termination is the final stage in the operation of a nuclear installation over which nuclear fuel is completely removed from it or is placed in spent fuel storage facilities designed for long-term safe storage of spent nuclear fuel.

On September 26, 2007 the SNRCU endorsed the Chornobyl NPP decision "On possible extension of operation of unit No 1 systems affecting upon SNF and radwaste management beyond the design lifetime till the unit critical components be investigated".

On December 19, 2008 the SNRCU Board considered lifetime extension of ChNPP unit No. 2 systems and components related to spent nuclear fuel storage and radioactive waste management beyond the designed period.

Taking into account positive conclusions of the state nuclear and radiation safety review, the "Decision on the possible lifetime extension of ChNPP unit No. 2 systems affecting upon safe management of spent nuclear fuel and radioactive waste beyond the designed period" and unit No. 2 inspection results, the SNRCU Board recognized that the state of the unit systems and components related to storage of spent nuclear fuel and radioactive waste management allows their safe operation beyond the design lifetime till 21 December 2018.

In March 2008 ChNPP developed and the SNRCU endorsed the "Chornobyl NPP Decommissioning Program" (henceforth – Decommissioning Program) which:

- *Describtion in detail and justification of the selected decommissioning strategy for Chornobyl NPP units – "postponed dismounting" that provides for the following stages:*
  - *complete closure and preservation of reactor facilities – 2013-2022;*
  - *cooldown of reactor facilities – 2022-2045;*
  - *reactor facilities dismounting – 2046-2064;*
- *establishes the priority, duration and the main content of stages describing qualitative state of the facility after each stage;*
- *includes information needed to apply this document as a Guide for Chornobyl NPP power units decommissioning;*
- *establishes an hierarchic documentation system (from general to specification) to be developed under decommissioning.*

The main objective of the Decommissioning Program is to ensure strategic planning of activities, cost estimate, human sources including all necessary justification that will allow starting the development of individual Decommissioning projects. In the framework of the project under technical cooperation with IAEA in 2008 expert mission was carried out associated with consideration and discussion of ChNPP proposals to structure and content of "Decommissioning design. Stage of final closure and preservation of Chornobyl NPP units No. 1, 2, 3". Resulting from the mission, IAEA experts submitted the report including recommendations. It is planned that the abovementioned design will be developed by 2011.

RADIOACTIVE WASTE MANAGEMENT AT CHNPP

Radioactive waste management at "Chornobyl NPP" is implemented according to the conditions established in the licenses of the State Nuclear Regulatory Committee of Ukraine:

License EO No. 000040 of 22 March 2002 to decommission Chornobyl NPP;

License EO No. 000033 of 30 December 2001 to operate the Chornobyl Shelter;

License OV No. 000334 of 23 August 2006 to transport radioactive materials.

Liquid radioactive waste resulting from the previous operation is stored in two storage facilities at ChNPP site which are connected with each other by special piping for liquid radioactive waste transportation, and in temporary storage for spent radioactive oil.

As of the end of 2008, the ChNPP liquid radioactive waste storage facilities contained: 13214 m^3 of vat residue (evaporation concentrate), 4054,90 m^3 of spent ion-exchange resins, 2258,12 m^3 of pearlite pulp, 104,8 m^3 of spent radioactive contaminated oil. Total volume of accumulated liquid radioactive waste is 19631,82 m^3.

During 2008, 57 m^3 of vat residue (evaporation concentrate), 30,25 m^3 of spent ion- exchange resins, 5,60 m^3 of pearlite pulp were produced at ChNPP and transported for storage.

Solid radioactive waste resulting from ChNPP operation and mitigation of the 1986 accident is stored in the solid radioactive waste storage facility at the ChNPP site that is designed to store solid radioactive waste of activity groups I, II and III. The solid radioactive waste storage facility is a surface concrete structure divided into three groups of sections. The storage compartments are conserved and the storage facility does not receive radioactive waste since the industrial complex for solid radwaste management is being constructed. The total volume of solid radwaste in the liquid radwaste storage facility is as follows: 1096 m^3 – of group I waste, 926,5 m^3 - of group II waste, 506,93 m^3 – of group III waste.

Low- and intermediate- level solid radwaste resulting from unit operation termination and Shelter transformation into an ecologically safe system is transferred to the "Buryakivka" radwaste disposal site (RWDS) of the "Complex" in the Exclision Zone. In 2008, 3016,50 m^3 (3003,50 t) of low-level waste was transported to the "Buryakivka" RWDS for disposal.

High –level waste is collected into containers (KTZV-0.2) designed to transport and store solid radwaste of group III and is placed into the special temporary storage for solid high-level waste at ChNPP site. In 2008, the temporary storage facility for solid high-level did not receive waste for storage.

** The first startup complex of NSC (NSC SC-1) is a protective building with process systems of life support and necessary infrastructure (Strategy for NSC design further implementation).*

The temporary storage facility for solid high-level waste accommodates approximately 0,81 m³ of high-level and long-lived solid waste with the total activity of about 0.5 TBq.

RADIOACTIVE WASTE MANAGEMENT INFRASTRUCTURE AT CHORNOBYL NPP

Infrastructure facilities for radwaste management are constructed at the ChNPP site within international assistance projects for Chornobyl NPP decommissioning. They include:

Liquid radwaste treatment plant (LRTP);

Industrial complex for solid radwaste management (ICSRM) consisting of:

- **Lot 1**- solid radwaste retrieval facility,
- **Lot 2** – solid radwaste processing plant,
- **Lot 0** - temporary storage for low- and intermediate-level long-lived and high-level radwaste designed for interim (during 30 years) storage of long-lived and high-level radwaste that will result from in sorting at Lot 2, as well as for storage of high-level radwaste resulting from preparatory activities for NSC construction,
- **Lot 3** – ENSDF - engineered near-surface disposal facility for solid radwaste constructed at the "Vector" site with the capacity of 50250 mi for disposal of conditioned ChNPP radwaste: concrete containers from Lot 2 and 200 liter drums of LRTP.

The liquid radwaste treatment plant (LRTP) is intended to process radwaste resulting from ChNPP operation and mitigation at the ChNPP of the 1986 accident, and to process liquid radwaste to be generated in ChNPP decommissioning.

In 2006 the contract was terminated with the contractor (international consortium of Belgatom/SGN/Ansaldo) because of failure to fulfill contractual obligations. In 2007 after the meeting of the Assembly of Donors to the Nuclear Safety Account, activities on LRTP design were renewed. In accordance with the "Strategy for completion of the liquid radwaste treatment plant" approved at this meeting, the work to be done is divided into four packages, which will be performed by national contractors after tendering and contracting in compliance with EBRD rules. This work covers: a number of modifications to the project, particularly, relative to the liquid radwaste retrieval from storage tanks and its transport to LRTP for processing; creation of the automated process control system; revision of liquid radwaste treatment prescriptions to optimize them and to bring cemented radwaste into the compliance with the acceptance criteria for disposal in ENSDF; development of a final safety analysis report.

In 2008 only the contract with OJSC KIEP (Kyiv Institute Energoproekt) was concluded for design activities. Tendering for other activities is postponed till 2009.

Currently, the facility is not completed and ChNPP performs operational maintenance of systems and equipment.

"Vector" site

Industrial complex for solid radwaste management (hereinafter ICSRM) is funded by the European Commission within TACIS Program and by contribution from the State budget of Ukraine.

During 2008 construction activities at LOTs 1, 2 are completed, almost all equipment is mounted, Contractor carried out individual tests of mounted systems and equipment. To carry out "active" tests, ChNPP has to obtain an individual written permit of the SNRCU for Lots 1, 2 commissioning after "non-active" comprehensive tests.

Contractor performed the whole scope of activities provided for by the contract (Amendment No.4) relative to construction of temporary storage facility LOT 0 in view of which the "Certificate on LOT 0 acceptance within ICSRM" was signed and the report on the "non-active" comprehensive startup testing results was issued. To avoid delays in licensing of this temporary storage facility, the SNRCU initiated reviewing draft safety analysis report for LOT 0 submitted by ChNPP.

The construction of LOT 3 disposal facility (ENSDF) at the Vector site has been completed. The certificate of the State Acceptance Commission on commissioning the constructed facility was signed on 12 May 2008. The infrastructure facilities that have to ensure ENSDF operation are common for ENSDF and the first start-up stage of the Complex "Vector". A number of them are constructed and accepted by the State Acceptance Commission.

In August 2008 the SNRCU considered the Technocenter application to obtain a license for ENSDF operation and a package of licensing documents.

Resulting from NRS review results, the SNRCU provided detailed comments to the main licensing documents - ENSDF Safety Analysis Report (Revision 1) and Acceptance Criteria (Revision 3) to be taken into account by a Licensee while their revision. Under these conditions and resulting from leaks in the drain gallery and other drawbacks detected during inspection it is recommended that Tekhnocenter revise the package of licensing documents.

In order to be sure that safety objectives related to the subsequent operation of ENSDF are achieved, the SNRCU has initiated involvement of the European Commission, as an investor of ICSRM project implementation, into discussion of urgent issues relative to licensing of ENSDF facility under participation of all stakeholders.

The SNRCU has arranged and carries on a dialogue with Technocenter relative to appropriate revision of the package of licensing documents in the following aspects: long-term safety of the disposal facility, design decisions, operational safety, acceptance criteria.

Taking into account that ICSRM and LRTP facilities represent a single technological complex, ChNPP and Tekhnocenter have to establish and ensure observance of the monitoring procedures and methods for LRTP and LOT 2 products characteristics.

Safety In Use Of Ionizing Radiation Sources

An ionizing radiation source (hereinafter - IRS) is a physical object containing radioactive substance or a technical device which generates or can generate ionizing radiation under certain conditions. Radioactivity is first of all the energy represented as invisible waves or particles that are called radiation.

Why ionizing radiation sources are hazardous? Radiation technologies, as any other technologies, are related to significant benefits for mankind and, in so doing, to certain risks. High exposure doses can jeopardize human health or cause cancer or genetic anomalies. Therefore, benefit of IRS applied in medicine, industry, scientific research etc. must be significantly higher as compared with potential harm related to additional human exposure. It is also obvious, that it is necessary to prevent possible accidents.

Failure to comply with safety standards and rules in the use of IRS may cause routine or potential exposure of personnel and/or the public and contamination of the environment.

