Ukraine

Annual Report of State Nuclear Regulatory Administration

1999

March, 2000

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INTRODUCTION

According to Article 50 of the Constitution of Ukraine, every person has the right to have the environment, which is safe to human life and health. Therefore one of the paramount obligations of the state is to reach balance between interests of the society and rights of an individual whilst implementation of modern nuclear and radiation technologies by regulation of their safety.

World-recognized mechanism of such regulation is the establishment of regulatory authorities that are entrusted with development of legal framework, put into effect safety norms and rules, permissive regulation including licensing and control over observance of norms, rules and conditions of the granted permissive documents.

This Report presents main outcomes of the activity of the State Regulatory Authority of nuclear and radiation safety during 1999, outlines problems arisen or still pending unresolved, and issues requiring urgent solution in the coming year.

1. DEVELOPMENT OF LEGISLATIVE AND REGULATORY BASIS FOR THE USE OF NUCLEAR ENERGY

1.1. Nuclear legislation

1.1.1. Laws approved before 1999

By the beginning of 1999 the following laws in the nuclear energy field were put in force in Ukraine:

May 5, 1993 - *Law on Participation of Ukraine in the 1980 Convention on Physical Protection of Nuclear Materials*;
November 16, 1994 - *Law on Adhering the Treaty on Non-Proliferation of Nuclear Weapons*;
February 8, 1995 - *Law on Use of Nuclear Energy and Radiation Safety*;
April 30, 1995 - *Law on Radioactive Waste Management*;
July 12, 1996 - *Law on Adhering the 1963 Vienna Convention on Civil Liability for Nuclear Damage*.
November 19, 1997 - *Law on Uranium Ore Mining and Processing*;
December 3, 1997 - *Law on Amendments to Legal Acts Due to Adhering the 1963 Vienna Convention on Civil Liability for Nuclear Damage*;
December 17, 1997 - *Law on Ratification of the Nuclear Safety Convention*;
December 17, 1997 - *Law on Ratification of the Agreement Between Ukraine and IAEA for Application of Safeguards in Connection with the Treaty on Non-Proliferation of Nuclear Weapons*;
January 14, 1998 - *Law on Protection of Population from Radiation Effects.*
December 11, 1998 – *Law on General Principles of the Further Operation and Decommissioning of Chornobyl NPP and Transformation of the Destroyed 4th Power Unit of this NPP into Environmentally Safe System.*

1.1.2. Laws approved in 1999 – beginning 2000

On November 17, 1999 the Parliament of Ukraine has adopted the *Law on adhering to The Joint Protocol Relating to the Application of the Vienna Convention and the Paris Convention of September 21, 1988.*

On January 11, 2000 the *Law on Permissive Activity in the Area of Nuclear Energy Utilization* was approved by the Ukrainian Parliament. This Law defines the legal and organizational basis

for the permissive activities in the field of nuclear energy utilization and general provisions for regulations of social relations, which take place during its implementation as an exemption from general provisions established by the *Law of Ukraine on Business Undertakings.*

1.1.3. Laws submitted to the Parliament

During 1999 the SNRA has continued to work with the draft laws, which are under the responsibility of the regulatory authority. The draft *Law on the taxation for implementation of state regulation of nuclear and radiation safety* was submitted to the Cabinet of Ministers of Ukraine. The main aim for this law is the definition of the mechanism for reimbursement of expenses of the State budget on independent financing of the regulatory authority for nuclear safety according to the Convention on Nuclear Safety.

The draft *Law on the Ratification of Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management* was approved by other governmental authorities and submitted through the President of Ukraine Office to the Ukrainian Parliament for consideration and adoption. The Law is expected to be adopted by the Parliament in the 2-nd quarter of 2000.

Draft *Law on Physical Protection of Nuclear Materials, Nuclear Installations and Other Radiation Sources* was approved by the Parliament in first reading on May 20, 1999. This law defines legal basis of the activities of legal entities and physical persons in the area of physical protection of nuclear installations, nuclear materials, radioactive waste, other sources of ionizing radiation. The law is expected to be adopted by the Parliament in the 3-rd quarter of 2000.

1.2. Development of the system of norms, rules and standards of nuclear and radiation safety

During 1999 the process was running of establishment and improvement of the system of norms, rules and standards of nuclear and radiation safety to ensure safety assessment of nuclear facilities designed for management of radioactive waste, radiation sources and to provide proper physical protection.

Revision and development of norms and rules of nuclear and radiation safety were made with the following purpose:

- to put operating norms and rules in compliance with the national legislation and to systemize them according to the subject-hierarchical principle;
- to fill up the gaps in the current regulatory system and ensure smooth transfer to the licensing regime of safety regulation;
- Systematic and step-by-step reviewing of the norms and rules in force, on the basis of the established strategy, basing on the internationally accepted methods, results of scientific research and experience feedback, taking into account perspectives of nuclear field development.

In order to create conditions to provide proper physical protection of nuclear facilities, nuclear materials, radioactive wastes and other radiation sources the following normative-legal acts have been issued:

- **Rules for managing the restricted-access information on physical protection of nuclear facilities, nuclear material, other radiation sources,** approved by Order No. 191 of 28.12.98 of Minecobezpeki and registered by the Ministry of Justice of Ukraine on 25.02.99, reg. No. 114/3407.
- **Rules on physical protection of nuclear materials and nuclear facilities,** approved by Order No. 34 of 27.09.99 of the State Nuclear Regulatory Administration and registered by

the Ministry of Justice of Ukraine of 02.11.99 reg. No.748/4041. Recommendations of IAEA INFCIRC/225/Rev.3 and INFCIRC/225/Rev.4 were taken into account during the process of development of these Rules.

- **Provisions on defining characteristics of possible types and levels of assault on nuclear facilities and nuclear materials and using these characteristics in physical protection,** approved by Order of #38 of 30.09.99 of the State Nuclear Regulatory Administration of Ukraine and registered by the Ministry of Justice of Ukraine on 14.10.99 reg. No.703/3996.
- **"General safety provisions for Nuclear Power Plants",** approved by Order of #63 of 09.12.99 of the State Nuclear Regulatory Administration of Ukraine and registered by the Ministry of Justice of Ukraine on 06.03.2000 reg. No.132/4353

Once "General provisions…" is approved, the OPB-88 will lose its validity. The mentioned project is the first step towards replacement of the "soviet" norms and rules of nuclear safety with national documents being based upon national legislation and take into account recommendations of international organizations and operational experience of the Ukrainian Nuclear Power Plants.

For further development of safeguards system the following documents were developed:

- **Rules to keep accountancy and control of nuclear material at the facility**, registered at Ministry of Justice of Ukraine on 15.01.99 reg#18/3311.
- **Provisions on inspection of the system of accountancy and control of nuclear materials at facility**, come into effect by Order #1 of 27.05.99 of Minecobezpeki of Ukraine.

According to the Program of measures approved by Resolution #847 dated 4 August 1997 of the Cabinet of Ministers of Ukraine in order to establish the State Register of Radiation Sources and to ensure functioning of the State System of Accountancy and Control of Radiation Sources (State Register), the following regulatory acts were developed and submitted for state registration to the Ministry of Justice of Ukraine:

- Procedure for registration of radiation sources;
- Instruction on drawing up of state inventory of radiation sources;
- Procedure for the use of Register;

A number of regulations have been developed that are under agreement process:

- Provision on the procedure to perform state expert examination of nuclear and radiation safety;
- I&C systems of Nuclear Power Plants. Safety. General technical requirements;
- Rules to secure nuclear materials, radioactive waste, other radiation sources;
- Requirements to structure and content of Safety Analysis Report at the stage of decommissioning of Nuclear Power Plants and research reactors;
- Recommendations to the structure and content of Safety Analysis Report for implementation of projects at the "Shelter" facility;
- Methodology for radiation monitoring of metal scrap and metal waste.
- Procedure for certification of radiation sources with expired operational term;
- Radiation sources. Procedure for investigation of radiation accidents;
- Form and procedure for introduction of the Territory Ecological Passport.

The **"List of the first-priority regulations on safety of radioactive waste management"** was approved (joint Order of the Ministry of Health and the State Nuclear Regulatory Administration of Ukraine, No.28/223 dated 10.09.99). The list stipulates for development of the following documents within 1999-2004:

- General sanitary rules for work with ionizing radiation sources;

- Sanitary requirements and criteria for siting to create radioactive waste disposal facilities;
- Sanitary rules for radioactive waste management (SPPRV)
- General provisions to ensure safe disposal of radioactive waste in geological formations.

1.3. Development of internal regulatory guidance

Within the framework of licensing process during implementation of Shelter Implementation Plan (SIP) the development of a set of regulations to conduct safety expert examination during the implementation of projects within SIP framework at Shelter Object.

Those are:

Procedure to conduct expert assessment (technical evaluation) of documents submitted to the State Nuclear Regulatory Administration of Ukraine for consideration within the licensing process for implementation of SIP, approved by Order #14 dated 13.08.99 of the State Nuclear Regulatory Administration of Ukraine.

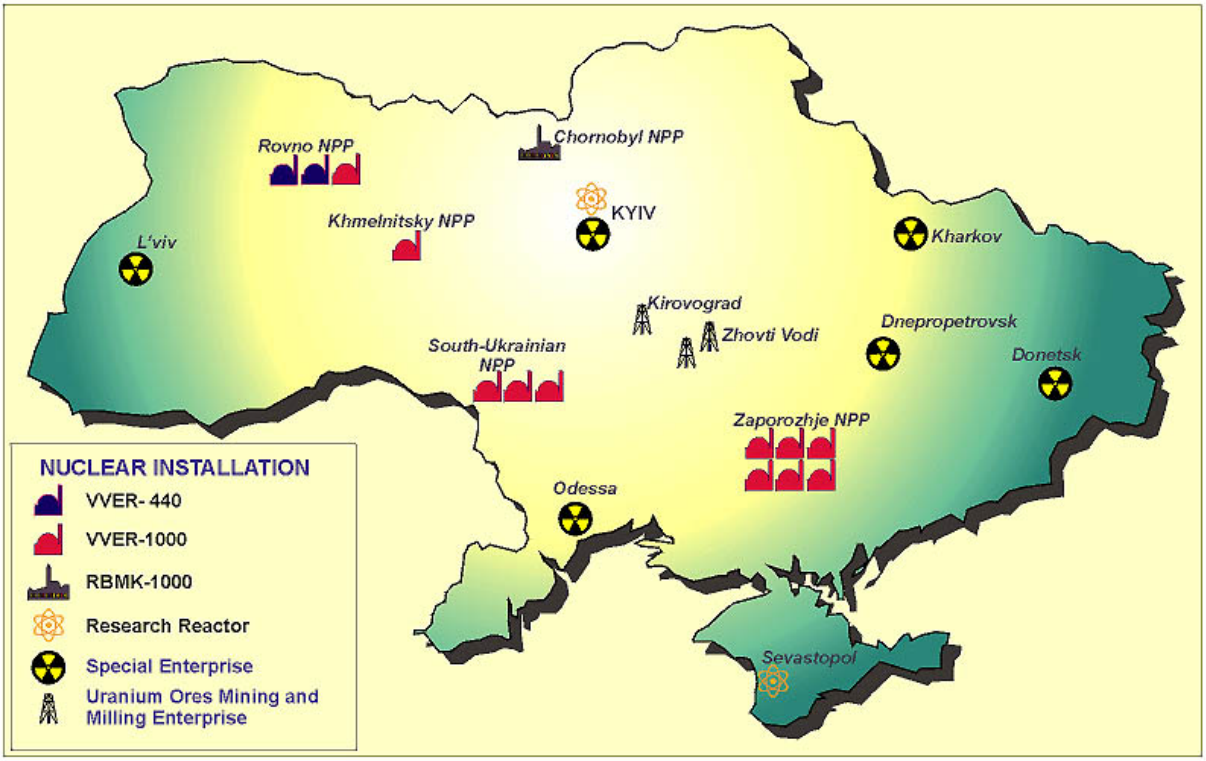
14 methodology guides to conduct expert assessment (technical evaluation) on different safety aspects of the documents to be submitted to the State Nuclear Regulatory Administration of Ukraine for consideration within the framework of licensing process for implementation of SIP. They were approved by the Orders of the State Nuclear Regulatory Administration of Ukraine.

This activity is of extreme importance in terms of complexity in applying criteria and requirements of regulations in force to the "Shelter" facility and the importance to ensure transparency of licensing process.

Development of a set of methodology documents has been commenced for expert assessment (technical evaluation) of Safety Analysis Reports of Nuclear Power Plants.

2. SAFETY OF FACILITIES AND ACTIVITIES IN THE NUCLEAR POWER FIELD

Map of Ukraine



In 1999 there were 14 power units at 5 nuclear power plants under *operation* in Ukraine (see map):

11 power units with WWER-1000 reactor (6 at Zaporizhia NPP, 3 at South Ukraine NPP, 1 at Rivne NPP and 1 at Khmelnytskyi NPP);

2 power units with WWER-440 reactor (at Rivne NPP);

1 power unit with RBMK-1000 reactor (at Chornobyl NPP) – will be shut down on December 15, 2000.