In order to decrease the probability of radiation accidents, systems for state regulation of radiation safety are established in the world.

Ukraine, like most other countries, performs regulatory control over IRS and associated legal activities. IRS use at the territory of Ukraine is based on a authorizing (licensing) principle whose objective, in compliance with the legislation, is to:

- *ensure use of those IRS that meet the internationally recognized requirements based on comprehensive assessment of all the factors affecting the safety, in particular, physical protection;*
- *permit the activity with IRS for those physical persons or legal entities only that can ensure meeting the requirements of the legislation, regulations, rules and standards on nuclear and radiation safety.*

The SNRCU priority tasks in IRS use are to implement preventive measures aimed at restriction of access to IRS to exclude possible IRS loss or theft, ensure observance of the requirements on IRS physical protection, exercise efficient state supervision and licensing of IRS use, and ensure state account and control of IRS, implement safety culture on IRS management.

State regulation (rule-making, supervision, licensing activity) to ensure nuclear and radiation safety and the international safety regimes at the Ukrainian territory is exercised by eight SNRCU State regional inspectorates on nuclear and radiation safety (hereinafter – State inspectorates) covering 27 administrative and territorial units of Ukraine and located in the following cities: Kyiv, Rivne, Ivano-Frankivsk, Odesa, Donetsk, Dnipropetrovsk, Simferopol, Kharkiv.

During 2008, 359 licenses were issued/reissued to implement activity on IRS use. 100 of them are issued to medical institutions which use IRS for diagnostic and therapeutic procedures, 76 licenses – for enterprises which repair and maintain generating devices and equipment containing sealed IRS. Entities that have no licenses obtain prescriptions to terminate the use of IRS, and enforcements are taken according to the established procedure.

Licenses on IRS production activity were obtained by 19 entities: 9 of them manufacture medical generating devices, 6 manufacture industrial and scientific generating devices, 3 – gamma-source units containing sealed IRS; 1 manufactures control IRS.

The state system on account and control of IRS – the State IRS Register is arranged in Ukraine (commercial operation of the Register started March 2007). To ensure state control of and account of IRS, they are recorded in the State Register in compliance with the "Procedure for State Registration of Ionizing Radiation Sources" improved by the Resolution of the Cabinet of Ministers of Ukiraine No. 1718 of 16 November 2000.

By the end of 2008 the information on 25 305 IRS was entered into the Register computerized database: 14 166 – sealed IRS, 289 – open IRS, 10 850 – generating devices; 549 – owners of radionuclide IRS, 2476 – owners of generating devices. Also the information was entered into the Register on import of 254 radionuclide IRS to Ukraine, on 176 manufactured IRS, 250 cases when IRS owner is changed, 361 IRS transferred to the category of radwaste and transported to specialized radwaste management enterprises, 46 X-ray units taken off from registration as those put out of service and written off, 161 sealed IRS and 18 X-ray units exported from Ukraine.

The SNRCU under IAEA support, exercises regular activities to ensure IRS safety and security. Resulting from the IAEA mission conducted in June 2008 a "good practice" was pointed out relative to:

- *Ensuring the state account and control of IRS;*
- *State supervision and licensing of IRS application and production;*
- *Perfection in licensing conditions for medical institutions;*
- *Methodological support to scrap metal suppliers relative to assurance of radiation monitoring.*

The IRRS mission has determined that the system of regulatory activity in the area of "radiation safety" meets mainly the international requirements, however, needs to be improved as regards the state regulation of IRS use safety in medicine, namely:

Improving cooperation between the SNRCU and the Ministry of Health of Ukraine relative to the state regulation of radiation safety;

Bringing health and safety rules into compliance with IAEA standards and Euratom Directives;

Developing state standards for medical equipment with IRS, procedures and methodologies to test this equipment;

Introducing a unified state system for control and account of individual exposure doses.

These aspects are the SNRCU first-priority activities for 2009-2010 and are included to the Action Plan to implement IAEA mission recommendations and suggestions.

In 2008 the SNRCU has carried out activities to ensure effective radiation protection in medicine, namely:

- *Started analyzing practices and legislation of Ukraine and EU countries concerning radiation protection of personnel and patients during IRS medical application;*
- *Completed development and registered in the Ministry of Justice of Ukraine: "Safety Requirements and Conditions (Licensing terms) to Implement the Activity on Ionizing Radiation Sources Use in Radiotherapy" approved by SNRCU Ordinance No.193 of 28 December 2007, registered in the Ministry of Justice of Ukraine, Reg. No.31/14722 of 18 January 2008 and "Requirements to the Quality Control System in Diagnostic and Therapeutic Procedures Using IRS" approved by SNRCU Ordinance of No. 166 of 03 October 2008, registered in the Ministry of Justice of Ukraine, Reg. No.1054/15745 of 29 October 2008;*
- *Provision on Cooperation between the SNRCU and the Ministry of Health relative to Radiation Safety State Regulation was developed and approved by SNRCU and the Ministry of Health of Ukraine approved.*

In the framework of the Ukrainian-Swedish cooperation two international workshops were held in 2008 in Kyiv (28-29 October 2008 and 8-11 December 2008): "Use of PET-technologies in nuclear medicine: technologies, legislation and control" and "Quality systems and quality control in X-ray diagnostics". More than 150 representatives of medical institutions participated in these workshops.

The first-priority areas for future international cooperation is to improve personnel and patients radiation protection through developing in Ukraine and putting the quality control system in medical radiology into the practice of medical institutions; to develop programs to train medical physicists; to improve the licensing system and determining reference dose for single-type radiodiagnosis procedures.

In 2008 the SNRCU has carried out measures to implement Technical Specification of sealed IRS approved by the Resolution of the Cabinet of Ministers of Ukraine No. 1382 of 05 December 2007, namely: the national standards, which in case of voluntary use, prove IRS compliance with the Technical Specification requirements were analyzed and their list was drawn up; proposals on assignment of a body to assess the compliance of sealed IRS with the Technical Specification requirements are submitted to the State Committee of Consumer Standard (Derzhspozhyvstandart).

In accordance with the requirements of the regulatory and legal acts, sources with expired lifetime (spent) are to be transferred to specialized enterprises on radwaste management.

An issue to be solved as soon as possible nowadays is to ensure further safe storage of spent high-level IRS stored involuntary by their owners at sites within a long period of time (over 10 years). Such IRS include high-level sources manufactured mainly to 1990 to be applied in exposure installations of Ukrainian scientific institutions, measurement and diagnostic devices, therapeutic installations. This situation results from a lack of IRS owners' costs to transfer them for subsequent safe storage to specialized enterprises on radwaste management.

To solve this issue the SNRCU made practical and administrative steps to develop the State program "Ensuring safe storage of spent high-level ionizing radiation sources" (hereinafter – Program) approved by the Resolution of the Cabinet of Ministers of Ukraine No.1092 of 03 August 2006.

To fulfill the Resolution of the Cabinet of Ministers of Ukraine No.56-21/999-10 of 19 March 2007 and No.55-21/2386-10 of 16 June 2007, the SNRCU in 2008 developed draft the Resolution of the Cabinet of Ministers of Ukraine "On New Revision of the State Target Program for Ensuring Safe Storage of Spent High-Level Sources of Ionizing Radiation".

Due date of the Program - 2007-2010, approximate amount of budgetary financing is 6,4 million of hryvnyas, including for 2008 - 150 thousand of hryvnyas.

The SNRCU and other central executive bodies made significant efforts to involve the international technical support to implement measures provided for by this Program.

In particular, in 2008 the SNRCU implemented measures to prepare an international technical assistance project "Decommissioning of exposure installations and ensuring of safe storage of ionizing radiation sources".

Jointly with the representatives of German Reactors and Facilities Safety Association (GRS mbH) – the project executor from the German party reviewed and determined a number of scientific institutions and enterprises-bankrupts to be involved in the project.

In the framework of this project in 2009 - 2012 it is envisaged that spent IRS from a number of enterprises be removed, transported and receipt for further storage.

Successful implementation of these projects will allow solving the issue relative to spent IRS and ensure their further safe storage.

RADIATION ACCIDENTS WITH IRS

During 2008, 24 cases of radiation incidents were revealed. 16 of them were the cases of detection of contaminated scrap metal, 2 were related with the loss of IRS, 5 – IRS detection in unauthorized circulation, 1 – loss of regulatory control over IRS as a result of a technological accident (melting) of 1 IRS.

The issue of personnel and patients radiation protection assurance in using IRS for medical purposes is of special concern. It is caused by the following radiation accidents occurred in 2008:

On October 24, 2008, in Municipal institution "Kryvorizhsky Oncology Health Center" an emergency situation - release of two radionuclide ionizing radiation sources of PT-K-11 type with radionuclide Co-60, activity of each 0,12 Ci (4,5E^{+9} Bq) - occurred during therapeutic procedures at gamma-therapeutic equipment AGAT-VZ. Route cause analysis of the accident was made, and 20 medical institutions that use IRS of the same type were informed about the necessity to undertake preventive measures.

On December19, 2008, in Ivano-Frankivsk Regional Oncology Health Center the equipment gate valve failed to close after therapeutic procedure with the use of remote gamma-therapeutic equipment AGAT-R1. As a result, radionuclide source of Co-60 failed to return into a "storage" mode.

The health center personnel took measures according to the "Emergency Action Plan During Gamma-roentgen Therapy in Radiological Department of the Oncology Health Center", namely: the equipment gate valve was closed manually, and IRS was transferred to the "storage" mode, health procedures were stopped, procedural equipment room was locked and sealed. Personnel of the Private Scientific and Production Enterprise "Cobalt-Service" carried out an unscheduled repair. According to preliminary information the IRS failure to return to the "storage" mode was caused by damage of mechanical parts of the gate valve. Gamma-therapeutic equipment AGAT-R1 used in Ivano-Frankivsk oncology health center was manufactured in 1990. Gamma-therapeutic equipment of such type in Ukraine is used in 18 oncology health centers (most of devices were manufactured in 1978-1992 and one device - in 1999).

The State Nuclear Regulatory Committee of Ukraine determined root causes of an accident, developed preventive measures, and informed 18 medical institutions which use IRS of similar type, in order to implement preventive measures.

On May 21, 2008 at OJSC "MK Azovstal" (the city of Maryupol) during a scheduled radiation monitoring it was revealed that the coke humidity detector equipped with IRS No. 385-02-05, contained radionuclide ^{241}Am+Be with activity 1,1E^{+10}Bq, was lost at gravimetric funnel DP 4. It was classified as a radiation accident.