2 power units are in the state of the preparation to *decommissioning*:

Unit-1 of the Chornobyl NPP (in accordance with the Decree of the Cabinet of Ministers #1445 of December 22, 1997);

Unit-2 of the Chornobyl NPP (in accordance with the Decree of the Cabinet of Ministers #361 of March 15, 1999).

4 power units are under *construction* (Rivne-4 and Khmelnytskyi-2, 3 and 4). 2 of them (Rivne-4 and Khmelnytskyi-2) are almost completed.

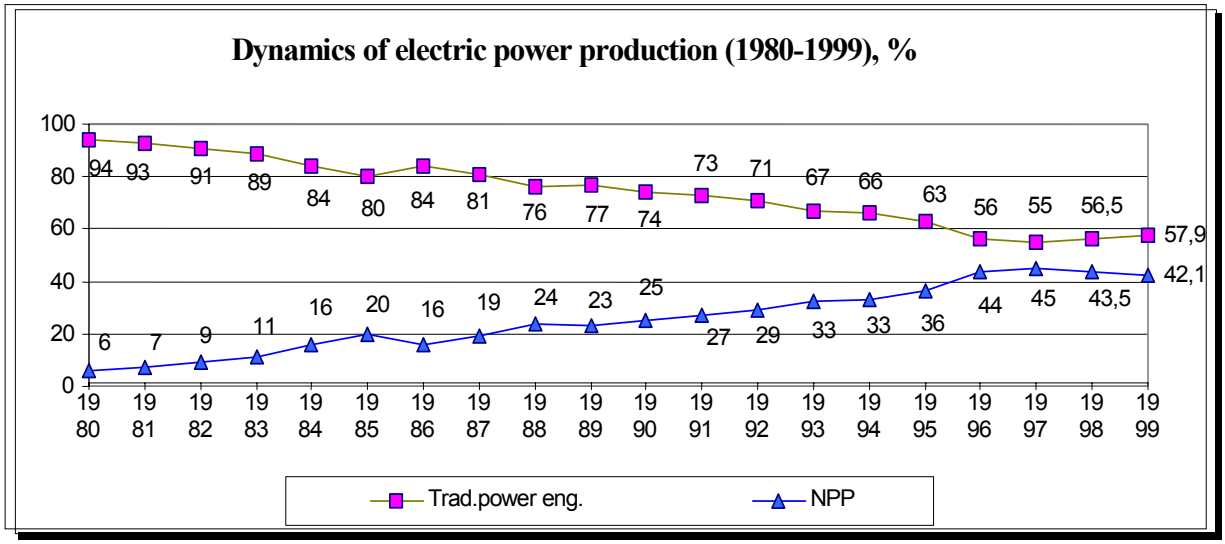
In 1999 Ukrainian Nuclear Power Plants generated 72,065 billions kWh of electricity that is 42,1% of the whole part of power generated in the country. At Nuclear Power Plants the capacity factor was 64%. Mentioned figures are slightly worse than these in 1998.

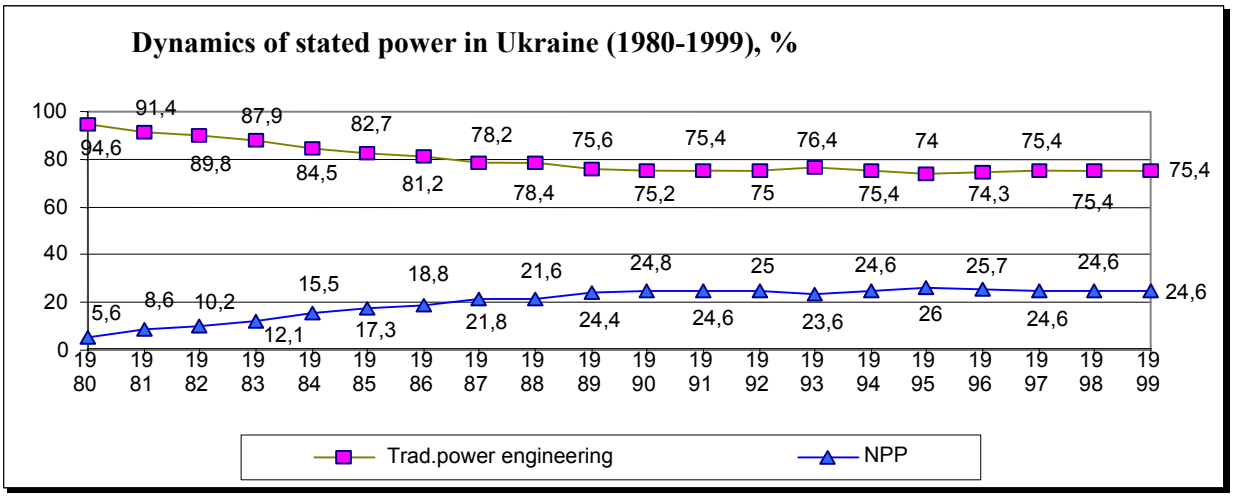
2.1. Nuclear power engineering

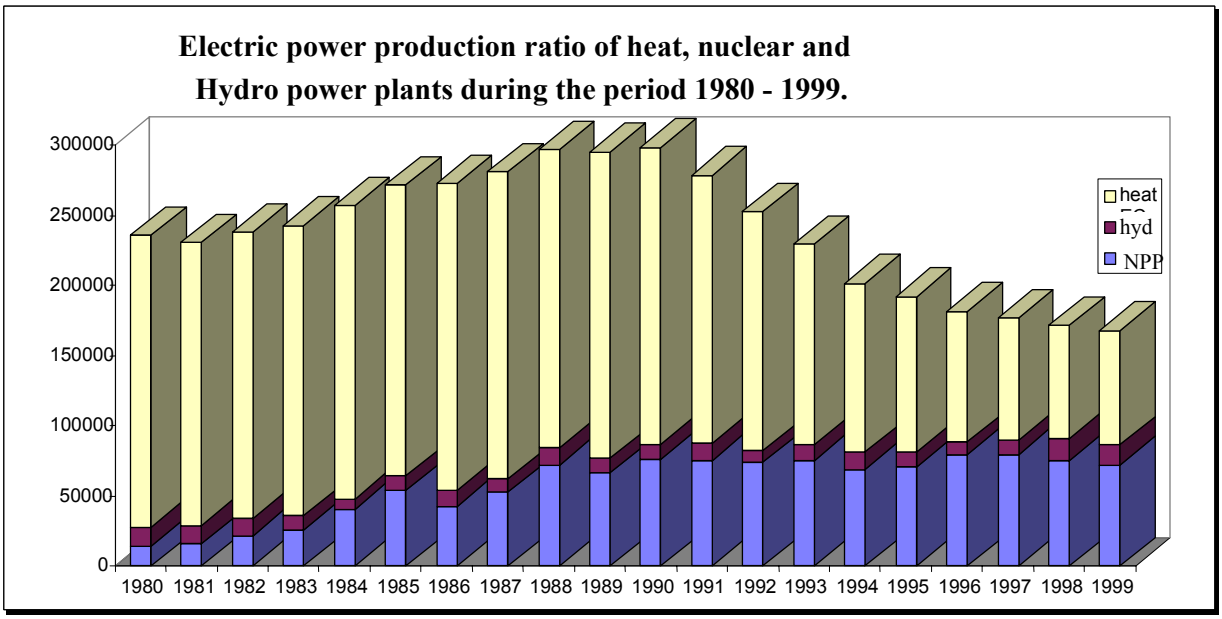
2.1.1. State-of-the-art of nuclear power engineering

In 1999 Ukrainian power plants keep on operating in the conditions of organic fuel deficiency and plural defaults of payments for produced electric power. It had essential influence on operational reliability and safety of the whole electric power system of Ukraine including nuclear power engineering. The difficulties with load schedule control have increased in consequence with the lack of necessary maneuver capacities, due to this the electric net frequency was kept at the level of 49,3 Hz and lower that resulted in NPP units trips.

It is necessary to notice that the decline of total electric energy production continues in Ukraine because of total decrease of production at traditional electric power plants and Nuclear Power Plants (see diagram 1, 2, 3) at permanent level of established power.

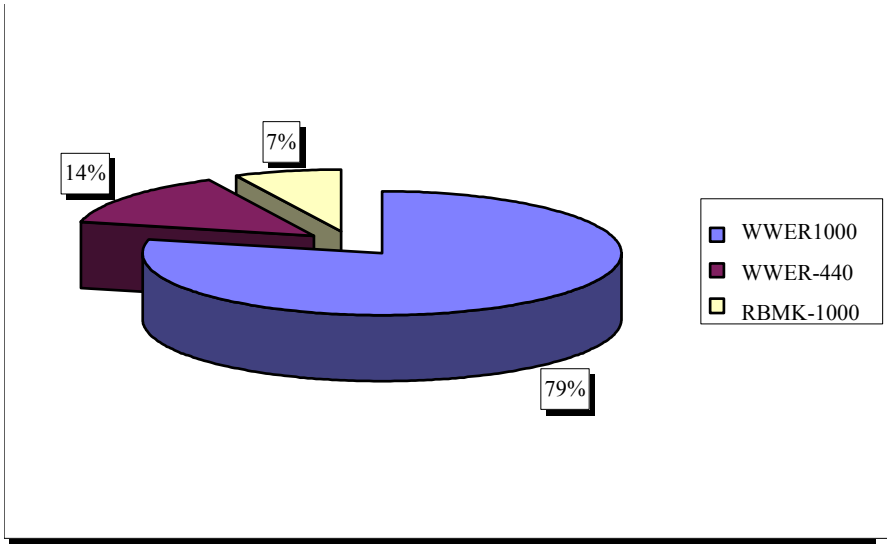






During last years nuclear power engineering took up the important place in the power engineering complex of Ukraine.

Diagram 4. Number of power units at Ukrainian Nuclear Power Plants by the reactor type, in %



Total established capacity of Ukrainian nuclear power plants is 12 818 mWt that makes 24,6% of the total stated capacity. Established Nuclear Power Plants units capacities are given in the diagrams 5, 8.
In 1999 nuclear power plants of Ukraine produced 72 065 m kWh of electric power that is 42,1% of total output of electric power in Ukraine (diagram 6, 7, 9).

Diagram 5

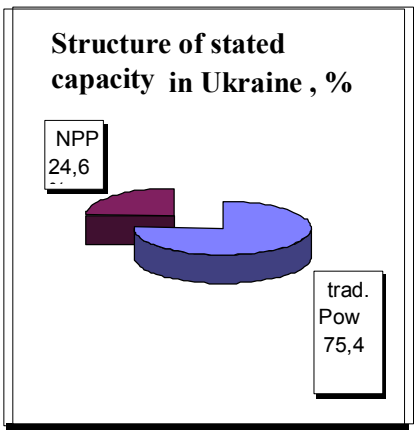
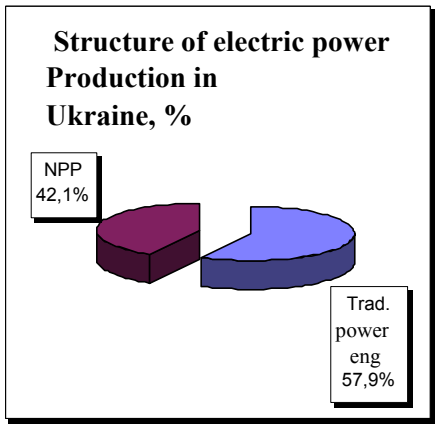


Diagram 6



The Chornobyl NPP power production drop was compensated with electric power production at other Nuclear Power Plants (in comparison with its part in total balance of established capacity (see diagrams 7, 9)

Diagram 7

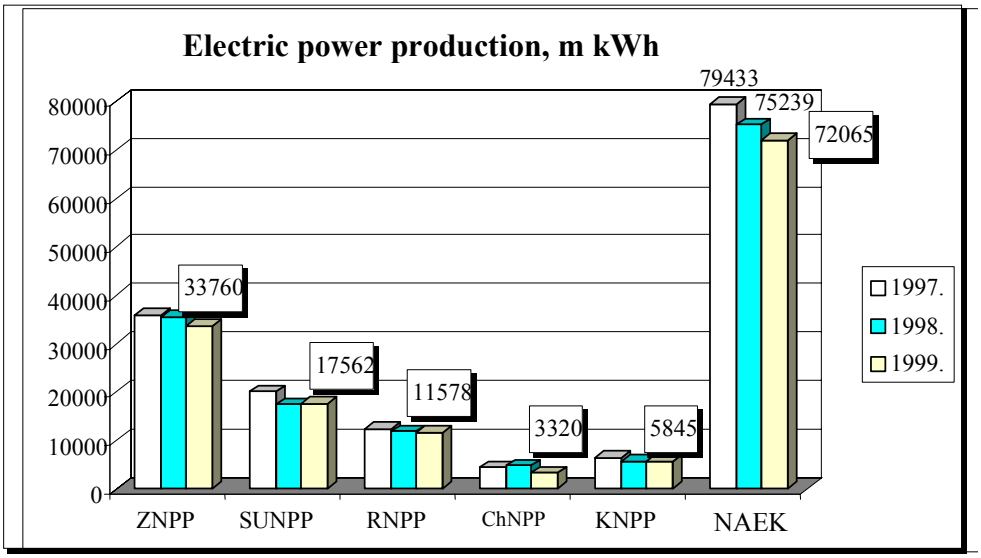


Diagram 8

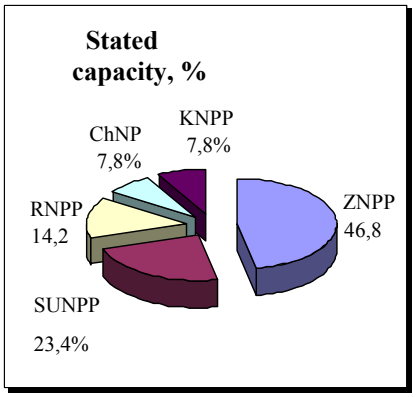
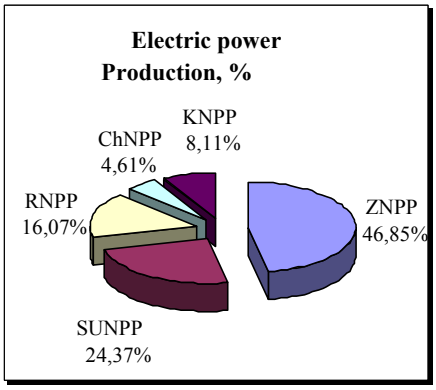