The cause of radiation accident was damage of welded joints in the place of location of equipment with IRS, and as a result, IRS got into blast furnace and was melted.

Appropriate commission was created at the enterprise, and radiation accident investigation was performed. As a result of that investigation, and laboratory examination of metallurgical manufacturing products and environmental samples a conclusion was made that the accident caused no hazardous impact on personnel of the enterprise, population and the environment.

Information on that radiation accident and recommendations regarding necessary safety measures were sent to all metallurgical enterprises of Ukraine.

On November 27, 2008 at SE "Potassium plant" of OJSC "Oriana" (the city of Kalush, Ivano-Frankivsk district) during inspection of observance of radiation safety requirements, West State Inspectorate detected absence of two IRS with radionuclide Cs-137 embedded into gamma-relay GR-7 with activity of about 5E^{+9} Bq.

Since 2002 OJSC "Oriana" was announced a bankrupt and was at the stage of reorganization, IRS were stored in an unequipped room without meeting the radiation safety requirements and appropriate security barriers. Measures on searching for lost IRS were taken.

To prevent such cases in future, the State Nuclear Regulatory Committee of Ukraine issued the order to regional State Inspectorates to perform extraordinary inspections at all enterprises-bankrupts of Ukraine which used to apply IRS in their production activity, regarding observance of radiation safety requirements, availability of measures on physical protection and appropriate storage of radionuclide IRS, and its transfer to specialized radioactive waste management enterprises.

In the fourth quarter of 2008 the enterprise UkrDO "Radon" carried out work on radiation accident elimination at the site of industrial waste landfill of PP "Ruta" in Kostyantyniv area of Illichivsk village in Donetsk district. 37 containers with radioactive waste of total weight 120 t were loaded and removed. Average specific activity of collected waste reached 107 Bq/kg.

In case of radiation incident and detection of unauthorized circulation of radioactive materials and IRS, preliminary information about the incident should be submitted within one hour to operating duty officer of the State Nuclear Regulatory Committee of Ukraine, and more detailed information should be submitted to the State Inspectorate within one day.

Radiation Accident Elimination at the Site of PP "Ruta"

Uranium Milling Safety

Uranium ore milling and processing on the territory of Ukraine started in late 1940s, and was kept secret, with no ecological safety requirements.

Two enterprises dealt with uranium ore mining and milling at that time: State Enterprise "Eastern Ore Mining and Milling Works (Zhovti Vody, Dnipropetrovsk region) (henceforth – SkhidGZK) and Dnieper Chemical Works (Dnipropetrovsk region).

Today, only SkhidGZK processes uranium ore used for fuel manufacturing for nuclear power plants. The Dnieper Chemical Works ceased its operation in 1991.

Construction of the "State Enterprise Directorate of Novokostyantyniv uranium ore deposits" (SE Directorate) started in 2000 to increase uranium ore mining on the territory of Kirovograd district.

SE SkhidGZK

Currently SE SkhidGZK is the only enterprise that performs full-scale cycle of uranium ore mining and milling in Ukraine. Uranium ore is mined at the Smolino and Ingul mines (Kirovograd region). Uranium ore is processed to obtain uranium ore concentrate (U3O8) at the Hydrometallurgical Plant (Zhovti Vody).

Substantial amount of tailings is generated during uranium ore processing at the Hydrometallurgical Plant, which contain increased amount of natural radionuclides. They are transferred to engineered tailing pits with the help of sludge line. In 2008, uranium ore processing tails were stored at the Scherbakivske Tailing Pit located at a distance of 5 km from the city of Zhovti Vody. As by the end of the year 2008 the Tailing Pit stored $3{,}515xE^{+7}$ of uranium processing tails with total activity of $3{,}8E^{+14}$ Bq. Dust suppression measures are being taken constantly to minimize the Tailing Pit impact on environment. In 2008 SkhidGZK carried out research and industrial testing regarding the use of chemical reagent GIPAN for dust suppression. The obtained positive results confirmed high effectiveness of its use.

SkhidGZK experts monitor permanently the technical state of Hydrometallurgical Plant facilities, carry out radiation monitoring of the environment both at the plant site and in its sanitary protective area, as well as personnel dosimetric monitoring to prevent initiation of emergencies (dust release, sludge line integrity break).

In 2008 no exceeding of reference (administrative) level of personnel individual exposure was detected by SkhidGZK. At the same time, creation of modern personnel dosimetric monitoring system remains urgent at the enterprise. This system will allow receiving of maximally complete and accurate data on personnel individual doses.

In order to solve the above issues SkhidGZK carried out a set of researches on implementing at the enterprise individual dosimetry of radon and its daughter decay products, uranium and long-lived alpha-nuclides using personal dosimeters produced by different manufacturers. Some positive results were obtained, reference levels of radiation hazardous factors were developed at SkhidGZK.

Based on the monitoring results in 2008 no violations of radiation conditions of the environment in the area of the facilities location were detected by SkhidGZK.

Dnieper Chemical Works

Dnieper Chemical Works ("PKhZ") is located in Dniprodzerzhynsk, Dnipropetrovsk district. From 1946 till 1991 uranium ore was processed at the enterprise, and Dniprovsky mineral fertilizer plant used technological liquids with the dissolved uranium production waste as a raw material to produce mineral fertilizers.

Dnieper Chemical Works is located in Dniprodzerzhinsk, Dnipropetrovsk district.

After the Dnieper Chemical Works ceased to process uranium ore, it was restructured. As a result, over 10 different specialized enterprises were created, such as "Barrier", "Smoly", "Tsirkoniy", "PMGZ", "Dnieper Chemical Works", "Polikhim", etc.

The process of sharing the property of enterprises at the site of the former Dnieper Chemical Works started, and continues now, without taking into account the nature of contamination, location, improper maintaining the facilities of the former Dnieper Chemical Works and negative impact of uranium waste accumulated at its site on the environment and health of workers.

Based on radiation monitoring, the contamination of certain building structures and areas is from 0.05 to 10 μSv/h and higher, while the background value is 0.02 μSv/h. As a result, workers of these facilities are exposed to uncontrollable external and internal irradiation.

Engineering buildings of Dnieper Chemical Works including uranium waste storage facilities "Dniprovsk", "Sukhachivsk", "Central Yar", "Zakhidne", Pivdenno-Skhidne", "Baza S", "Lantanova Fraktsiya", "DP-6" are not in operation at present, and the scope of monitoring is insufficient. The most part of these storage facilities is not preserved; their physical protection and radiation monitoring systems were destroyed. This causes hazardous impact on the environment, population and personnel of the enterprises at the site of the former Dnieper Chemical Works.

For rehabilitation and reclamation of the former Dnieper Chemical Works site, the Resolution of the Cabinet of Ministers of Ukraine No. 1846 of 26 November 2003 approved the State Program for transforming hazardous enterprises of the Dnieper Chemical Works into an ecologically safe system and ensuring public protection against adverse effect of ionizing radiation for 2005–2014 (henceforth – the Program). The "Barrier" enterprise of the Ministry of Fuel and Energy of Ukraine takes measures under the Program.

To renew radiation monitoring system at uranium waste storage facilities of the Dnieper Chemical Works, the Center for Monitoring and Environmental Technologies (Kyiv) and Marseev Institute for Radiation Hygiene and Medical Ecology of Academy of Medical Sciences of Ukraine started work on installation of the observation wells network. These efforts are made under the Program for radiation monitoring of the "Barrier" uranium facilities.

Uranium waste storage facility "Pivdenno-Skhidne" before and after filling up

In 2008 two wells were equipped at the "Dniprovsk" storage facility, and two - at the storage facility "Baza S". Also the work on covering with earth of the radiation contaminated plots the uranium waste storage facility "Pivdenno-Skhidne" was performed.

Based on the SNRCU initiative, on May 27, 2008 the joint field meeting took place of the representatives of the Committee of the Supreme Council of Ukraine on ecological policy, use of natural sources and elimination of Chornobyl accident consequences, and the Board of the State Nuclear Regulatory Committee of Ukraine. Ecological and social problems emerged at the site of the former Dnieper Chemical Works were considered at the meeting. According to the decision made at that meeting, to solve ecological issues in Dniprodzerzhynsk the Interdepartmental commission was created and approved by Resolution of the Cabinet of Ministers of Ukraine No. 857-r of 11 June 2008, and the "Plan of priority measures for 2009 on improving the ecological condition of Dniprodzerzhynsk" was developed and approved by Resolution of the Cabinet of Ministers of Ukraine No. 1425 of 12 November 2008. Also a new State Special Ecological program "Transformation of uranium facilities of the former Dnieper Chemical Works to the safe state" is being developed.

Measures on putting the acting regulations and laws of Ukraine into compliance with the current radiation safety requirements regarding radiation safety assurance during uranium facilities decommissioning are specified as the priority for 2009.

SE "Direction"

In 2008 the enterprise SE "Direction" carried out a set of building construction and mounting, and major mining construction works to provide the beginning of uranium ore mining.

At present, the enterprise does not perform any uranium ore mining activities. The State Nuclear Regulatory Committee of Ukraine and its regional body – Central State Inspectorate on Nuclear and Radiation Safety – take appropriate measures to ensure necessary radiation safety level at preparatory stage of activities, develop radiation monitoring system, and accumulate information on natural radiation conditions in the area of the enterprise location.

Emergency Response And Preparedness

The Law of Ukraine "On Protection of Population and Territories against Man-Induced and Natural Emergencies" of 18 June 2000 sets forth the organizational framework for the Unified State System for Prevention of and Response to Man-Induced and Natural Emergencies (henceforth - USSE) that is established in Ukraine. According to the Resolution of the Cabinet of Ministers of Ukraine No. 1198 of 3 August 1998, the SNRCU is responsible for the establishment and operation of the USSE functional subsystem "Safety of Nuclear Power Facilities".

USSE FUNCTIONAL SUBSYSTEM "SAFETY OF NUCLEAR POWER FACILITIES"

The USSE functional subsystem "Safety of Nuclear Power Facilities" operates at national, regional and facility levels. Facility-level activities are carried out by on-site State Nuclear Safety Inspectorates, regional-level activities are carried out by State Regional Inspections on Nuclear and Radiation Safety.

At the national level, the SNRCU Emergency and Information Centre (EIC) is the key element of the subsystem. The EIC is staffed with the most skilled SNRCU experts and subordinated organizations. During 2008 EIC functioned in normal (routine) mode of operation, when 24-hour duty is maintained, operational information is received from Ukrainian NPPs, analyzed, recorded, and published at the SNRCU website www.snrc.gov.ua.

It is planned to implement at EIC the RODOS decision support system in the event of a radiation accident. In 2008 a licensing agreement was signed between the SNRCU and RODOS Consortium for pilot operation of the RODOS system at EIC, proposals were prepared on the implementation of the RODOS system in the framework of the cooperation program with the European Commission.

In 2008 a number of the documents that regulate functioning of the USSE functional subsystem "Safety of Nuclear Facilities" were revised: Agreements between the SNRCU and the Ukrainian Hydrometeorological Centre of the Ministry of Emergencies on interaction in the area of emergency response and the Provisions on USSE functional subsystem "Safety of Nuclear Facilities".

To fulfill intergovernmental agreements with other countries on early notification of a radioactive accident, information exchange and cooperation in nuclear safety and radiation protection, the communication tests with competent points of contcts in Austria, Byelorussia, Bulgaria, Latvia, Germany, Norway, Poland, Romania, Slovakia, Turkey, Hungary, Finland and Sweden were condacted.

The SNRCU, as a national point of contact established within the Convention on Early Notification of a Radioactive Accident, participated in IAEA ConvEx-1a and ConvEx-2a exercises to test the communication with the IAEA emergency center and in ConvEx-2b exercise to work out information exchange with the IAEA emergency center in the event of a radiation accident.

NAEK ENERGOATOM'S EMERGENCY CENTERS

The NAEK Energoatom emergency preparedness and response system is integral part of the USSE functional subsystem "Nuclear Energy and Fuel and Energy Complex", which is within the competence of the Ministry for Fuel and Energy of Ukraine.

This functional subsystem of USSE includes, as technical means, the main and backup emergency centers of the NAEK Energoatom, nuclear power plant support center located at the separated subsidiary of this organization – "Technical Emergency Center" in the village of Bilohorodka, Kyiv district, and separated subdivision "Atomremontservis". In the event of an emergency at NPP, experts of the Technical Emergency Center and Atomremontservis are sent to the site where they are at the disposal of the site incident commander.

The NAEK Energoatom's main emergency centre is located at the Headquarters in Kyiv and the backup emergency centre is established and operates at the former Chornobyl NPP emergency control centre in the village of Dniprovske, Chernigiv region.

Current regulations envisage establishment of the on-site and off-site emergency centers at each NPP. An on-site emergency centre is designed to manage accident localization and mitigation actions at the NPP site and in the controlled area. An off-site emergency center is located in the observation area and is to be involved in the event of such accidents when the on-site centre cannot be used. In 2008 procedures for information exchange of NPP emergency centers with EIC were developed, and activities were continued on establishing data transmission system from NPP emergency centers to EIC through both primary and backup lines.

When an accident occurs at NPP, the whole network of NAEK Energoatom emergency centers is activated, if needed, including on-site emergency centers of non-emergency NPPs is a part of groups of engineering and technical support.

To ensure a reliable video communication link in emergencies, the NAEK Energoatom installed a satellite communication system that covers the main and backup emergency centers, emergency centers of separated subdivisions.

In 2008 a fiber optic communication link was arranged between the NAEK Energoatom and the Rosenergoatom emergency center. This link is designated for obtaining consultations from Russian scientific and technical organizations in case of an accident at Ukrainian NPPs.

EMERGENCY TRAINING AND EXERCISES

The Radiation Safety Standards of Ukraine (NRBU-97) require emergency training of the operator's personnel involved in emergency response actions.

In 2008 the SNRCU participated in the following emergency exercises:

- *On-site emergency exercise at Khmelnitsky NPP with full EIC activation;*
- *On-site emergency exercise at Rivne NPP without EIC activation, with involvement of the personnel of the Emergency and Information Department;*
- *Full-scale emergency exercise at WWR-M reactor of the Nuclear Research Institute of the National Academy of Sciences of Ukraine with full activation of EIC;*
- *EIC internal emergency exercise based on a radiation accident scenario with radiological terrorism issues;*
- *International IAEA CONVEX-3 exercise of response to a conditional radiation accident at Laguna-Verde NPP in Mexico without EIC activation and with involvement of the personnel of the Emergency and Information Department;*
- *On-site emergency exercises at NPPs without EIC activation with the aim of regulatory assessment for regulatory assessment. During 2008 the State Nuclear Safety Inspections at NPP participated in 160 emergency exercises at NPPs, including 39 on-site emergency exercises.*

Based on exercise results, a set of the EIC personnel procedures were revised (16 documents in total), a meeting was held with the representatives of NRI of NASU, Holosiivska State Regional Administration and the Central Directorate of the Ministry of Emergencies in Kyiv to discuss emergency preparedness of NRI, a draft order was prepared to approve interaction procedure of the State Nuclear Regulatory Committee of Ukraine and the Security Service of Ukraine on information exchange in case of emergencies and was sent to the Security Service of Ukraine for approval.

In 2008 a training seminar was held on emergency response and preparedness for experts involved into the EIC activity.

Account And Control Of Nuclear Materials

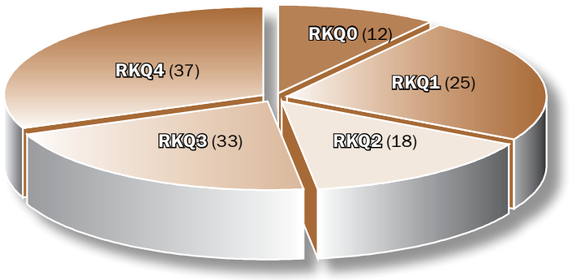
The State system of account and control of nuclear materials in Ukraine, coordinated by the SNRCU, is a basis for implementing the Agreement between Ukraine and the International Atomic Energy Agency for the Application of Safeguards in connection with the Treaty on Non-Proliferation of Nuclear Weapons (henceforth – Safeguards Agreement) and Additional Protocol to the Agreement between Ukraine and the International Atomic Energy Agency for the Application of Safeguards in connection with the Treaty on Non-Proliferation of Nuclear Weapons (henceforth – Additional Protocol) ratified by appropriate Laws of Ukraine.

By the end of 2008 there were 125 establishments and enterprises that undertook the state account and control of nuclear materials. They are divided territorially into materials balance areas as shown in Figure 1.

During 2008 the SNRCU took the following measures to implement the Safeguards Agreement and Additional Protocol:

- *75 IAEA inspections were carried out at Ukrainian nuclear facilities: ZNPP - 22 inspections, SUNPP – 12 inspections, KhNPP - 9 inspections, RNPP - 12 inspections, NSCKPI – 8 inspections, Kyiv Nuclear Research Institute (KNRI) – 4 inspections, ChNPP – 7 inspections, Sevastopol' National Institute for Nuclear Energy and Industry (SNINEI) – 1 inspection.*
- *7 IAEA inspections were carried out at Ukrainian enterprises: Ukrainian State Izotop Production Enterprise, State Interregional Specialized Enterprises of the Ukrainian State Radon Association, "Ukrtekhprogress", "Solar-1", State Interregional Specialized Enterprises of the Ukrainian State Radon Association in the city of Kharkiv, OJSC "Dniprovazhmash", Manufacturing Company "Makarov South Engineering Plant" in the city of Dnipropetrovsk;*
- *IAEA inspectors obtained 10 additional accesses according to the Additional Protocol. By the way, in 2008 first since 1995, when the Agreement on the Application of IAEA Safeguards in Ukraine became valid, state inspectors have participated in all inspections and activities under additional accesses of the Agency;*
- *271 reports on nuclear materials and other information according to the Safeguards Agreement were processed and sent to the Agency;*
- *updated information for Ukraine's declaration as required by the Additional Protocol (50 declarations) was prepared and submitted to the IAEA;*
- *17 preliminary notifications on export/import of nuclear materials were sent to the IAEA;*
- *other information provided for in the Safeguards Agreement and Additional Protocol was submitted to IAEA: schedules for repairs, information on radiation doses of the IAEA inspectors, etc.*

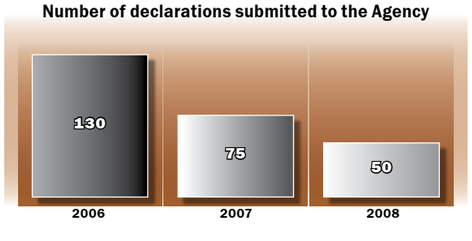
Figure 1.
Territorial distribution of enterprises and establishments into materials balance areas



RKQ0 *— City of Kyiv and Kyiv oblast*
RKQ1 *— Vinnytsya, Volyn, Ivano-Frankivsk, Zhytomyr, Carpathian, Rivne, Lviv, Chernivtsi, Khmelnytsky, Ternopil*
RKQ2 *—Sumy, Kharkiv, Poltava, Cherkasy, Chernihiv*
RKQ3 *—Luhansk, Donetsk, Dnipropetrovsk*
RKQ4 *—Zaporizhzhya, Kherson, Mykolayiv, Kirovohrad, Odesa, Crimea*

Figure 2 shows that the number of declarations sent by the State Nuclear Regulatory Committee of Ukraine to the IAEA under the Additional Protocol has decreased since the submission of information on Ukrainian nuclear activity is nearing completion. However, in 2008 the Agency intensified its activity to verify this information – the number of verifications almost doubled (Figure 3). The State Nuclear Regulatory Committee of Ukraine received 16 requests resulting from additional accesses and studying open information sources. Moreover, in July the Agency carried out a technical visit, involving managing staff of IAEA safeguards department to the city of Kharkiv. The delegation met with the Kharkiv district administration, visited a set of leading enterprises and establishments of the city, particularly, Scientific and Technical Complex (STC) "Monokristals Institute", Open Joint Stock Company (OJSC) "Khartron", Kharkiv Malyshev Plant and conducted a technical meeting for leaders of Kharkiv district enterprises, scientific and research and development establishments dealing with nuclear materials or carrying out research and development and design activities that may relate to nuclear fuel cycle.