Diagram 9

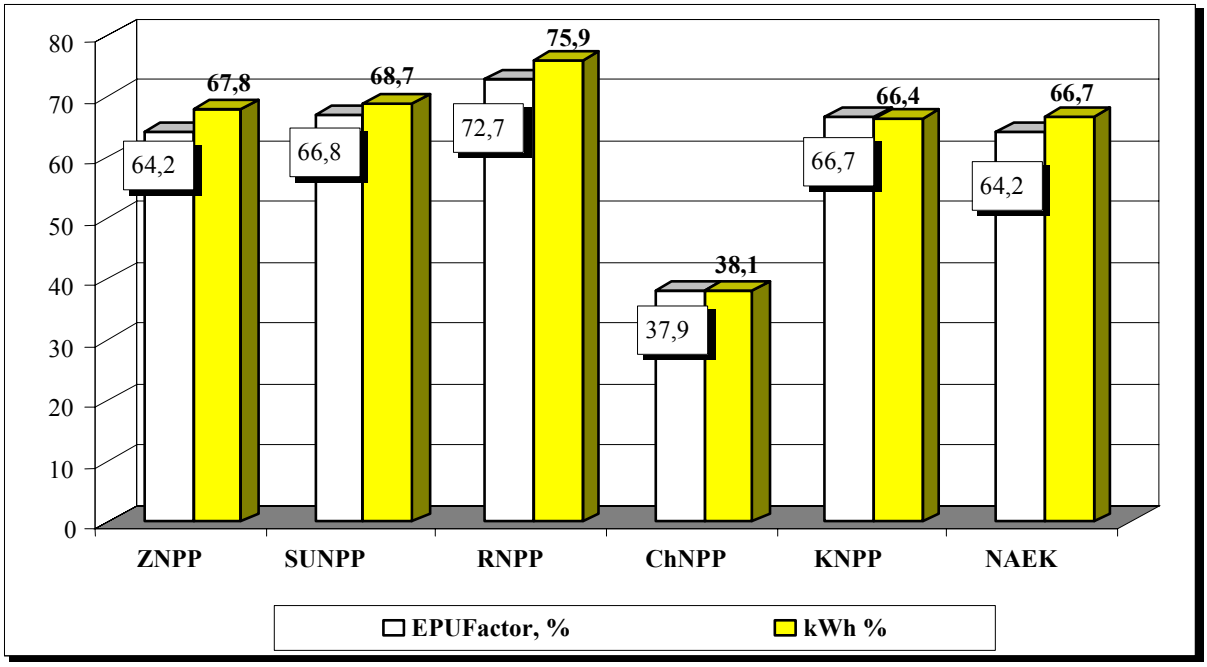


In comparison with 1998 nuclear power production decreased for 4,2% - 3 174 m kWh (diagram 7), deficiency in nuclear power production increased from 33% (37 076 m kWh) in 1998 to 35,8% (40 221 m kWh) in 1999.

The established plant-use factor (EPUF) is an important index of branch activity. Either low, (compared with foreign Nuclear Power Plants indices where even the former USSR produced reactors have 80%) EPUF of separate power units and generally in this branch of industry has considerably decreased in reporting year in comparison with past years (EPUF decreased for 2,8%, from 67% to 64,2% (diagram 10). An essential reason of such decrease is shortage of funds for purchasing fuel, spare parts, equipment, repair service, maintenance, scientific support that caused substantial exceed of power units outage time.

The highest EPUF is 87,4% at power unit #1 of Rovno NPP, the lowest EPUF is 37,9% at power unit #3 of Chornobyl NPP (diagram 11).

Diagram 10

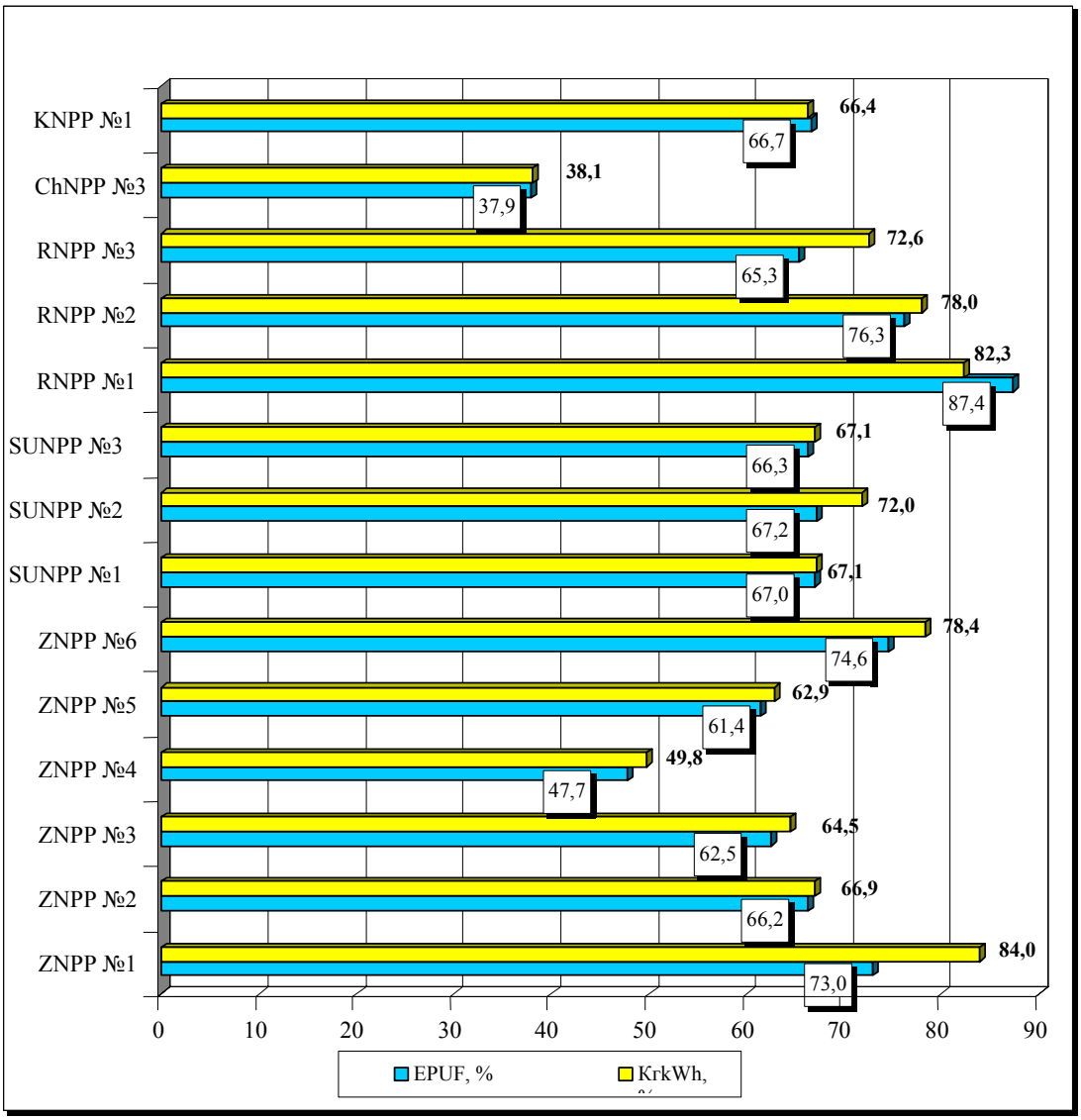


The decrease of electric power production in 1999 in comparison with past years is explained by the upgrowth of the number of planned outages, their duration as well as units operation with lower capacity that is directly connected with economical conditions of NPP.

In detail the main reasons of electric power production decrease are as follows:

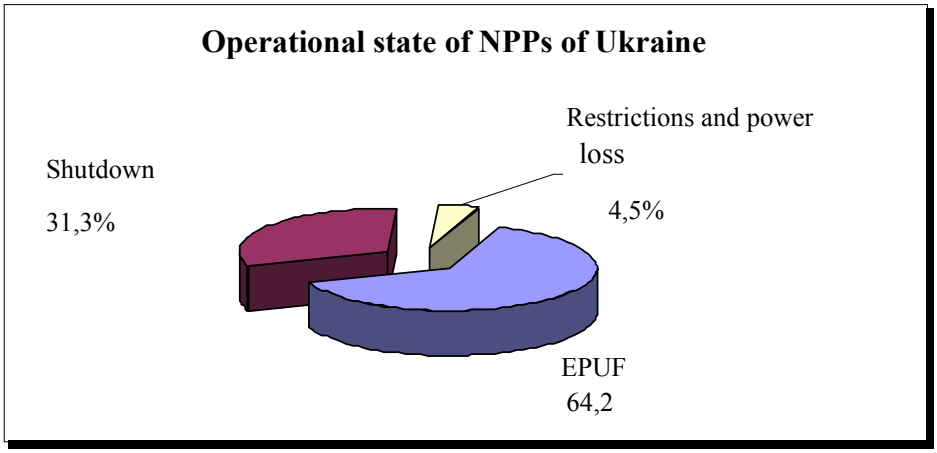
- Total time of power units outages increased for 3,3% (from 35 767 in 1998 to 36 956 in 1999);
- The electric power production losses increased for 64% due to power units operation at power effect (from 340 m kWh in 1998 to 558 m kWh in 1999);
- The losses connected with untimely delivery of fuel increased in 34,3% (from 648m kWh in 1998 to 870 m kWh in 1999);
- Electric power production deficiency increased in 2,3 times due to dispatching restrictions (from 359 m kWh in 1998 to 830 m kWh in 1999);
- Electric power production deficiency increased in 2,8 times due to equipment defects (from 393m kWh in 1998 to 1 119 m kWh in 1999).

Diagram 11



Brief analysis of established power capacity underproduction in the branch of industry has shown that if utilization coefficient of established capacity of Ukrainian Nuclear Power Plants is 64,2%, then the underproduction of established power capacity is 35,8%. This amount can be broken down as follows: power units' shutdown - 31,3%, this is the main reason of losses. 4,5% of losses is due to restrictions and losses of different character. (Diagram 12).

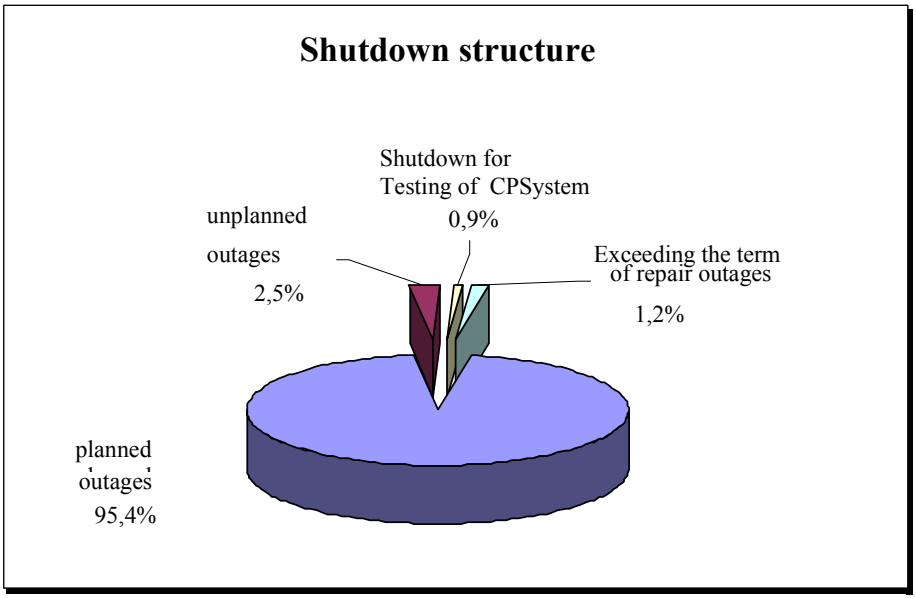
Diagram 12



During reported period NPP power units were in the following state (diagram 13):

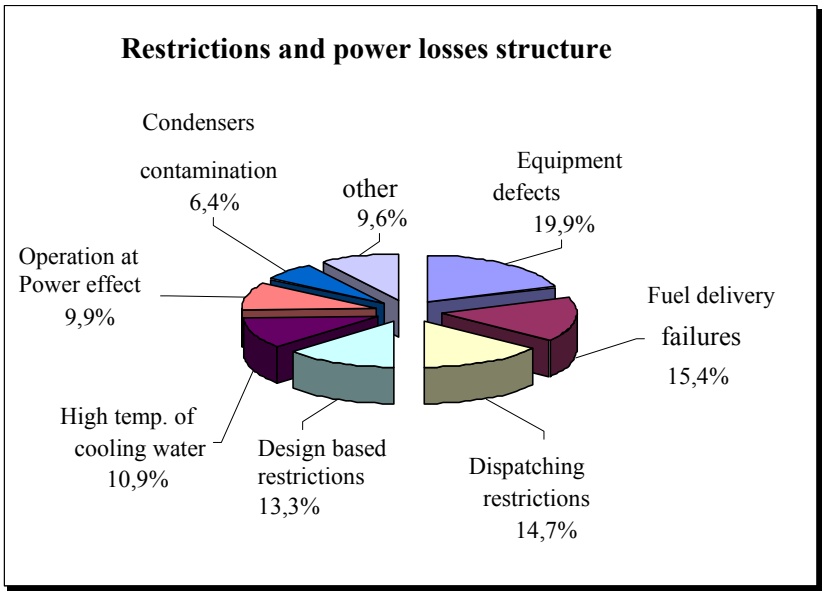
- Planned repair outages (big, medium and operating), 95,4% of power loss is due to that because of shutdown;
- Unplanned outages (power units shutdown took place due to violations) – 2,5%;
- Shutdowns for testing of protection systems control rods - 0.9%;
- Repair outages overtime – 1.2%

Diagram 13



4.5% of losses in production is for restrictions and power losses (diagram 14), the main reason for this is equipment defects, failure of fuel deliveries and dispatching restrictions.