Figure 2.
Number of declarations submitted to the Agency



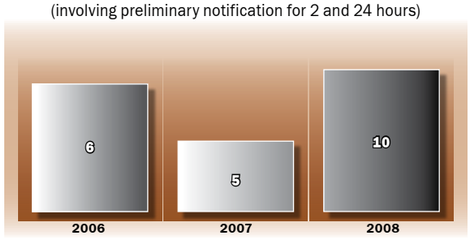
Since the IAEA intensified its activity to verify the information submitted by Ukraine under the Additional Protocol, certain drawbacks took place. In particular, once the deadline of issuing access to the IAEA inspectors at NPP sites exceeded, and inconsistency was detected in the information submitted by the Ministry for Fuel and Energy. Issues that occur in implementing the Additional Protocol were discussed at the meeting of the State Nuclear Regulatory Committee of Ukraine in November 2008. To solve these issues, an action plan was accepted for the improvement of the State system for account and control of nuclear materials. This plan was taken into account in drawing up the SNRCU Comprehensive Plan for 2009.

This primarily applies to the improvement of the regulatory and legal framework. A new revision of the Provisions on the System for Accounting for and Control of Nuclear Materials is to be approved by a Resolution of the Cabinet of Ministers of Ukraine. The Provisions on implementing the Agreement between Ukraine and the International Atomic Energy Agency for the Application of Safeguards to the whole nuclear material in every peace nuclear activity of Ukraine is to be registered by the Ministry of Justice of Ukraine. It is also planned to revise the Rules on organization account and control of nuclear materials, which establish a procedure for keeping accounting and reporting documentation on state control of nuclear materials at enterprises.

Moreover, measures will be taken to create a state system for professional training of experts on account and control of nuclear materials and to increase the role of the SNRCU state inspections in operation of the State system of account and control of nuclear materials.

These measures will contribute to strengthening of the State system of account and control of nuclear materials of Ukraine.

Figure 3. Number of additional accesses
(involving preliminary notification for 2 and 24 hours)



Transport Of Radioactive Materials

Radioactive materials are transported for energy, industry, medicine needs during radioactive waste management, as well as due to nuclear fuel transit through the Ukrainian territory.

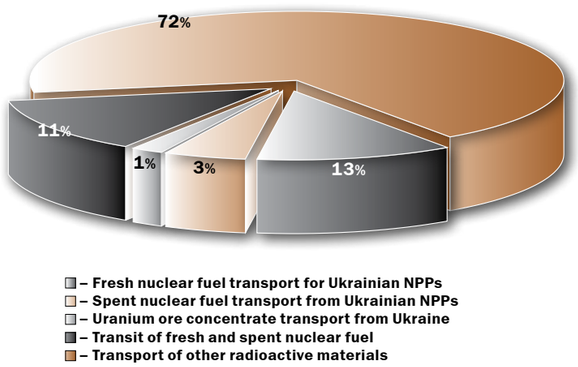
Within 2008 the State Nuclear Regulatory Committee of Ukraine issued 127 permits for international transport of radioactive materials, particularly:

- *transport of fresh nuclear fuel for Ukrainian NPPs – 17 (including: 1 – for the Nuclear Research Institute reactor of the National Academy of Science of Ukraine, 1 – transport of defective fresh nuclear fuel from ChNPP to Russia);*
- *transport of spent nuclear fuel from Ukrainian NPPs to Russia – 4;*
- *transport of uranium ore concentrate from Ukraine – 1;*
- *transit of fresh nuclear fuel from Russia to Slovakia, Hungary and Bulgaria – 10;*
- *transit of spent nuclear fuel from Bulgaria to Russia – 3;*
- *transit of spent nuclear fuel from the research reactor in Bulgaria to Russia – 1;*
- *transport of ionizing radiation sources – 91.*

Transport activities are licensed in compliance with the legislation. As of the end of 2008, 34 enterprises had licenses to implement the activity on radioactive materials transport. The following enterprises undertake the greatest scope of radioactive materials transport: NAEK Energoatom, Eastern Ore Mining and Milling Enterprise, Ukrainian State Isotope Production Enterprise, State Interregional Specialized Enterprises of Ukrainian State Radon Association, Ukrgeofizyka State Enterprise, State Complex Specialized Enterprise. In 2008 the State Nuclear Regulatory Committee of Ukraine issued 3 licenses for legal entities dealing with radioactive materials transport, reissued 12 licenses, and amended 1 license.

In 2008, eight certificates on approval of packaging design and special shipments of radioactive materials transport were granted and reissued.

Compliance of shipment participants with legislation and safety rules for radioactive material transport ensures the safety of the public, personnel and the environment. No incidents or accidents occurred in radioactive material transport in Ukraine in 2008.



Fulfillment Of International Obligations by Ukraine

Participation of Ukrainian Delegation in the Forth Review Meeting to Fulfill Obligations of the Nuclear Safety Convention (14-25 April 2008, Vienna, Austria)

The Forth Review Meeting to fulfill obligations by Member States under the Nuclear Safety Convention was held in IAEA headquarters in Vienna from 14 to 25 April 2008.

The Ukrainian Delegation at the Forth Review Meeting was headed by the SNRCU Chairperson. The Ukrainian Delegation presented the Forth National Report on fulfillment obligations by Ukraine under the Nuclear Safety Convention and provided substantiated and comprehensive answers to questions of other countries' representatives.

138 written questions from other countries were received regarding the National Report of Ukraine – Austria, France, Germany, Great Britain, Finland, Romania, the Russian Federation, Japan, China and Pakistan demonstrated a great interest to Ukraine.

The presentations to the National Report were provided by the SNRCU Administration and the President of NAEK Energoatom according to the competence.

In particular, the information was provided on a status and strengthening of the regulatory body independence in nuclear and radiation safety, state of financial support and staffing, transparency in nuclear and radiation safety regulation in Ukraine and public involvement, regional inspectorates on nuclear and radiation safety, findings of the rule-making activity on nuclear and radiation safety.

The information was also presented on implementing the safety improvement programs for NPP units, in particular, positive dynamics in performing safety enhancement measures and increase in amount of their financing.

The measures developed by the State Nuclear Regulatory Committee of Ukraine and aimed at fulfillment of obligations by Ukraine under the Nuclear Safety Convention were included into the Action Plan to implement the Ukrainian Energy Strategy till 2030.

Fulfillment of obligations by Ukraine under the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management

In 2008 the State Nuclear Regulatory Committee of Ukraine jointly with the Ministry for Emergencies of Ukraine, the Ministry for Fuel and Energy of Ukraine, the Ministry of Health of Ukraine developed and published the third National Report of Ukraine on fulfillment of obligations by Ukraine under the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management at the official web-site of the Joint Convention Secretariat. The third Review Meeting to consider the national reports of the Contracting Parties under Joint Convention will be held in May 2009.

International Cooperation

Ukraine's international cooperation in the peaceful use of nuclear energy and nuclear and radiation safety is aimed at attaining world standards in safe operation of nuclear power units throughout their life cycle based on multilateral international agreements and treaties.

Multilateral international cooperation is conducted within international organizations to which Ukraine is a member, multilateral international treaties, conventions, agreements etc. entered into by Ukraine, and international programs and projects for peaceful use of nuclear materials, application of advanced technologies for nuclear energy development, improvement of nuclear reactors and technologies safety level, management of radioactive technologies etc.

Cooperation with IAEA

The national projects implemented in 2008 for Ukraine covered Chornobyl NPP units 1, 2, 3 decommissioning, the Shelter, use of nuclear medicine in oncology, improvement of nuclear and radiation safety infrastructure, comprehensive safety assessments of radioactive waste in Ukraine, NPP life cycle management, and improvement of NPP personnel training system.

The Ministry for Fuel and Energy of Ukraine, the Ministry for Emergencies and Public Protection against Chornobyl Accident Consequences, the Ministry of Health, the State Nuclear Regulatory Committee of Ukraine, NAEK Energoatom, Chornobyl NPP are beneficiaries of these projects.

In 2008 almost 200 representatives of the Ministries and Departments of Ukraine, state enterprises, medical institutions took part in IAEA events (technical meetings, working groups, workshops, conferences, training courses etc.) carried out in Ukraine and abroad.

The 2008 was marked by successful implementation of the IAEA National Project for the SNRCU –- UKR/9/025 "Strengthening the Nuclear and Radiation Safety Infrastructure in Ukraine". Under the support of this Project a number of experts from the regulatory authority of Ukraine participated in topical international meetings, workshops and conferences. The assistance under the Project was also directed at supply of server equipment to SNRCU and publishing of this Annual Report.

Fulfillment of Ukraine-EU Memorandum of Understanding on Cooperation in the Field of Energy of 1 December 2005

Within the preparation of Ukraine entering into the Agreement on Energy Community and in order to fulfill provisions of Ukraine-EU Memorandum of Understanding on Cooperation in the Field of Energy of 1 December 2005 in the area of "Nuclear safety", Joint Project Ukraine-EC-IAEA on Ukrainian NPPs safety assessment was initiated.

The Joint Project is aimed at general assessment of Ukrainian NPPs for compliance with the IAEA standards in force in the following areas:

- *NPP design safety;*
- *NPP operational safety;*
- *Radioactive waste management and decommissioning;*
- *Regulatory issues.*

To plan properly measures within the project and assess results of the activity performed, a Steering Committee was created, including representatives of the IAEA, European Commission and Ukraine. Meeting of the Steering Committee is held twice a year in the IAEA headquarters.

In June 2008 a training workshop on self-assessment was conducted at SU NPP for representatives of Ukrainian NPPs, design institutes and NAEK Energoatom in the area of "NPP Design Safety". In October 2008, the IAEA mission was conducted at KhNPP to verify the results of self-assessment and "design safety" activity for compliance with the international standards. The mission work results were presented to NAEK Energoatom Directorate. On the whole the "design safety" activity at KhNPP was considered satisfactory and such that complies with the international standards. By the end of 2008 SU NPP and RNPP prepared and submitted the reports on design safety self-assessment to IAEA experts for review.

In 2008 the missions were conducted at RNPP and ZNPP sites within the implementation of the "Operational safety" aspect.

In July 2008 a training workshop on self-assessment was conducted for representatives of all Ukrainian NPPs under the aspect "Radioactive Waste Management and Decommissioning". The submission of a copy of the National Report of Ukraine on fulfillment of obligations under the Joint Convention on the Safety of Spent Fuel Management and on Safety of Radioactive Waste Management became one of the activities under this aspect.