Diagram 14



During 1999 there were 67 operational violations at five Ukrainian nuclear power plants. Dynamics of violation distributed by years is given in Diagram 15.

Diagram 15

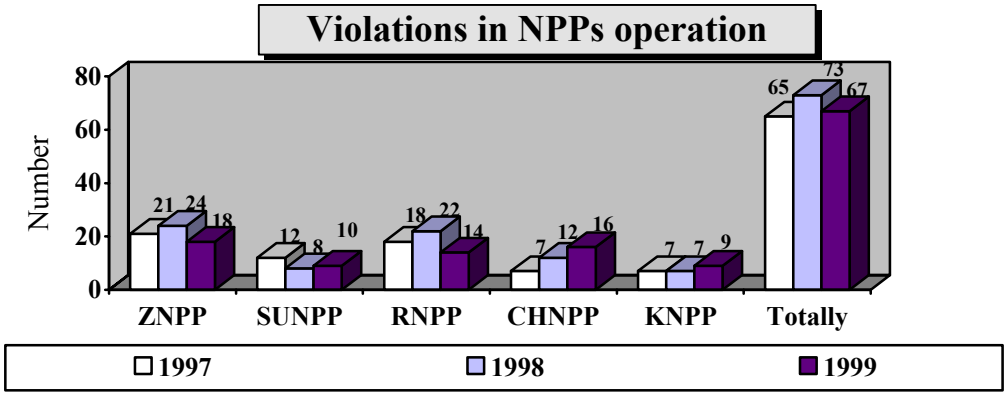
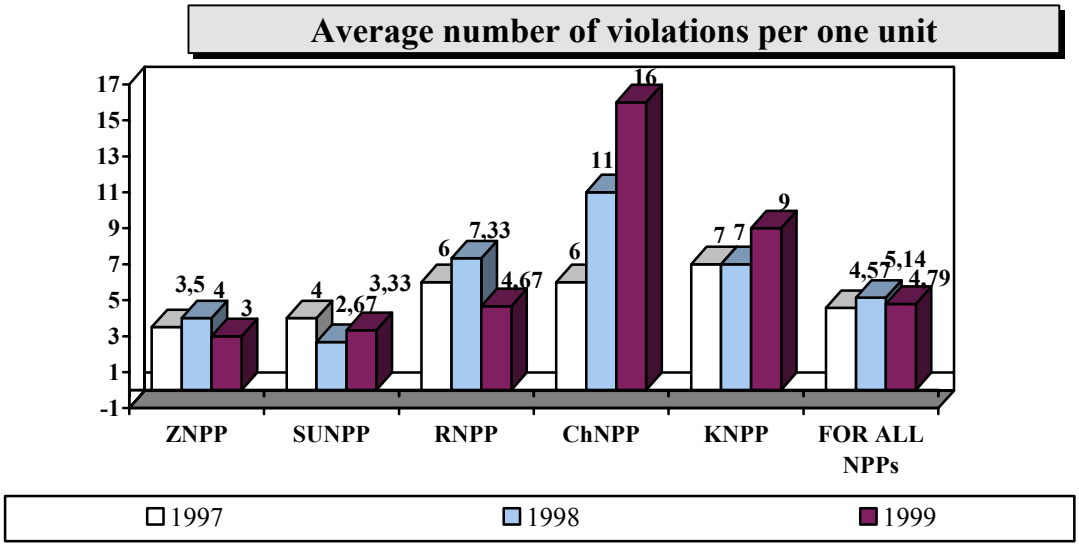


Diagram 16



Average number of violations is calculated for 14 nuclear power units and is 4,79 (diagram 16,table 5, Supplement 2).

The biggest number of violations in 1999 has been at the following nuclear power units (table 4 Supplement 2):

#3 of Chornobyl NPP – 16 violations;

#1 of Khmelnitsky NPP – 9 violations;

#2 of Rivne NPP – 7 violations.

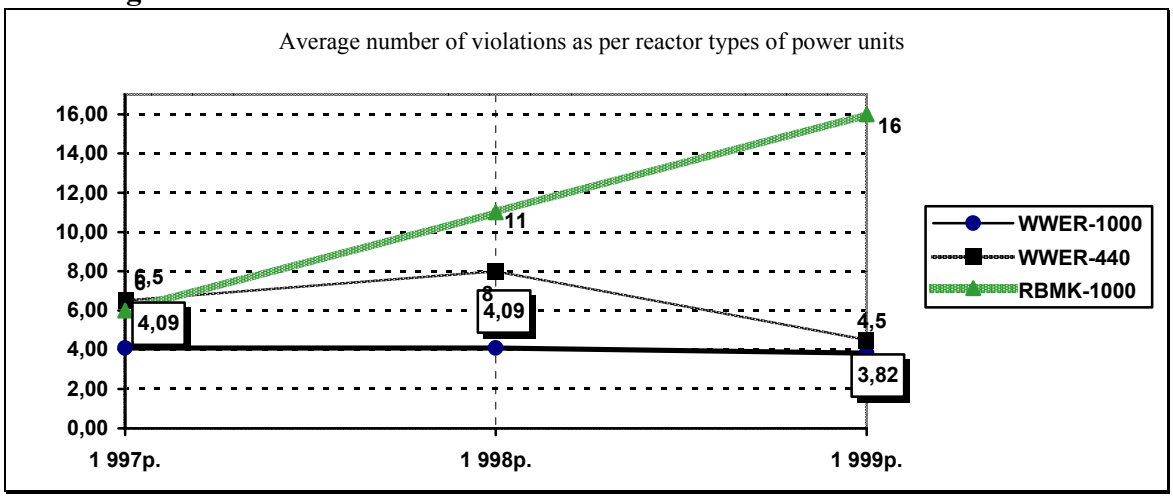
During reporting period power unit #2 of Zaporizhie NPP operated in stable mode, without violations.

In 1999 there were no accidents and incidents at Ukrainian nuclear power plants. 59 violations in NPP operation (in 1998 – 65 violations) are classified as zero level (do not impact safety).

8 violations (in 1998 –7 violations) are referred to level 1 (anomalies) of INES scale.

Breakdown of violations by the reactor types (see diagram 17) showed that in 1999 in comparison with 1998 the number of violations per one unit has decreased and is 4,79. The biggest number of violations in 1999 related to power unit with reactor of RBMK-1000 type.

Diagram 17



In 1999 the biggest part of violations in nuclear power plants operation relates to such that connected with inefficient serviceability of equipment. Violations connected with design-based imperfections decreased during last years and are approximately 11-18% of all violations per year.

A number of violations caused by poor quality of repair and maintenance is at the same level during 1994–1999 and is 15-20% of the total number of violations connected with human factor impact.

A number of violations connected with equipment aging is stable during the last two years and is 10-15 % of total number of violations per year.

A number of violations caused by mechanical damages of equipment has decreased during 1994 – 1999 and is 17-25% of total number of violations. This fact shows the effectiveness of measures provided by the utilities in the frames of “Safety Upgrading Program”. This activity is under the control of Main State Inspectorate for Nuclear Safety.

Personnel errors caused 34% of violations per year.

The main technical problems of power units with the reactors of WWER-1000 type are the following:

- Exceeding of design-based time of control system rods drop;
- Loss of tightness of heat-exchanging surface of steam-generators pipes;
- Lack of technical means for adjusting and testing of impulse-preventive devices of pressurizer.

For power unit #3 of Chornobyl NPP with RBMK-type reactor the main problems are:

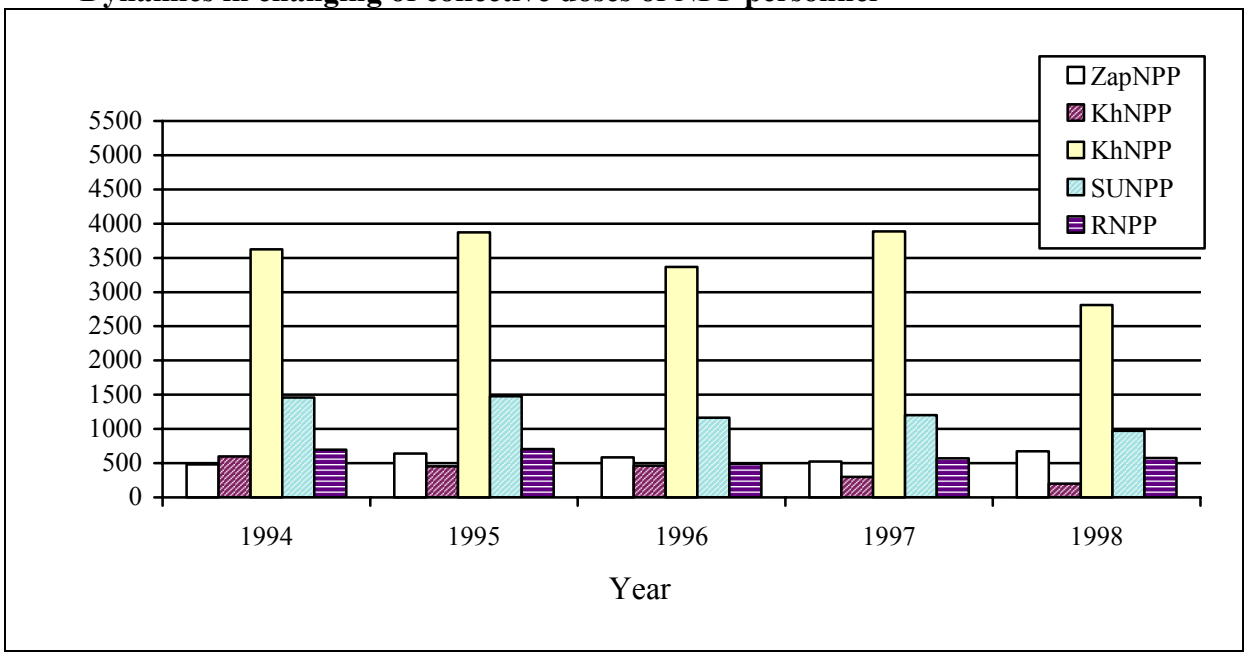
- Cracking of welded joints of multiple forced circulation pipelines;
- Exceeding of permissible meanings of channels inner diameters, as a result the clearance between graphite layer and some channels is exhausted.

Analysis of NPP operation in 1999 has confirmed the existence of both general problems discovered before for all nuclear power plants and the problems which are characteristic for every type of reactors. The problem related to design service life expiration of equipment is mutual for all nuclear power plants.

2.1.2. Collective exposure doses of the personnel

Dynamics in changing of collective doses of NPP personnel is presented in the diagram. For resent years values of collective exposure doses of NPP personnel of Ukraine are kept remaining stable.

Dynamics in changing of collective doses of NPP personnel



Greater values of collective doses of ChNPP personnel vs. other Nuclear Power Plants of Ukraine can be explained by another type of the reactor, an increased number of preventive and planned repairs, consequences of the Chornobyl catastrophe in 1986.

More objective factor characterizing the level of radiation protection of personnel is correlation of annual collective exposure dose of NPP personnel to quantity of NPP generated energy (Table 1).