The independent IAEA mission "Integrated Regulatory Review Service" (IRRS mission) was conducted in the State Nuclear Regulatory Committee of Ukraine from 8 to 20 June 2008 under the aspect "Regulatory Issues".

Participation in Implementation of the European Commission Projects

International technical assistance rendered by the European Commission plays an important role in the international cooperation within TACIS nuclear safety program.

In 2008 a number of projects within TACIS Program were implemented covering the following issues: licensing assessment of on-site assistance projects, ZNPP modernization project, assistance in licensing of KhNPP modernization projects, development of regulations and inspection procedures for commissioning of new nuclear facilities, support to the regulatory body in assessing safety analysis reports for operating NPP units, support to the regulatory body in licensing safety enhancement measures for operating NPP units, support to the regulatory body in licensing activities related to TACIS/NSA financed decommissioning facilities of Chornobyl NPP-site assistance projects, support to the regulatory body in assessing Probabilistic Safety Analysis (PSA) for Ukrainian NPP units, support in licensing of NPP radioactive waste treatment etc. In 2008 the procedure was completed on signing the Agreement on financing the Annual Nuclear Safety Actions Program for 2007 in the framework of the new Instrument for Nuclear Safety Cooperation (INSC) instead of the TACIS program. In accordance with the Agreement, a number of projects will be initiated in 2009 which is aimed at rendering sector assistance to develop long-term safety management in Ukraine (design safety), accomplishing the construction project of the national training center at ZNPP, performing institutional and technical cooperation with the regulatory body of Ukraine to develop its capabilities based on transferred European safety principles and practices, taking additional measures on the Industrial Complex for Solid Radwaste Management project at Chornobyl etc.

The International Community pays a great attention to Chornobyl NPP decommissioning and implementation of the Action Plan on Shelter transformation into an ecologically safe system. As a result, in 2008 taking into account the ISF-2 construction activities performed by Ukraine, the European Bank for Reconstruction and Development proposed to provide support in ISF-2 licensing. It is planned to sign an appropriate agreement on grant between EBRD and Ukraine in 2009.

Mechanisms of multilateral cooperation

Forum for Countrie that Operate WWER Reactors (Forum of WWER Regulators) 7-9 July 2008

From 7 to 9 July 2008 the 15th meeting of the annual Forum for WWER regulators was held in Kyiv, Ukraine, aimed at information and experience exchange on nuclear safety for WWER reactors, making joint decisions on issues related to NPP safety operated in the Forum member states.

Top managers of regulatory bodies of Bulgaria, China, Czech Republic, Finland, Hungary, India, Iran, Russian Federation, Slovakia and Ukraine took part in the Forum. IAEA and GRS (Germany) experts participated in the Forum as observers.

Each Forum member presented a report informing on the last achievements in nuclear legislation,

15th meeting of the Forum for WWER Regulators (Kyiv, Ukraine)

regulation of nuclear and radiation safety and nuclear energy use, events occurred at NPPs which are of general interest and measures taken as a result of events investigation etc.

During the Forum, leaders of working groups (three working groups work under the auspices of the Forum: WG on regulatory aspects for applying probabilistic safety analysis, WG on operational experience feedback for NPP safety improvement, and WG on regulatory aspects for organizational issues and safety culture at NPP) presented results of their work for the period past from the previous Forum meeting and plans of working groups for the next year. Based on common decision of all the Forum participants the working groups' activity was considered effective and a mandate was provided for their following functioning.

While general discussions the Forum participants considered the issue on creating the Forum official web-site with restricted access, implementation of a tool for experience exchange on training and re-training of the regulatory bodies personnel, periodical open meetings of the Forum, involving representatives of operating organizations, technical support organizations etc. to discuss achievements and challenges to NPP safety.

Resulting from the Forum work, the understanding was achieved to continue information and experience exchange by e-mailing. An IAEA observer proposed the IAEA support in subsequent coordination of the Forum. The next Forum meeting will be held in accordance with the queue principle in the Republic of Bulgaria in July 2009.

Bilateral international cooperation in the area of nuclear and radiation safety continued in 2008 in compliance with the concluded intergovernmental and interagencies agreements.

Cooperation with the United States of America

Nuclear Regulatory Commission

The bilateral meeting of the Head of Ukrainian Delegation, Chairperson of the State Nuclear Regulatory Committee of Ukraine - O.Mykolaichuk and Chairperson of the US Nuclear Regulatory Commission - Dale Klein was held on 16 April 2008 during the Forth Review Meeting on the fulfillment of obligations by the Contracting Parties to the Nuclear Safety Convention.

The results and the status of the USA and Ukraine cooperation in nuclear and radiation safety and prospects for the subsequent development were discussed during the meeting. Based on the meeting results the Memorandum was signed which determines cooperation aspects between the State Nuclear Regulatory Committee of Ukraine and the US NRC for 2008-2009:

- *Regulatory reviews;*
- *Risk-informed regulatory activity;*
- *New fuel management;*
- *Transport and interim storage of spent fuel;*
- *Radioactive waste management;*
- *Emergency response and relevant capabilities;*
- *Regulatory oversight over radiation sources;*
- *Account for and control of nuclear materials, physical protection;*
- *Personnel training;*
- *Strengthening of infrastructure capabilities.*

In compliance with the Memorandum the project "Improvement of regulatory oversight over ionizing radiation sources: computer equipment and software for 8 SNRCU regional inspectorates" was initiated in 2008. In the framework of the project the computer equipment and software was purchased for the SNRCU regional inspectorates. It is also planned to purchase dosimetric equipment and vehicles.

In 2008 the project "Strengthening of the SNRCU infrastructure capabilities" was initiated. In the framework of the project it is planned to purchase and install computer equipment and servers for the State Nuclear Regulatory Committee of Ukraine.

Department of Energy

In order to fulfill the Implementing Agreement between the US Department of Energy and the SNRCU concerning cooperation to enhance the security of Ukraine's usable sources of ionizing radiation of 23 June 2006 and in frames of project implementation "Improvement of security of radioactive sources used in Ukraine", in 2008 physical protection systems were upgraded at several enterprises on radwaste management as well as in medical institutions applying IRS for treatment of oncological patients.

Bilateral Cooperation with European Union Countries

Republic of Poland

A regularly scheduled bilateral meeting of representatives of the State Nuclear Regulatory Committee of Ukraine and National Atomic Energy Authority of Poland took place in November 2008 in the city of Kuznetsovsk at RNPP. The subjects of discussions during that meeting were the safety of Ukrainian NPPs (including the new KhNPP power units), the issues of radiation monitoring and radwaste management. The parties exchanged their experience in the area of relations of regulatory bodies with local communities (experience in carrying out exhibitions, workshops, and round-table discussions), issuing printed materials and web site support.

Based on the meeting results, the Minutes were signed and cooperation plans were agreed for 2009.

Lithuania

According to the invitation of the State Nuclear Regulatory Committee of Ukraine in December 2008, Head of Regulatory Body of Lithuanian Republic - the State Inspectorate on Nuclear Energy Safety (VATESI) – Mr. Gytis Maximovas visited Ukraine.

The objective of this visit was to make cooperation between the Ukrainian and Lithuanian regulatory bodies more active, and to come to a new format of bilateral relations that provides for regular consultations and drawing up agreed positions on political and technical issues of nuclear safety.

During the visit, meetings with management and experts of the State Nuclear Regulatory Committee of Ukraine were held, as well as a technical tour to ChNPP, participation in the International Topical Meeting on Nuclear and Radiation Safety Issues devoted to the 8th anniversary of establishing independent Ukrainian nuclear and radiation safety regulatory authority - SNRCU.

Bilateral meeting of representatives of the State Nuclear Regulatory Committee of Ukraine and National Atomic Energy Authority of Poland (Rivno NPP, Ukraine)

Based on the visit results, a joint decision was made regarding more active cooperation between Ukrainian and Lithuanian regulatory bodies. It was also decided to prepare and agree a draft interagency agreement during 2009.

Germany

Within cooperation with Association for Installation and Reactor Safety (GRS mbH) in February 2008 in Berlin (Germany) the Program of workshops for 2008 was signed according to project INT 9180 "Scientific and Technical Exchange of Experience in Nuclear Safety Area with Regulatory Bodies of Central and Eastern Europe and Middle Asia".

During 2008 a number of meetings was held with GRS mbH representatives where issues of technical assistance use to solve problems of IRS management at Ukrainian enterprises at the stage of sanitation; activities on irradiating facilities decommissioning and ensuring the safe storage of disused high level IRS, as well as creating and equipping the united national system of monitoring and accounting of individual exposure doses of population in Ukraine were discussed. During the meetings the facilities requiring assistance were inspected to verify their current state.

Finland

In 2008 a number of meetings were carried out with representatives of nuclear and radiation safety regulatory authority of Finland (STUK). During the meetings proposals of cooperation between the SNRCU and STUK were considered, and a Plan of bilateral cooperation for 2008-2009 was signed.

This Plan specifies the following priority directions of cooperation:

- *Development of functional and technical specifications for a mobile radiation monitoring laboratory;*
- *Development of an information and reference system for training purposes and its use during work by subdivisions of the State Nuclear Regulatory Committee of Ukraine;*
- *Development of specifications of equipment for regional inspections necessary to improve their capability on nuclear materials identification.*

Sweden

During 2008 the fulfillment of joint projects with Sweden in the area of radiation protection and emergency response continued. For the projects

implementation the Swedish Radiation Protection Authority (SSI) and Sweden State Nuclear Regulatory Inspectorate (SKI) was engaged from the Swedish side. According to the decision of Swedish Government both agencies were united into one Regulatory Body on Nuclear and Radiation Safety (SSM).

During 2008 the following events took place:

- *Training seminar on methodology for inspecting radioactive waste management facilities and ionizing radiation sources;*
- *International workshop "Experience of adaptation of Swedish legislation in radiation protection area to EU requirements";*
- *Working meeting "Experience of adaptation of Swedish legislation to the EU requirements";*
- *Workshop "PET application in nuclear medicine. Technologies, legislation and monitoring";*
- *Workshop "Quality monitoring and assurance in X-rays diagnostics";*
- *Workshop "Radiation safety regulation";*
- *Training course "Quality system implementation and monitoring in medical radiology".*

In 2008 the negotiations with Swedish experts were held, where approaches on legislation improvement in the area of physical protection of nuclear facilities and nuclear materials, and results of cooperation between Ukrainian and Swedish regulatory bodies were discussed.