Table 1

	ZNPP	SUNPP	RNPP	KhNPP	ChNPP	Nuclear Power Plants of Europe
Correlation of annual collective exposure dose of NPP personnel to quantity of NPP produced energy indiv*cSv/ MWt*year	**0,098** (1999)	**0,406** (1999)	**0,321** (1999)	**0,245** (1999)	**9,770** (1999)	No data (1999)
	0,166 (1998)	**0,489** (1998)	**0,427** (1998)	**0,306** (1998)	**5,181** (1998)	**0,210** (1998)

The given factor for the Ukrainian Nuclear Power Plants with WWER type reactor (except Chornobyl NPP with RBMK type reactor) in 1999 is better in 20-40 % vs. analogues factors in 1998, but in some extend yields to analogues factor for Nuclear Power Plants of Europe. This factor is better at Zaporizhia NPP comparing to an average factor for Nuclear Power Plants of Europe.

2.1.3. The licensing process

The SNRA applies principles established by the Resolution #28/1 of 14 December 1994 by the Collegium of the former State Committee of Ukraine on Nuclear and Radiation Safety – UkrSCNRS.

Main provisions of this Resolution are:

- **Licenses for NPP operation (NPP units) that were in operation before can be issued only on positive results basis of Safety Analysis Reports and Quality Assurance Program reviewed by the regulatory body;**
- **Before the completion of Safety Analysis and Quality Assurance Programs by Operating organization for operated power units, the power units are operated on the basis of temporary permits. These permits are issued annually after completion of repairs and maintenance (for Nuclear Power Plants) and outages (for WWER reactors) by the results of review of the defined list of documents demonstrating the observance of safety requirements.**

Since Quality Assurance Program and Safety Analysis have not been completed for any power unit and a number of legal requirements regarding financial guarantees were not met (for indemnification of a nuclear damage and the insurance fund for future decommissioning, etc.), in 1999 the NEGC "Energoatom"- utility issued the temporary permits for operating NPP units with WWER-type reactors.

Taking into account the operation experience and the results of investigation of violations in NPP operation during the last outage, the following was stated in special conditions of temporary permits for power units with WWER-type reactors:

- To continue the regular tests (once per month) during unit operation of control rod time drop into the reactor core under actuation of emergency protection system. In order to abate overrunning the design time of 4 seconds for control rod drop the introduction of a number of design and organizational measures has been kept continuing during the outage-99, but the problem has not yet reached its final solution;
- In order to ensure further safe operation of steam generators PGV-1000:

- establish substantiated criterion of heat-exchange pipe shut down due to wall thinning corrosion;
- establish requirements to the integrity inspection system of header heat-exchange pipes and

partitions to detect deficiencies timely;
- Operating organization shall develop and implement the reconstruction project for steam generator blowout system to eliminate "salt compartment" near the cold header.
- Operating organization shall make an analysis of a probability and consequences of a destruction of two or more tubes caused by SG thinned wall tubes;

- Implementation of specific safety upgrading measures for power units. During the year the SNRA assessed Progress Reports on safety upgrading measures that had to be implemented at NPP during the validity period of operation permits;
- A comprehensive implementation of measures to prolong service life of equipment that have expired its design basis service life. This is the pressing problem of Ukraine NPP units, most of which have been operated for more than 10 years. According to the established procedure, the regulatory body considers, assesses and approves Inspection and Test Programs in order to asses a potential for prolongation of service time for each type (kind) of equipment, pipelines, instrumentation and devices. In 1999 more than 200 such decisions were made. Since this is a branch problem, NEGC "Enegroatom" proposed to develop a range of measures to establish a unified system to prolong the service life for equipment of safety-significant systems for all Nuclear Power Plants.

During the reporting year the SNRA has started receiving parts of Safety Analysis Reports of so-called pilot power unit (selected by Operating organization as a prototype to develop SAR for certain type of reactor facility). Some parts of SAR have been received for power unit #1 of Rivno NPP (WWER-440, W-213 reactor), power unit #1 of South Ukrainian NPP (WWER-1000 "small series"), and for power unit #5 of Zaporozhzhie NPP (serial reactor WWER-1000, W-320). In order to speed up the process of SAR review the Administration, not having awaiting to receive a completed SAR from Operating Organization, has started submission of already received separate parts and sections of SAR for state expertise of nuclear and radiation safety.

One of the most difficult and pressing issues in licensing of operated power unit in 1999 was the issue of **conditions and validity term of permit to prolong operation of ChNPP-3 by transiting to year 2000**. Since this issue had also a political importance, it was decided to put it for consideration to the Collegium of the State Nuclear Regulatory Administration of Ukraine, held on November 24, 1999. Representatives of the Ministry of Energy of Ukraine, Operating organizations, ChNPP, and experts assessing documents demonstrating a potential to prolong the operation of ChNPP-3 with transition to year 2000 were invited to the meeting. During the meeting it was pointed out that in the view of the Memorandum on Understanding between Ukraine and G7 countries signed in 1995, during the period of 1996-99 safety upgrading measures were performed within the only scope of "Short-term Safety Upgrading Measures Program". It did not include a number of safety improvements related to replacement of equipment with service time exhausted in 2000 and later.

The gained operational experience of nuclear facilities with RBMK-1000-type reactors and the research work performed in Ukraine and Russian Federation have shown that the design service time of fuel channels by complex safety indicators exhausts in 17-19 years since the starting of operation. Basing the review of results of inspections and calculations submitted by the Operating organization, a decision was made to limit the operation term of power unit #3 after the outage -99 within a period not more than 200 days.

Results of inspections and calculation on the status of equipment, which design service time has run out or is close to its end were also discussed. In particular, this relates to the primary pipelines on which during 1997-1999 a considerable number of defects caused by intergranula stress corrosion was detected. It was singled out that the existing monitoring methods do not guarantee defect-free welds. Operating organization calculated defect progress rate upon request of the regulatory body. On the basis of the obtained results it was decided that the safe operation of the primary circuit pipelines could be possible till 15 November 2000.

The Collegium has decided that the prolongation of the operation of ChNPP-3 with transition to year 2000 is possible under the above-mentioned restrictions.

According to the decision of the Collegium, Chornobyl NPP of NEGC "Energoatom" was granted with temporary permit #73-E(t)-ChNPP-3-12-99 for operation. According to this permit **the operation of power unit #3 is allowed for a period of 200 effective days but not longer till 15 November 2000**.

In 1999 the SNRA **did not issue permit for extension of the operation of fuel assemblies with zirconium stingers and guiding channels at ZNPP-3 and RNPP-3**. This decision was based on the results of inspections of research fuel assemblies performed in early November 1998 at RNPP-3 and in early November 1999 at ZNPP-3 that have revealed displacement of stingers against the design basis position. Moreover, state expertise has concluded that there was insufficient substantiation of safety criteria during the operation of fuel assemblies with displaced stingers.

In 1999 SUNPP submitted to the SNRA the documents required for licensing of the second stage of trial operation of morpholine mode of the secondary circuit of power unit #2. The review of these documents was followed by comments of experts. Once the comments are satisfied or the rejection of those is reasoned the SNRA will issue permit for prolongation of the second stage of trial operation in morpholine mode.

The SNRA requirements to the certification of hydro-jacks, which are used on the pre-stressed containment of WWER-1000 power units, have speed up the commissioning of a hydro-jack grading loop at ZNPP and a force-measuring platform at SU NPP, which considerably increased the reliability of measurements of reinforce rope tension.

In 1999 the licensing procedures were completed and relevant permits were issued for:

- Commercial operation of an informational-calculation system delivered by "Westron" at SUNPP-1;
- Research-commercial operation of informational-calculation systems delivered by «SUSECA» at RNPP-1,2;
- Research-commercial operation of refueling machine control system at ZNPP-1;
- Research-commercial operation of a system "ALUES" for detection of primary circuit leakage at RNPP-3;
- Research-commercial operation of SPSS at ChNPP-3, SUNPP-1, KhNPP-1, ZNPP-5.

Taking into account the experience of licensing SPSS pilot projects (KhNPP-1, ZNPP-5), the procedure for SPSS projects at SUNPP-2, ZNPP-3, and RNPP-3 was developed and approved and relevant actions have been commenced.

Licensing of system modernization projects are kept running:

- ARM, ROM, SIAZ delivered by "Hartron-Enkos" at RNPP-1 (implementation of system preliminary tests is agreed);
- ASUT-1000-2 and turbine hall regulators at ZNPP units on the basis of system ASUT-1000-M.

In connection with **the Y2K problem** the SNRA developed and implemented necessary regulatory measures.

By the request of the SNRA the hardware and software at NPP units was inventoried and necessary changes were introduced accordingly.

In case of possible emergency situations related to Y2K problem NPP developed Emergency Response Plans. During the review of these Plans a sharp attention was paid to the reliability of the country energy system and ensuring of nuclear safety in case of the system failures.

In November 1999 Collegium of SNRA was devoted to the above-mentioned issue. By the results of this meeting, actions were planned to obtain the final confirmation of the power unit readiness to get over the Y2K problem. The completed reports of the Ukrainian Nuclear Power Plants were agreed in principle and **the level of readiness of NPP units to get over possible effects of Y2K problem was recognized as satisfactory**.

Plan of the SNRA's actions during the date transition was developed and implemented.

2.1.4. Chornobyl NPP power Units 1 and 2

During 1999 ChNPP-1 was in the state of stopped operation on the basis of temporary permit #07/1-E(t)-ChNPP-1-1198 issued by NRA in 1998.

The permit is valid until the end of fuel unloading from the reactor core.

During this period activities were performed at power unit #1 provided by the "Program of Stopping Operation of Power Unit #1".

Besides, a part of fuel that can be found in the reactor core and cooling pond in the amount of 711 fuel assemblies will be used in the reactor of power unit #3. For this purpose the operating organization agreed with the SNRA on a corresponding decision in 1999.

ChNPP-2 has been stopped since October 1991, all the nuclear fuel was removed from the reactor.

According to the "Memorandum on Mutual Understanding Between the Governments of G7 countries, the Commission of European Union and the Government of Ukraine Concerning ChNPP Closure", on 15 March 1999 the Cabinet of Ministers of Ukraine adopted Decree #361 "On Early Decommissioning of ChNPP power unit-2".

Nowadays ChNPP is preparing necessary documents that are specified by OPB-SE in order to be granted by the regulatory body with permit for ChNPP-2 operation at the stage of suspension of operation, namely:

- "Program for shut down of ChNPP-2 operation";
- "Process procedure at shutdown stage of ChNPP-2 operation".

In 1999 the above-mentioned "Program for shutdown…" was approved by the SNRA.

2.1.5. NPP units under construction

During 1999 the construction of KhNPP-2 and RNPP-3 was performed. Construction of units KhNPP-3,4 has been suspended.

Construction of RNPP-4 was performed on the basis of license #07/2-B-RNPP-4-12-96 issued to the Operating organization "Rivne NPP" in December 1996 according to the legislation in force.

In January 2000 this license has expired. On December 3 1999 a new Application with a set of documents was received from Rivne NPP for issuance of a new construction license for power unit #4.

On November 30 999 Khmelnytska NPP submitted an application with a set of documents to get KhNPP-2 construction license.

The SNRA developed draft licenses for the construction of power units. These licenses will be issued in accordance with the established procedure after the review of submissions provided that the conclusions of the review are positive.

The SNRA together with the Ministry of Energy of Ukraine and NEGC "Energoatom" defined safety upgrading measures for power units within the start-up complex. Power unit start-up complex was supplemented with a number of the most safety-significant measures that, from the SNRA's point of view, must be necessarily performed before power unit commissioning. Some of them are significant not only for commissioning units but either for all WWER-1000. These measures are: development of a new program of reactor vessel surveillance samples, a set of measures to test the containment, etc.

2.2. Research reactors

2.2.1. Research reactor at SC of Institute Nuclear Research, NAS of Ukraine

During 1999 the research reactor WWER-M SC NRI was operated on the basis and according to the conditions of the temporary permit for operation WWER-M #07/2-E-DR-05-98 issued by NRA in 1998.

This permit is not valid since January 1 2000. The main condition to prolong the research reactor operation is replacement or prolongation of the service time of the existing control and protection system.

In January 2000 SC NRI submitted to the SNRA a set of documents demonstrating a possibility to prolong the service time of WWER-M MPS.

2.2.2. SIYaEP research reactor

Expert review of the following documents was completed during the year:

- Process Procedure for IR-100 Safe Operation;
- Safety Substantiation Report for IR-100;
- A set of documents demonstrating the possibility of the prolongation of IR-100 MPS service time;
- A set of documents demonstrating the possibility of the service time prolongation for radiation monitoring system IR-100 "KRUK-1";

Among them:

a) The SNRA approved the decision to prolong the service time of radiation monitoring system "KRUK-1";
b) The documents on prolongation of the service time for IR-100 MPS were returned to the applicant for revision;
c) After the review of Process Procedure for IR-100 Safe Operation and Safety Substantiation Report and their expert reviews the SNRA will make a decision on the possibility to approve these documents.

2.3. Spent nuclear fuel storage facilities

Spent nuclear fuel (SNF) from Ukraine NPP with WWER-type reactors after its preliminary cooling in cooling pools (CP) is sent for interim storage and then for reprocessing to Russia. Due to instability of intergovernmental relations as well as with unresolved financial problems the Ukrainian Nuclear Power Plants with WWER-type reactors faced a problem of safe storage of spent fuel assemblies. The Operating organization has undertaken a number of measures to

ensure safe management of SNF of NPP with WWER-type reactors, they are: high density storage racks for SNF in CP and creation of autonomous facilities for SNF storage.