To summarize the 2008 activities, and to discuss cooperation plans for 2009 in the area of radiation protection and non-proliferation and safeguards, several working meetings were carried out in December.

France

During 2008 a draft Agreement between the State Nuclear Regulatory Committee of Ukraine and French Institute for Radiological Protection and Nuclear Safety (IRSN) on cooperation in nuclear safety and radiation protection area was developed, as well as a draft Agreement between the State Nuclear Regulatory Committee of Ukraine and French Nuclear Safety Authority (ASN) on exchange of technical information and cooperation in nuclear safety and radiation protection area. These Agreements were duly negotiated with the French side, and they passed necessary national endorsement procedures.

Signing of these Agreements is planned for February 2009 during a working visit of the Chairperson of the State Nuclear Regulatory Committee of Ukraine Olena Mykolaychuk to France.

In June 2008 under assistance of French Institute for Radiological Protection and Nuclear Safety (IRSN) a workshop "EPR reactor safety" was carried out in Kyiv. During the workshop Ukrainian experts were familiarized with the new type of European nuclear reactor, and, particularly, with safety measures during its operation, etc.

Spain

In November 2008 after invitation of Nuclear Safety Council of Spain the Chairperson of the State Nuclear Regulatory Committee of Ukraine Olena Mykolaichuk took part in bilateral consultations on construction, licensing and operation of dry type spent nuclear fuel storage facility. The meeting program envisaged a visiting to Trillo NPP and spent nuclear fuel storage facility constructed at Hose Cabrero NPP based on the design of "Holtec".

During the meeting with administration of the Nuclear Safety Council of Spain, Chairperson of the Council, Mrs. Carmen Martinez Ten proposed to revitalize bilateral cooperation between the regulatory bodies of Ukraine and Spain and in this regard to compose and sign a new Agreement on cooperation and information exchange. In turn, Chairperson of the State Nuclear Regulatory Committee of Ukraine, Mrs. O.Mykolaichuk invited Mrs. Martinez Ten to Ukraine in August 2009 to sign the Agreement during her visit.

Annex 1

ADDRESS BY MR. DWIGHT D. EISENHOWER, PRESIDENT OF THE UNITED STATES OF AMERICA, TO THE 470TH PLENARY MEETING OF THE UNITED NATIONS GENERAL ASSEMBLY

Madam President and Members of the General Assembly;

When Secretary General Hammarskjold's invitation to address the General Assembly reached me in Bermuda, I was just beginning a series of conferences with the prime Ministers and Foreign Ministers of the United Kingdom and France. Our subject was some of the problems that beset our world. During the remainder of the Bermuda Conference, I had constantly in mind that ahead of me lay a great honour. That honour is mine today as I stand here, privileged to address the general Assembly of the United Nations.

At the same time that I appreciate the distinction of addressing you, I have a sense of exhilaration as I look upon this Assembly. Never before in history has so much hope for so many people been gathered together in a single organization. Your deliberations and decisions during these sombre years have already realized part of those hopes.

But the great tests and the great accomplishments still lie ahead. And in the confident expectation of those accomplishments, I would use the office which, for the time being, I hold, to assure you that the Government of the United States will remain steadfast in its support of this body. This we shall do in the conviction that you will provide a great share of the wisdom, of the courage and of the faith which can bring to this world lasting peace for all nations, and happiness and well-being for all men.

Clearly, it would not be fitting for me to take this occasion to present to you a unilateral American report on Bermuda. Nevertheless, I assure you that in our deliberations on that lovely island we sought to invoke those same great concepts of universal peace and human dignity which are so clearly etched in your Charter. Neither would it be a measure of this great opportunity to recite, however hopefully, pious platitudes. I therefore decided that this occasion warranted my saying to you some of the things that have been on the minds and hearts of my legislative and executive associates, and on mine, for a great many months: thoughts I had originally planned to say primarily to the American people.

I know that the American people share my deep belief that if a danger exists in the world, it is a danger shared by all; and equally, that if hope exists in the mind of one nation, that hope should be shared by all. Finally, if there is to be advanced any proposal designed to ease even by the smallest measure the tensions of today's world, what more appropriate audience could there be than the members of the General Assembly of the United Nations.

I feel impelled to speak today in a language that in a sense is new, one which I, who have spent so much of my life in the military profession, would have preferred never to use. That new language is the language of atomic warfare.

The atomic age has moved forward at such a pace that every citizen of the world should have some comprehension, at least in comparative terms, of the extent of this development, of the utmost significance to every one of us.Clearly, if the peoples of the world are to conduct an intelligent search for peace, they must be armed with the significant facts of today's existence.

My recital of atomic danger and power is necessarily stated in United States terms, for these are the only incontrovertible facts that I know, I need hardly point out to this Assembly, however, that this subject is global, not merely national in character.

On 16 July 1945, the United States set off the world's biggest atomic explosion. Since that date in 1945, the United States of America has conducted forty-two test explosions. Atomic bombs are more than twenty-five times as powerful as the weapons with which the atomic age dawned, while hydrogen weapons are in the ranges of millions of tons of TNT equivalent.

Today, the United States stockpile of atomic weapons, which, of course,increases daily, exceeds by many times the total equivalent of the total of all bombs and all shells that came from every plane and every gun in every theatre of war in all the years of the Second World War. A single air group whether afloat or land based, can now deliver to any reachable target a destructive cargo exceeding in power all the bombs that fell on Britain in all the Second World War.

In size and variety, the development of atomic weapons has been no less remarkable. The development has been such that atomic weapons have virtually achieved conventional status within our armed services. In the United States,the Army, the Navy, the Air Force and the Marine Corps are all capable of putting this weapon to military use.

But the dread secret and the fearful engines of atomic might are not ours alone.

In the first place, the secret is possessed by our friends and allies, the United Kingdom and Canada, whose scientific genius made a tremendous contribution to our original discoveries and the designs of atomic bombs.

The secret is also known by the Soviet Union. The Soviet Union has informed us that, over recent years, it has devoted extensive resources to atomic weapons. During this period the Soviet Union has exploded a series of atomic devices, including at least one involving thermo-nuclear reactions.

If at one time the United States possessed what might have been called a monopoly of atomic pow-

er, that monopoly ceased to exist several years ago. Therefore, although our earlier start has permitted us to accumulate what is today a great quantitative advantage, the atomic realities of today comprehend two facts of even greater significance. First, the knowledge now possessed by several nations will eventually be shared by others, possibly all others.

Second, even a vast superiority in numbers of weapons, and a consequent capability of devastating retaliation, is no preventive, of itself, against the fearful material damage and toll of human lives that would be inflicted by surprise aggression.

The free world, at least dimly aware of these facts, has naturally embarked on a large programme of warning and defence systems. That programme will be accelerated and extended. But let no one think that the expenditure of vast sums for weapons and systems of defence can guarantee absolute safety for the cities and citizens of any nation. The awful arithmetic of the atomic bomb doesn't permit of any such easy solution. Even against the most powerful defence,an aggressor in possession of the effective minimum number of atomic bombs fora surprise attack could probably place a sufficient number of his bombs on the chosen targets to cause hideous damage.

Should such an atomic attack be launched against the United States, our reactions would be swift and resolute. But for me to say that the defence capabilities of the United States are such that they could inflict terrible losses upon an aggressor, for me to say that the retaliation capabilities of the United States are so great that such an aggressor's land would be laid waste, all this, while fact, is not the true expression of the purpose and the hopes of the United States.

To pause there would be to confirm the hopeless finality of a belief that two atomic colossi are doomed malevolently to eye each other indefinitely across a trembling world. To stop there would be to accept helplessly the probability of civilization destroyed, the annihilation of the irreplaceable heritage of mankind handed down to us from generation to generation, and the condemnation of mankind to begin all over again the age-old struggle upward from savagery towards decency, and right, and justice. Surely no sane member of the human race could discover victory in such desolation. Could anyone wish his name to be coupled by history with such human degradation and destruction?Occasional pages of history do record the faces of the "great destroyers", but the whole book of history reveals mankind's never-ending quest for peace and mankind's God-given capacity to build.

It is with the book of history, and not with isolated pages, that the United States will ever wish to be identified. My country wants to be constructive,not destructive. It wants agreements, not wars, among nations. It wants itself to live in freedom and in the confidence that the peoples of every other nation enjoy equally the right of choosing their own way of life.

So my country's purpose is to help us to move out of the dark chamber of horrors into the light, to find a way by which the minds of men, the hopes of men, the souls of men everywhere, can move forward towards peace and happiness and well-being.

In this quest, I know that we must not lack patience. I know that in a world divided, such as ours today, salvation cannot be attained by one dramatic act.I know that many steps will have to be taken over many months before the world can look at itself one day and truly realize that a new climate of mutually peaceful confidence is abroad in the world. But I know, above all else, that we must start to take these steps - now.

The United States and its allies, the United Kingdom and France, have over the past months tried to take some of these steps. Let no one say that we shun the conference table. On the record has long stood the request of the United States, the United Kingdom and France to negotiate with the Soviet Union the problems of a divided Germany. On that record has long stood the request of the same three nations to negotiate an Austrian peace treaty. On the same record still stands the request of the United Nations to negotiate the problems of Korea.

Most recently we have received from the Soviet Union what is in effect an expression of willingness to hold a four-Power meeting. Along with our allies,the United Kingdom and France, we were pleased to see that this note did not contain the unacceptable preconditions previously put forward. As you already know from our joint Bermuda communique, the United States, the United Kingdom and France have agreed promptly to meet with the Soviet Union.

The Government of the United States approaches this conference with hopeful sincerity. We will bend every effort of our minds to the single purpose of emerging from that conference with tangible results towards peace, the only true way of lessening international tension.

We never have, and never will, propose or suggest that the Soviet Union surrender what rightly belongs to it. We will never say that the peoples of the USSR are an enemy with whom we have no desire ever to deal or mingle in friendly and fruitful relationship.

On the contrary, we hope that this coming conference may initiate a relationship with the Soviet Union which will eventually bring about a freer mingling of the peoples of the East and of the West - the one sure, human way of developing the understanding required for confident and peaceful relations.