One of the main measures to create on-site storage facilities is the completion and commissioning of the on-site SNF storage facility at ZNPP using ventilated storage containers with a possibility of design modernization.

Since 1993 ZNPP performed work on creation of Dry Spent Fuel Facility. Since 1994 the regulatory body has been paying a significant attention to safety assessment and licensing of this storage facility.

During the year the revision of safety substantiation and ZNPP SNFSF design was continued. Basing on the conclusions of the State expert review (version 01.2) of 30 August 1999 as well as on expert reviews that were performed earlier, State Nuclear Regulatory Administration of Ukraine has considered safety substantiation for SNFSF commissioning presented in the "Report…» satisfactory, provided that some specific conditions are fulfilled.

The SNRA representatives took part in the State Acceptance Commission while accepting the FNSSF of ZNPP to operation. By their requests the decision of the State Acceptance Commission concerning the storage facility readiness to commercial operation was supplemented with a list of issues to be implemented prior the first three containers loading.

The results of the storage facility safety assessment are presented in the "Report of the State Nuclear Regulatory Administration of Ukraine about the results of safety assessment of ZNPP SNFSF". **On 7 October 1999 the Board of the State Nuclear Regulatory Administration of Ukraine considered the issue of "Issuance of Licenses for Operation of SNFSF at ZNPP"**. The Board considered the above-mentioned Report and suggested to the management of NEGC "Energoatom" and ZNPP to submit to the SNRA the operational documents, programs, and reports according to the list. The Board also defined the main conditions of the operational license for ZNPP SNFSF.

Currently the SNRA is reviewing the submissions of ZNPP.

Storage of SNF from ChNPP is also a sharp problem. In accordance with the initial design the ChNPP SNF shall be stored at the power units and collected in a basin-type interim spent nuclear fuel storage facility. The capacity of the storage facility has almost been exhausted. The problem is getting more pressing regarding the spent nuclear fuel storage during ChNPP units decommissioning.

In accordance with ChNPP Safety Upgrading Program (item C-2) preparations were made for creation of ChNPP spent nuclear fuel storage facility-2 that would be located within ChNPP the Exclusion zone. The design of the storage facility shall provide for storage of about 25000 spent fuel assemblies in a dry-type storage facility. Spent nuclear fuel storage facility-2 designing is a part of the Grant Agreement signed by the government of Ukraine, the European Bank of Reconstruction and Development, and ChNPP. On a competitive basis a storage facility design proposed by firm "FRAMATOM" was selected. State expert review on nuclear and radiation safety was arranged and performed of a number of NAEC “Energoatom" documents regarding the creation of ChNPP spent nuclear fuel storage facility-2, in particular ChNPP. Feasibility Study of siting for spent nuclear fuel storage facility-2 construction".

The SNRA has received Application for issuance of a license for design and survey concerning the selection of site for SNFSF-2. The SNRA has reviewed the submissions and made remarks to it.

Draft Resolution of the Cabinet of Ministers of Ukraine "On location of the Storage Facility #2 of Spent Nuclear Fuel From ChNPP" that has been developed by the Ministry of Energy is approved by the results of SNRA's review of this document. (According to the Law of Ukraine "On the use of nuclear energy and radiation safety", Article 37).

Preparatory work for spent nuclear fuel storage facility-2 construction is performed according to the above-mentioned Resolution of the Cabinet of Ministers of Ukraine.

2.4. Shelter Object

2.4.1. General assessment of the "Shelter" Object status

The status of the "Shelter" Object

"Shelter" Object (SO) is damaged by beyond design-basis accident unit 4 of Chornobyl NPP, which has lost all functions of power unit, where first-priority measures for mitigation of the accident consequences were performed and activities aimed at ensuring of its nuclear and radiation safety are going on.

The main peculiarity of the "Shelter" Object is its potential danger for personnel as well as for population and environment, which is determined by the following factors:

- long-lived radioactive materials, located in the object, with the total activity about 20 MCI which have no reliable physical barriers on the way of radioactivity spreading into environment and thus, are open sources of ionizing radiation;
- radioactive materials in quantity which reaches according the results of conservative evaluations 200 tons, without means of active impact on criticality, which stipulates potential possibility of self-sustaining fission reaction, are located on the Object
- building structures of the Object, which perform function of the main physical barrier on the way of radioactivity spreading into the environment do not meet requirements of normative safety documents on mechanical reliability, structural integrity and construction reliability, have uncertain service life;
- control of its state as prescribed in the safety documents is not provided at the Object, including state of radioactive materials outside and nuclear materials located inside;
- due to incomplete research of the Object, reliable qualitative assessments of different types of hazards are not performed;

- On the site around the Object under the layer of materials (sand, gravel, concrete), significant quantity of radioactive materials not isolated from hydro-geological environment is located.

Operation of the "Shelter" Object in 1999.

Activity of the operating organization on the "Shelter" Object is performed on the basis of the License 07/5-B-0397-32 of 28.03.97, reregistered officially on 06.08.99 because of replacement of legal entity (now it is nuclear power generating company NAEK "Energoatom"). The scope of the permitted activity as well as special conditions of its performance is established by the License.

The goal of any activity on the "Shelter" Object (including activity concerning its transformation into ecologically safe system) is protection of personnel, population and environment from hazardous impact of radiation.

Operation (technical maintenance, repair and upgrading) of the Shelter Object was performed according to "Technological Regulations of ChNPP Unit № 4 "Shelter" Object" (Regulations).

In 1999 the Administration reviewed and analyzed new revision of the Regulations.

The Administration did not approve the above mentioned document as that one, which did not meet requirements of normative documents on nuclear and radiation safety in Ukraine, returned it for revision and prolonged validity term of the old wording of "Technological Regulations…" dated 19.12.94 for the period till 01.07.2000.

In accordance with the Grant Agreement between EBRD and the Nuclear Regulatory Administration of the Ministry for Environmental Protection and Nuclear Safety of Ukraine concluded on 11 May 1998, as well as in order to support the Nuclear Regulatory Administration of Ukraine while resolving SIP licensing issues, **an International Advisory Committee (IAC) of regulatory bodies has been established**.

The first meeting of IAC was held on 2-3 December 1999 in Kiev. Representatives of regulatory bodies of the USA, Canada, Spain, Italy, France, Great Britain, Finland, Germany, as well as EBRD representatives took part in the meeting. IAC members considered the draft technical requirements to IAC establishment, listened to the reports of representatives of the SNRA, EBRD, Licensing Consultant, SSTC NRS, Project Management Unit from ChNPP regarding the implementation of SIP projects. IAC expressed its comments regarding the SIP licensing as well as recommendations on the following issues:

- interrelations and allocation of responsibilities between the parties implementing SIP;
- licensing program policy;
- legal base, norms and standards applied;
- licensing process;
- evaluation methodology;
- public relations.

2.4.2. Radiation situation inside the "Shelter" Object

Nuclear safety of the "Shelter" Object is evaluated according to results of primary circuit parameters measurements in the established control points of main fuel containing materials concentration with the help of measuring systems "Shatyor", "Finish-R", and also 4 measuring gamma-channels of fuel containing materials control system (FCM CS). According to the Regulations in force, the above mentioned systems control:

- density of neuron flow (12 points);
- strength of the gamma radiation exposure dose (13 points);

- temperature (6 points).

With the purpose of obtaining of additional information about the FCM state and input data for development of the monitoring system in the frames of "Shelter" Object Implementation Plan during 1999, the prototype of nuclear safety monitoring system "Pilot" was functioning in the mode of experimental operation. The mentioned system is experimental and designed for checking and working through of technical solutions under development of monitoring systems.

Basing on the obtained in the course of the year factors of FCM state, it is possible to certify absence of any incidents related to the change of FCM properties. Temperature values and density of neutron flow in the places of FCM concentration have practically stabilized on the levels of 1998. But in the same time, it is necessary to stress that present technical state of control systems and its scope does not allow to guarantee reliability and quality of performed measurements. In comparison with the previous year, quantity of "Shatyor" and "Finish" systems failures increased by 1,5 and 2,5 respectively. Issues related with the necessity of "Shatyor" system decommissioning, which lifetime has ended, modernization of "Finish" system, will be solved after commissioning of standard FCM CS.

Exceeding of reference levels (RL) of beta-active nuclides in the air, and also exceeding of actual water activity reference levels was not observed, but three cases of reference level exceeding of air activity according to long-lived alpha-aerosols were registered. Two cases of RL exceeding occurred on 15.04.99 during the performance of work concerning rehabilitation of industrial and drinking water system and during the performance of welding. Third case of RL exceeding was registered on 03.11.99 during changing of clothes by personnel after work, which was carried out in the area of beams B1 and B2. Contaminated working clothes were the source of aerosol activity increase.

The study of radionuclide composition of water samples from "Shelter" Object premises has shown that cesium and strontium isotopes are main contributors into total activity. Maximal concentration of uranium isotopes in water in the Shelter Object, constituted in 1999 1,05E+03 mg/m^3, and maximal plutonium activity – 8,6+06 bq/ m^3. But, there is a danger of radionuclides significant quantities accumulation in bottom sediments in places of the highest water concentration in premises situated on the low level of the "Shelter" Object. As studies showed, total activity of beta-radiating radionuclides in bottom sediments was 2,5E+09 bq/kg.

During the year 12 planned dust suppressions in central hall were performed (85 tons of localizing and 85 tons accumulating substances were used).

2.4.3. Radiation situation on the "Shelter" Object site

No exceeding of exposure dose reference levels were recorded at off site facilities and SO site. Some increase of surface contamination by radionuclides, which was stipulated by increased dust migration because of long period of high temperature and absence of precipitation.

189 air samples were taken for the reporting period. Activity of air samples was in the limits:

- according long-lived alpha-aerosols from <3,7E-03 to 1,89E-02 bq/m^3 (KR – 2,2E-02bq/m^3),
- according to long-lived beta-aerosols from <0,37 to 7,03 bq/m3 (KR – 11 bq/m^3).

In 1999 overall scope of releases of long-lived nuclides from the "Shelter" Object (release into ventilation stack as well as release of aerosols through cracks of the "Shelter" Object were considered) was significantly lower (by 26%) as compared with the release scope in 1998. What concerns chemical and radiochemical characteristics of ground water, values presented did not suffer significant changes. But distribution of tritium and potassium in ground water, values of mineralization of ground water and value of hydrogen factor is of a big concern, because it

indicates on the possibility of SO influence (for example, radioactive waste, which are under So cascade wall) on hydrological environment.

2.4.4. Transformation of the "Shelter" Object into ecologically safe system

Complex plan of measures concerning "Shelter" Object transformation, which entirely covers stabilization phase, and partially, preparation phase of the Object transformation into ecologically safe system (Shelter Implementation Plan Into Ecologically Safe System" – SIP), consists of 22 interdependent tasks, which were structures by the operating organization into four packages:

- Package A "Civil construction";
- Package B "Operation and monitoring";
- Package C "Emergency systems";
- Package D "Fuel containing materials".

In the framework of SIP implementation the goals concerning decrease of "Shelter" Object damage possibility (reduction of damage consequences in case of any), increase of nuclear safety and personnel safety levels, environment protection and strategy development of "Shelter" Object transformation into ecologically safe system should be reached.

Reduction of possibility of SO damage should be reached by means of introduction into it of integrated project of stabilization and shielding, which will ensure complex stabilization of different zones and constructions of the Object confining building. But the actual state of affairs testifies about unsatisfactory performance by the operating organization of this task, which is referred to first-priority SIP projects.

Subject of a concern is also the situation with fulfillment of tasks in the frames of the other projects. It became evident, when the State Nuclear Regulatory Administration reviewed issues concerning decision making on integrated project of stabilization and shielding (hereinafter – P1). Development of number of documents which are necessary for decision making on P1 is not completed, or, according to schedules of operating organization, is foreseen already after taking of decision concerning choice of integrated project of stabilization and shielding (it concerns such important issues as strategy development of fuel containing materials removal from the "Shelter" Object, radioactive waste management and building of new confinement).

2.4.5. Radiation protection of personnel

In 1999 the radiation-hazardous works, which made major contribution into the dose loads, were:

- Complex of B1 and B2 stabilization work;
- Buildings structures inspection work;
- repair works concerning mounting and operation of fuel-containing materials control systems'' Finish'' and ''Shatyor'';
- Mounting and setting up of unit 4 premises lighting system;
- Boring in ''Shelter'' local zone;
- Setting up of (BT-2) OY ventilation tower light-proof enclosure;

The value of "Shelter" staff individual average dose made up 0,547 cSv, of the attached staff – 0,070 cSv. As to the Contractors organizations, the value of average individual dose is determined by the character of implementing works on "Shelter" facility and made up 0,601 cSv in 1999.

Total collective dose of "Shelter" staff including Contractor organizations and attached staff came to 820.

Control of internal irradiation was carried out for the staff taken part in the works under conditions of reference levels exceeding for alpha and beta aerosol concentration in the "Shelter" facility airspace. Maximum content of caesium-137 in the organism of the critical group staff is: for the "Shelter" facility workers – 400 nKi, and for the Contractor organization workers – 338 nKi. The maximum estimate of internal irradiation dose value made up 0, 0443 cSv and 0, 0407 cSv accordingly.