Instead of the discontent which is now settling upon Eastern Germany,occupied Austria and the countries of Eastern Europe, we seek a harmonious family of free European nations, with none a threat to the other, and least of all a threat to the peoples of the USSR. Beyond the turmoil and strife and misery of Asis, we seek peaceful opportunity for these peoples to develop their natural resources and to elevate their lot.

These are not idle words or shallow visions. Behind them lies a story of nations lately come to independence, not as a result of war, but through free grant or peaceful negotiation. There is a record already written of assistance gladly given by nations of the West to needy peoples and to those suffering the temporary effects of famine, drought and natural disaster. These are deeds of peace. They speak more loudly than promises or protestations of peaceful intent.

But I do not wish to rest either upon the reiteration of past proposals or the restatement of past deeds. The gravity of the time is such that every new avenue of peace, no matter how dimly discernible, should be explored.

There is at least one new avenue of peace which has not been well explored -an avenue now laid out by the General Assembly of the United Nations.

In its resolution of 28 November 1953 (resolution 715 (VIII)) this General Assembly suggested: "that the Disarmament Commission study the desirability of establishing a sub-committee consisting of representatives of the Powers principally involved, which should seek in private an acceptable solution and report...on such a solution to the General Assembly and to the Security Council not later than 1 September 1954.

The United States, heeding the suggestion of the General Assembly of the United Nations, is instantly prepared to meet privately with such other countries as may be "principally involved", to seek "an acceptable solution" to the atomic armaments race which overshadows not only the peace, but the very life, of the world.

We shall carry into these private or diplomatic talks a new conception. The United States would seek more than the mere reduction or elimination of atomic materials for military purposes. It is not enough to take this weapon out of the hands of the soldiers. It must be put into the hands of those who will know how to strip its military casing and adapt it to the arts of peace.

The United States knows that if the fearful trend of atomic military build-up can be reversed, this greatest of destructive forces can be developed into a great boon, for the benefit of all mankind. The United States knows that peaceful power from atomic energy is no dream of the future. The capability,already proved, is here today. Who can doubt that, if the entire body of the world's scientists and engineers had adequate amounts of fissionable material with which to test and develop their ideas, this capability would rapidly be transformed into universal, efficient and economic usage?

To hasten the day when fear of the atom will begin to disappear from the minds the people and the governments of the East and West, there are certain steps that can be taken now.

I therefore make the following proposal.

The governments principally involved, to the extent permitted by elementary prudence, should begin now and continue to make joint contributions from their stockpiles of normal uranium and fissionable materials to an international atomic energy agency. We would expect that such an agency would be set up under the aegis of the United Nations. The ratios of contributions, the procedures and other details would properly be within the scope of the "private conversations" I referred to earlier.

The United States is prepared to undertake these explorations in good faith.Any partner of the United States acting in the same good faith will find the United States a not unreasonable or ungenerous associate.

Undoubtedly, initial and early contributions to this plan would be small in quantity. However, the proposal has the great virtue that it can be undertaken without the irritations and mutual suspicions incident to any attempt to set up a completely acceptable system of world-wide inspection and control.

The atomic energy agency could be made responsible for the impounding,storage and protection of the contributed fissionable and other materials. The ingenuity of our scientists will provide special safe conditions under which such a bank of fissionable material can be made essentially immune to surprise seizure.

The more important responsibility of this atomic energy agency would be to devise methods whereby this fissionable material would be allocated to serve the peaceful pursuits of mankind. Experts would be mobilized to apply atomic energy to the needs of agriculture, medicine and other peaceful activities. A special purpose would be to provide abundant electrical energy in the power-starved areas of the world.

Thus the contributing Powers would be dedicating some of their strength to serve the needs rather than the fears of mankind.

The United States would be more than willing - it would be proud to take up with others "principally involved" the development of plans whereby such peaceful use of atomic energy would be expedited.

Of those "principally involved" the Soviet Union must, of course, be one.

I would be prepared to submit to the Congress of the United States, and with every expectation of approval, any such plan that would, first, encourage world-wide investigation into the most effective peacetime uses of fissionable material, and with the certainty that the investigators had all the material needed for the conducting of all experiments that were appropriate; second,begin to diminish the potential destructive power of the world's atomic stockpiles; third, allow all peoples of all nations to see that, in this enlightened

age, the great Powers of the earth, both of the East and of the West, are interested in human aspirations first rather than in building up the armaments of war; fourth, open up a new channel for peaceful discussion and initiative at least a new approach to the many difficult problems that must be solved in both private and public conversations if the world is to shake off the inertia imposed by fear and is to make positive progress towards peace.

Against the dark background of the atomic bomb, the United States does not wish merely to present strength, but also the desire and the hope for peace. The coming months will be fraught with fateful decisions. In this Assembly, in the capitals and military headquarters of the world, in the hearts of men everywhere, be they governed or governors, may they be the decisions which will lead this world out of fear and into peace.

To the making of these fateful decisions, the United States pledges before you, and therefore before the world, its determination to help solve the fearful atomic dilemma - to devote its entire heart and mind to finding the way by which the miraculous inventiveness of man shall not be dedicated to his death, but consecrated to his life.

I again thank representatives for the great honour they have done me in inviting me to appear before them and in listening to me so graciously.

Annex 2

ADDRESSES OF STATE INSPECTORATES FOR NUCLEAR AND RADIATION SAFETY

State Inspectorate	Head of State Inspectorate	Administrative subdivisions	Phone number	Address, e-mail
Northern State Inspectorate Kyiv	Lyudmyla S. Kuraksa	Vinnytsya, Zhytomyr, Kyiv, Cherkasy, Chernihiv, City of Kyiv	Tel. +380 67 695 5350 Tel./fax +380 44 292 0195	3, Verkhovna Rada Avenue, 02100 Kyiv, Ukraine kuraksa@inspect.snrc.gov.ua
North-Western State Inspectorate Rivne	Volodymyr V. Khabarov	Volyn, Rivne, Ternopil, Khmelnytsky	Tel. +380 67 695 5361 Tel./fax +380 362 236 185 Tel. +380 362 637 327	41 S. Bandery Street, 33028 Rivne, Ukraine nordwest_insp@ukr.net
Western State Inspectorate Ivano-Frankivsk	Oksana V. Dzhuranyuk	Carpathian, Ivano-Frankivsk, Lviv, Chernivtsi	Tel. +380 67 695 5347 Tel./fax +380 342 713 426	77 S. Bandery Street, office 103, 76014 Ivano-Frankivsk, Ukraine wsinrs@ukr.net
Southern State Inspectorate Odesa	Serhiy V. Kobylinsky	Mykolayiv, Odesa, Kherson	Tel. +380 67 695 5325 Tel./fax +380 482 344 308	P.O. box 115, 69044 Odesa, Ukraine kobylinskiy@breezein.net
South-Eastern State Inspectorate Donetsk	Borys P. Zemsky	Donetsk, Zaporizhzhya, Luhansk	Tel. +380 67 695 5427 Tel./fax +380 62 385 8446 Tel. +380 62 385 8447	2 Razenkova Street, 83003 Donetsk, Ukraine bpz@mail.ru
Central State Inspectorate Dnipropetrovsk	Serhiy V. Myts	Dnipropetrovsk, Kirovohrad	Tel. +380 67 695 5374 Fax +380 56 377 6499	52 Komsomolska Street 49000 Dnipropetrovsk, Ukraine , Dnepr_insp@i.ua
Eastern State Inspectorate Kharkiv	Viktor T. Pravdyuk	Poltava, Sumy, Kharkiv	Tel. +380 67 695 5358 Tel./fax +380 57 705 4527 Tel. +380 57 705 4528	P.O. box 4619, 61022 6 Svobody Square, Kharkiv, Ukraine vostok_inspect@ukr.net
Crimean State Inspectorate Simferopol	Alla I. Pashentseva	Crimea, Sevastopol	Tel. +380 67 695 5330 Tel./fax +380 652 601 945 Tel. +380 652 543 819	P.O. box 1446, 95000 40M K.Mrksa Street, Semferopol, Ukraine, crimInspyadbesp@ukr.net

Annex 3

ADDRESSES OF STATE REGISTRATION CENTRES AND REGIONAL REGISTRATION CENTRES OF THE STATE REGISTER FOR IONIZING RADIATION SOURCES

№	Registration centre	Coverage (oblasts)	Address	Contact person
	The Main Registration Centre of the State Register for Ionizing Radiation Sources	Ukraine	152 Gorkoho Street, 03680 Kyiv, Ukraine tel. +380 44 528 3104	Borys S. Horemykin
1	Registration centre in Rivne	Rivne, Ternopil, Khmelnytsky, Volyn	1 Soborna Street, office 310, 33000 Rivne, Ukraine tel. +380 362 636 181	Larysa O. Khabarova
2	Registration centre in Odesa	Odesa, Mykolayiv, Kherson	152 Gorkoho Street, 03680 Kyiv, Ukraine tel. +380 44 529 0685	Lidiya P. Strygina
3	Registration centre in Kyiv	Zhytomyr, Cherkasy, Kyiv, Vinnytsya, City of Kyiv	152 Gorkoho Street, 03680 Kyiv, Ukraine tel. +380 44 528 31 04	Natalia N. Mikhailenko
4	Registration centre in Dnipropetrovsk	Dnipropetrovsk, Kirovohrad	of.442, 52 Komsomolska Street, 49000 Dnipropetrovsk, Ukraine tel. +380 56 372 8013	Dmytro H. Hazhev
5	Registration centre in Donetsk	Donetsk, Zaporizhzhya, Luhansk	5 Khodakovskoho Street, office 901-a, 83023 Donetsk, Ukraine tel. +380 62 312 7779	Serhiy V. Podolsky
6	Registration centre in Kharkiv	Kharkiv, Poltava, Sumy	7/8 Povstannya Street, office 802, 8th floor, 61005 Kharkiv, Ukraine, tel. +380 57 732 8949	Serhiy K. Bastanzhyyan
7	Registration centre in Simferopol	Crimea Sevastopol	1 Kirova Street, office 607, 95015 Simferopol, Ukraine, tel. +380 65 254 3822	Kateryna L. Zaonehina
8	Registration centre in Ivano-Frankivsk	Lviv, Carpathian, Ivano-Frankivsk and Chernivtsi	77 Bandery Street, office 304, 76014 Ivano-Frankivsk, Ukraine, tel. +380 342 520 561	Oksana I. Olenych