During last year, the cases of the annual reference level excess of the external irradiation dose were not fixed as well as reference level excess of the internal content of radionuclides at "Shelter" facility.

It is also necessary to add that at the time the project consideration of B1 and B2 beams support units, much attention is devoted to the basis of radiation safety protection during the period of its implementation. As this project was carried out in two steps, the respective technical decisions were prepared by the operational organization for implementation of works in the frame of each step. The authorization of work implementation in the frame of each technical decision was given by the Administration on condition of sufficient safety protection basis under realization of these work. As a result, the application of optimization principle of irradiation protection during work planning, implementation of measures aimed at decline of personnel dose loads, total collective dose under 1st stage of realization (crane and elevator mounting) constituted 52,35 man cSv (Planned – 76,50 man cSv). Respectively, under 2nd stage (mounting of passage, shielding block, scaffolding, concrete work, welding of reinforcing construction on 50-P and 50-Zh axis) it constitutes 302, 22 man cSv, the planned one is 500,70 man cSv.

"Shelter" facility radiation protection state was analyzed in accordance with the requirement of the document "Control safety radiation levels at "Shelter" facility (CLRS-SO-98), period of validity of which ended on 13.07.99. Issue of approval in the Ministry of Health Protection of Ukraine of a new revision of "Reference levels of Personnel Radiation Safety" (CLRS-SO-99) was not solved by the end of 1999, in spite of multiple requests of the Administration made to the leadership of the operating organization.

2.4.6. State of building structures

Examinations of building structures status performed in 1999 showed that:

- deformation process, which is characterized by replacement of planned and high-altitude location of control marks on the Object goes on in the "Shelter" Object;
- deformations of reinforced concrete framing of deaerator are characterized by replacement of planned and high-altitude location of upper crossings of columns.

Last year project on stabilization of reinforcement points of beams B1 and B2 in places of leaning of wall beams on the wall in center shaft 50. These works were foreseen in SIP Package A working plans.

Works concerning stabilization and shielding of SO building structures are foreseen by "Shelter" Object Implementation Plan in first-priority projects of Package A "Civil construction". Works

in which geo-technical researches and examinations of SO building structures were included, with the purpose of integrated project of stabilization and shielding creation, safe confinement strategy development, had to be performed in 1999. But violation by the operating organization of terms of works fulfillment, established in the integrated basic schedule, which besides was corrected several times and is still corrected due to shifting of time-terms, led to situation that decision concerning realization on SO of stabilization and shielding project of building structures was not taken.

2.5. Radioactive waste management

2.5.1. Radioactive waste management at NPP and NPP decommissioning

Operation of NPP equipment results in generation of solid and liquid radioactive waste of NPP which are stored in processed or semi-processed form depending on type of waste and available equipment at NPP.

Liquid radioactive waste is generated, mainly, from drain water, controlled and non-controlled leaks of primary circuit, regenerated water of special water purification system, decontamination liquids, water from showers and special laundries. Solid radioactive waste is generated from maintenance and repair of equipment of power units, decontamination works, reconstruction of structures.

Annual increase rate of radioactive waste volumes in storage facilities at NPP of Ukraine is in average 4-6% for solid waste and 11-13% for liquid radioactive waste out of design basis capacities for radioactive waste storage facilities. When such rate of filling in the capacity of storage facilities is keep we might face a problem in NPP operation in the coming years.

According to results of state inventory of radioactive waste that was conducted in 1999 the following has been highlighted:

- according to the design RAW storage facilities of NPP are temporary and are operated in regime of RAW accumulation;
- a spare capacity for solid waste of group III will be enough till the end of operation period of power units;
- No technical means and measurement methodology to define general, specific and surface activity of solid radioactive waste which impends truth worthy definition of total activity and composition of solid radioactive waste;
- no methodology of cost estimation for RAW management.

Management of radioactive waste generated during NPP operation is performed on the basis of temporary permits for NPP operation and licenses for operation of RAW processing facilities.

The first-priority task of the SNRA is to implement the concept of RAW minimization to the practically achievable minimum in terms of its amount and activity, as well as creation of state-of-the-art RAW processing systems at NPP. For this purpose the special conditions of temporary permits for operation of NPP units were supplemented with requirements concerning implementation of measures on minimization of radioactive waste and modernization of the existing at NPP waste processing facilities in accordance to the “RAW Management Program”.

For the reported period the SNRA issued the following licenses to NEGC “Energoatom” basing on the results of consideration of materials substantiating the safety of operation of liquid RAW deep evaporation facility and solid RAW compacting facility at ZNPP as well as on the confirmation by the State Nuclear Inspection that DD “Zaporizhya NPP” is capable to operate these facilities:

- #07/5-E-0299-68 for operation of LRAW evaporation facility at ZNPP;
- #000015 of NRS series for operation of SRAW compacting facility at ZNPP.

By the results of consideration of KhNPP's application for updating the license #07/5-E-0997-42 for operation of the site for interim storage of salt waste in "BB-cube" containers because of the change of the legal entity status (NEGC "Energoatom"), the SNRA updated the license.

In order to prepare Ukraine for receipt of RAW after reprocessing of spent nuclear fuel from Russia, the "Methodology for Calculation of the Amount of Returned RAW After Reprocessing of SNF from WWER-400 reactors of Rivne NPP" was reviewed. By the results of the consideration of the document and basing on the expert conclusions, the document was returned to Production Union "Mayak" for completion.

Since the ChNPP design does not provide for LRAW solidification and SRAW reprocessing, ChNPP applied to the SNRA for a license for the designing and manufacturing of the equipment for solid RAW reprocessing. By the results of the review of submitted materials, expert conclusions of the State Quality Center, and the Act of the Main State Inspectorate regarding the NPP capability to perform the applied type of activity, the SNRA refused to issue to NEGC "Energoatom" a license for the designing and manufacturing of equipment for solid RAW reprocessing at ChNPP. The submitted documents do not substantiate ChNPP's capability to perform the applied type of activity.

According to the "Memorandum on Mutual Understanding Between the Governments of G7 countries, the Commission of European Union, and the Government of Ukraine Concerning ChNPP Closure", on 15 March 1999 the Cabinet of Ministers of Ukraine adopted a Decree #361 "On Early Decommissioning of ChNPP-2".

According to "General Provisions on Safety Assurance During Decommissioning of NPP and Research Reactors" (NP 306.202/1.004-98), the operating organization NEGC "Energoatom" developed the "Program of the shutdown of ChNPP-2 Operation" which was approved by the State Nuclear Regulatory Administration of Ukraine.

In the framework of ChNPP decommissioning, it is planned to build several RAW management facilities. Construction of LRAW reprocessing facility (LRAWRF), an interim SNF storage facility (SNFSF-2), facilities for retrieving solid RAW, solid RAW reprocessing plant, and a short-living RAW storage facility is financed by the EBRD and TACIS Program by the Commission of European Union. The three last facilities are united into one industrial complex for solid RAW management (ICSRAWM).

During the reported period:

- ChNPP's Technical decision was approved regarding the location of solid RAW reprocessing plant (Lot 2);
- "Technical specifications for designing, licensing, manufacturing, supply, construction, installation, and commissioning of the industrial complex for management of solid RAW from ChNPP";

The SNRA considered ChNPP's decision on the location of the interim storage facility for low-level and medium-level long-living radioactive waste on the site and made comments towards the substantiation of the safety of the site selection.

According to the program for the project "Support to the Ukrainian Regulatory Body in Licensing TACIS-NSA Financed Projects on Construction of Facilities for ChNPP Decommissioning" the SNRA has reviewed the Program of licensing and certification of the plant for reprocessing of liquid RAW from ChNPP and the Program of licensing and

certification of the interim storage facility for ChNPP spent nuclear fuel, and made comments by suggesting to complete the above-mentioned Programs immediately.

2.5.2. Radioactive waste management in ChNPP exclusion zone

Chornobyl exclusive zone – is the territory of Ukraine, polluted by radionuclides as the result of Chornobyl catastrophe. The lands of this territory are taken out from the national economic circulation and represent the potential danger for the whole Ukraine because of possible carrying of radionuclides out of the borders of the zone.

During the decontamination process of the exclusion zone the sources of radioactive wastes are to be considered as the ground, buildings, machines, mechanisms etc. which have high levels of radioactive contamination and are located on the surface of the exclusion zone or in the temporary radioactive waste disposals. The quantity of these disposals is valued more than 800 and all of them are actually not operated.

Specialized state enterprises «Complex» and «Technocenter» perform activities on RAW management in the Exclusion Zone.

The first enterprise performs collection of RAW in the Exclusion Zone, its transportation, operates the existing RAW disposal facility "Buryakivka" and monitors RAW disposal facilities "Pidlisnyy" and "ChNPP third line" which are not operated. It also implements the projects agreed by the SNRA related to RAW redisposal from the places of temporary RAW storage as well as monitors this waste. Before 1999 the State specialized Enterprise "Complex" was acting on the basis of permission issued by the SNRA in 1996. In order to increase the radiation safety level during RAW management the SNRA in its licenses defined special conditions for the permitted activities and for most important of them the deadlines were established. It shall be noted that almost all conditions have been met by the enterprise.

In August 1999 the SSE "Complex" submitted to the SNRA a set of documents for granting a license to put RAW management facilities into operation. After elimination of the SNRA's remarks and after pre-licensing inspection by the Main ecology Inspectorate, the SNRA issued a license to the applicant for RAW disposal facility operation (RAWDF), RAW interim localization facility (RAWILF), and specialized laundry. The special conditions of the issued license first of all state the requirements to the licensee regarding the putting of the existing in the exclusion area RAWDF and RAWILF into compliance with the nuclear and radiation safety requirements in force. The terms were defined for the development of design documentation and performance of work putting the RAWILF "Naftobaza" into environmentally safe state (including activities on redisposal of RAW in the framework of projects agreed on by the SNRA), for the development of the concept of operating RAWDF "Buryakivka" shutdown, concept of the shutdown of RAWDF "Pidlisnyy" and "ChNPP III-d line" that are not in operation, as well as for the inventory of RAW in the exclusion zone. Besides, in order to meet the requirements of the legislation in force regarding introducing and functioning at an enterprise of the quality assurance system, the SNRA defined for the licensee the terms of revision of the Instruction on the quality and submission of implementation plan of the quality assurance system at the enterprise.

By the SNRA's request regarding the licensing of the facility operation for decontamination of metal-roll, plastic items, scrap metal, devices and mechanisms, the SSE "Complex" submitted documents to obtain the relevant license. The SNRA has performed the expert review of the submitted materials and returned the materials for completion because of a great number of remarks regarding the insufficiency of the data on RAW parameters, on the process of work with RAW, substantiation of the personnel dose exposures, as well as because of a lack of analysis of possible emergency situations, etc.

It should be noted that filling of the design capacity of RAWDF "Buryakivka" is planned to be completed in 2001. According to the "Complex Program of RAW Management" the "Vector" complex shall deal with the processing and disposal of low-level and medium-level RAW. The first line of the complex is planned to be commissioned in 2002.

In spite of the fact that the great part of the work, as for the elimination of the effects of the accident on the ChNPP has been done, the exclusive zone still represents a great danger for the environment. According to the "Complex program of the radioactive waste management" the construction of "Vector" complex is planned in order to solve the problems of safe radioactive waste management within the exclusive zone, and its first line is supposed to be commissioned in 2002.

The construction of the first stage of the "Vector" complex is performed by SSE "Technocenter" on the basis of a license issued by the SNRA in January 1997. In January 1999 the SNRA arranged a nuclear and radiation safety expert review of the corrected project for the first turn of the complex for decontamination, transportation, reprocessing, and disposal of RAW from the areas contaminated in a result of the Chernobyl accident. The completed project was agreed in August. Besides, the SNRA performed nuclear and radiation safety expert review of the program submitted by the enterprise for radiation monitoring of the "Vector" complex environment. By the expert review results some observations were expressed regarding the insufficiency of the substantiation of parameters to be monitored and the data on the equipment to be used for monitoring, as well as regarding the monitoring procedures. The SNRA suggested the use of the completed programs for creation of the system for environmental monitoring and radiation monitoring of the "Vector" complex. So far as the object is under the control of the Cabinet of Ministers of Ukraine, Administration presented to the Cabinet of Ministers of Ukraine the report as for the results of the construction of the complex "Vektor". It is necessary to point out that existing speed of construction financing will not give possibilities to commission the object in 2002, as this was planed by the Complex program of radioactive waste management. This postpones the transformation of the exclusive zone into a safe system up to undetermined terms and can have negative influence on the decommissioning of ChNPP. Assuming the above, during the meeting of the Interdepartmental Commission for the problems of implementation of radwaste management Complex program, the issues concerning construction of the complex "Vector" were discussed in June and July last year. The Interdepartmental Commission recommended to examine the financing of the complex "Vector" construction as a primordial one and to start negotiations with the European Commission on the possibility of availability of funds allocated according to the Project TACIS/OSAT for the completion of the first line of complex "Vector" construction.

The special conditions of the license issued to SSE "Technocenter" for the complex construction are the SNRA's requirements to perform the permitted activities in compliance with quality standards, rules, and norms in force.

Besides, during the year the SNRA arranged nuclear and radiation safety expert reviews of SSE "Technocenter" materials regarding the equipment of the complex for RAW reprocessing (decontamination facility). Because of the insufficiency in the submitted materials of input data regarding radiation safety assurance during the facility operation, regarding the operational regulations, etc., the materials have been returned for completion. At the present time the SNRA is performing the expertise of the reviewed materials.

2.5.3. Management of radioactive waste generated from the use of radiation sources

Activities associated with collection, transportation and disposal of low-medium activity solid and liquid RAW and spent radiation sources (hereinafter referred to as RS) from all domestic enterprise, institutions and organizations (except enterprises of energy sphere) are performed by

"Radon" enterprise (hereinafter referred to as "Radon"). There are 6 state interregional special enterprises within the "Radon". They are: Kyiv, Kharkiv, Odessa, L'viv, Dnepropetrovsk and Donetsk enterprises.

At the territories of special industrial enterprise the following facilities are placed:

- 14 storage facilities for solid RAW disposal – 10 of them are filled and closed.
- 14 storage facilities for temporary liquid RAW disposal – 2 of them are filled and closed;
- 14 storage facilities for spent ionizing radiation sources – 4 of them are closed.

Besides:

- At Kiev special industrial enterprise the technological hangar is intended for temporary disposal of solid RAW – its capacity reserve is approximately 50%.
- At Kharkiv enterprise there is a building for solid RAW disposal and spent ionizing radiation sources – its capacity reserve is approximately 50%;
- At L'viv special enterprise there is a hangar type storage facility for RAW – its capacity reserve is approximately 90%.

According to the legislation the state interregional special enterprises of "Radon" perform their RAW management activities on the basis of licenses issued by State Nuclear Regulatory Administration of Ukraine.

Kharkov, Odessa, Lviv, Dnepropetrovsk enterprises received licenses in 1998, Kyiv and Donetsk enterprises received it in 1999 for period of 3 years.

The licenses determine both a scope of permissive activity and special conditions stated in the license aimed to upgrade safety level whilst performing the permissive activity.

During 1999 the SNRA analyzed the fulfillment of license conditions.

Special conditions of licenses issued for all enterprises (term of fulfillment is scheduled within 1999) were to review and agree with the SNRA the following:

RAW Management programs, social protection of the personnel working with RAW, accreditation of radiation laboratory service, to receive safety certificate for containers being used by special enterprises during RAW transportation, development of Quality Assurance implementation plan, that is to be scheduled for license validity term, to be applied at special enterprises.

The review of RAW Programs submitted to the SNRA has shown a lack of proposed organizational measures and technical decisions aimed at conversion of special enterprises into temporary sites of RAW storage in containers, lack or incompleteness of analysis for existing or new technologies of RAW reprocessing and conditioning, the need of those will follow the conversion of special enterprises, lack of analysis on sources of secondary RAW generation, lack or insufficient measures to minimize these RAW. As a result, these programs have been returned with remarks to special enterprises for revision with the main requirement to specify concrete measures to RAW management, state the ways and terms of their completion.

Failure of special enterprises to meet special conditions on personnel social protection dealing with RAW, accreditation of laboratory service of radiation safety, obtaining safety certificate for containers, development of Plan to apply Quality Assurance at special enterprises has forced the SNRA in October 1999 to send a letter addressing to Senior Management of Ministry of Emergency situations and protection of the population of the consequences of Chernobyl accident (MES) and request them to take relevant decisions to provide a necessary financial resources and organizational support to improve the situation. However, till the beginning of

2000 neither a single measure to improve the situation nor fulfillment of the special conditions has been carried out.

Special conditions of license of Kyiv and Kharkiv special enterprises provide fulfilling plans approved by the SNRA, of urgent measures to eliminate radiation accident consequences that resulted from an imperfect design of storage facilities and technologies for solid RAW disposal. According to the emergency plans the key measures to prevent further Tritium spreading is to pump out water from these facilities. In 1999 upon request of the SNRA the Kharkiv special enterprise carried out activities to pump out water from storage facilities and its temporary closure. This resulted in a considerable decrease of specific activity of Tritium in underground water and this gave the evidence of situation improvement. The SNRA has tasked Kharkiv special enterprise to apply radiology monitoring systems placing the emphasis on monitoring of Tritium content in various mediums.

According to the plan Kyiv Special Enterprise had to complete water pumping out from facility in September 1999, but till the end of the year this work have not been performed in spite of the SNRA's request to Senior Management of Kiev Special Enterprise.

Special condition of license of Kharkiv Special Enterprise provides commissioning of special complex of temporary container-type storage for spent radiation sources. On the basis of reviewed submissions that have followed by positive conclusions of nuclear and radiation safety expertise the SNRA granted permit to conduct installation of this complex. After completion of construction and assembling work Kharkiv Special Enterprise sent application and supporting documents to the SNRA to obtain the permit to operate the complex. As the result of review of these documents and basing on a conclusion of state expertise of nuclear and radiation safety the SNRA returned the documents to Applicant for revision with remarks to Safety Analysis Report concerning radiation safety ensuring during reloading of radiation sources into accumulation container and during emergencies, etc.

In 1999 upon request of the SNRA Odessa Special Enterprise constructed a protective shielding cover over high level waste storage facility, commissioned technological equipment of high level waste storage facility, commissioned perimeter alarm system at RAW disposal facility, repaired sanitary control point, equipped decontamination station for special vehicles.

In 1999 upon request of the SNRA Donetsk Special Enterprise inspected precipitation tank at decontamination station in order to determine safe operation term and needs of repair. Also they installed additional purification equipment for sewage water of decontamination station that prevented liquid radioactive waste penetration into the central sewage system.

Upon request of the SNRA in 1999 all special enterprises introduced changes into normative and technical and organizational documentation related to RAW transportation, work with radiation sources, emergency preventive measures to prevent accidents and fire and their consequences, training and refreshing of the qualification of the personnel. All these actions were resulted in enhancement of radiation safety level during RAW management and handling of radiation sources at special enterprises.

According to the annual report on radiation safety at UkrDO"Radon" special enterprises for 1999, the individual exposure dose rate of category A personnel did not exceed the reference levels and were as follows:

at Kharkiv – 4 mSv/year;

at Dnipropetrovsk – 15 mSv/year;

at L'viv – 10 mSv/year;

at Kyiv – 18 mSv/year;

at Odesa – 10 mSv/year;

at Donetsk - 2 mSv/year.

2.6. Use of radiation sources.

The ionizing radiation sources of such radioactive materials or devices that generate ionizing radiation are widely used in Ukraine for different useful purposes in industry, medicine, research, education and other fields. Radiation sources are used in more than 2500 enterprises, institutions, organizations of non-medical profile and in many medical establishments of the country for medical and diagnostic aims. In medicine main sources of ionizing radiation are X-ray-diagnostic equipment and radio pharmaceutical preparations (RPP) which are used for the radio diagnostics and also, X-ray, gamma-therapeutic equipment, charged particle accelerator, unsealed and sealed radioactive preparations which are used in the radiotherapy. There are 2425 X-ray departments in Ukraine where 1067 X- ray installations are used, among them there are 1900 X-ray fluorography installations, 75 computer tomographs, 64 consulting rooms for radionuclide diagnostic. Radiotherapy is held on the 130gamma- therapy and 176 X-ray therapy installations. There are 4177 radiographers, 656 radiologists, more than 12 000 nurses, including engineers and technicians who provide the work.

Danger related to the usage of radiation sources in great degree depends on the activity, radionuclide, and forms of their usage, energy of ionization and other factors. The use of generating equipment and sealed radiation source can lead to the contamination of the environment and to the penetration of the radioactive substances to the human organism.

Danger related to the usage of radiation source is limited by the State with the help of State regulation of sources safety use, which provides the following measures: to establish norms, rules and standards on nuclear and radioactive safety; to give permits for the operation with radiation sources; to supervise the observation of normative requirements and conditions of given permits.

The Ministry of Environment and Natural Resources of Ukraine gave the licenses for operation with radiation sources. In 1999 the licenses for operation with radiation sources were obligatory for the legal entities that have been already worked with radiation sources. Physical persons did not apply for the licenses. 107 licenses were issued in 1999.

Some enterprises (organizations) did not receive planned licenses due to their decision to assign a right to use radiation sources. Moreover, another hampering reason in license issues is incapability of Applicants to fulfil the following requirements:

- to prolong the term of the use of expired service life radiation sources or send them to special enterprises;
- to confirm the level of qualification on radiation safety matters for relevant individuals and the personnel;
- to ensure radiation (including individual dosimetric) monitoring etc.

In 1999 no licenses were issued for activities dealing with radiation sources used in medical treatment and diagnostic purposes. Medical institutions use radiation sources under the control of State Sanitary and Epidemiology Supervision Office of Ministry of Health of Ukraine. Ministry of Health of Ukraine as the regulatory authority is in charge of state regulation of radiation safety in the area of nuclear energy utilization. The legislative basis outlining the current activities of institutions of sanitary and Epidemiology services of Ukraine, their area of competence, authorities and duties of officials is considerably wide. According to the current legislation the sanitary and epidemiology service of Ukraine exercises control of radiation safety including control over observance of permissive limits of radiation impact on the personnel, the public, control over observance of norms, rules and standards of radiation safety.

In 1999 some enterprises in terms of financial aspects or due to disability to meet requirements of radiation safety refused activities dealing with radiation sources and transferred radiation sources for storage to special enterprises. For example, in 1999 in Cherkassy region eight enterprises were granted with licenses and four enterprises transferred radiation sources to UkrDO "Radon" . In Chernigov region approximately one third of enterprises refused the use of radiation sources and transferred radio-nuclide radiation sources to special enterprises. A pressing problem is that there are enterprises (institutions, organizations) in Ukraine that refused the use of radiation sources but are lack of both conditions to store radiation sources and funds to pay for transfer of radiation sources to special enterprises on radioactive waste disposal. These enterprises constitute a hazard in terms of occurrence of so-called "abandoned" radiation sources. In spite of the fact that such enterprises are under continues control of state supervision authorities the problem of radiation sources of the mentioned enterprises is still required solution. Thus, during several years the problems of "Electron-Gas" enterprise has not been resolved. The enterprise has more than 2000 radiation sources that are not in the use. Cost estimation for urgent measures related to disposal of radiation sources is 3 900 thousand Ukrainian gryvnas.

In Ukraine three is no technology and equipment to dispose radiation sources of high level activity, the number of those exceeds 1 000 items according to available data. During the time of the former USSR such radiation sources after their service life expiration had been returning to manufactures located in Russia. Currently, efforts to place an agreement with Russian Federation concerning returning of spent radiation sources to Russian manufactures are underway.

Taking into account a wide use of radiation sources in Ukraine, the activities dealing with those are mainly performed at a majority of branches of national economy, the accountancy and control of radiation sources are one of measures to implement state guaranties for radiation protection of individuals according to requirements of Ukrainian legislation.

In order to ensure national accountancy and early control of the status and location of radiation sources in 1997 the Government of Ukraine made a decision to establish unified Computerized State Accountancy and Control System of Radiation Sources – State Register of Radiation Sources (hereinafter referred to as the Register). It was planned to assign 760 thousand hryvnyas from the State Budget in 1997-1998 for the establishment of the Register but due to financial shortage the planned activities were not put into practice. On the basis of Ukrainian State Production Enterprise "Isotope" in 1998 a separate subdivision State Register of Radiation Sources was established to perform functions of main registration center of the Register and to liaison with a range of regional registration center. In 1999 the State Environment Protection Fund financed development of "Feasibility Study for establishment of State Register of Radiation Sources", "Technical register design", regulations that are necessary for establishment and functioning of the Register such as "Procedure for registration of radiation sources", "Instruction for state inventory of radiation sources", "Registration Card Form", "Procedure for use of the Register". Another activities on development of normative and technical decisions, operational documentation, structure and composition of hardware and software were performed for the total amount of 2000 thousand hryvnas. Under the assistance program for state regulatory authority on nuclear and radiation safety the IAEA provided hardware means to equip central office of the Register for the total amount of 33 880 US dollars. If appropriate funds would be in place the Register could be launched into trial operation in 2000.

The document «Radiation Safety Norms of Ukraine» regulates permissive diagnostic exposure dose for patients and the personnel. Medical exposure treatment of patients are not regulated by the said Norms because the treatment is defined by medical factors, however, in some extent it depends on an organization performing the radiotherapy.

Annually more than 16 000 X-ray diagnostics, 16 000 prophylaxis fluorographies,

75 000 radiology studies have been conducted and more than 92 000 patients received radiotherapy treatment.

Doses received by patients during the course of diagnostic (prophylaxis) exposure treatment are estimated according to Annex to Order #118 of June 19 1990 of the Ministry of Health of Ukraine. Estimated exposure dose for whole human body of adults (an average value) is 0,77 mSv, under special research methods is 1 mSv, under computer tomography is 16 mSv, under X-ray examination without X-ray picture intensifier (XPI) is 2,5 mSv/min, under radio-nuclide diagnostics is 3,75 mSv. Only 9% of X-ray examination are used with XPI. Dose rate by using XPI is less in 3,3%.

Specific weight of X-ray diagnostics in formation of collective exposure dose rate for the public of Ukraine due to artificial radiation sources is 75%.

In 1999 at the territory of Ukraine there were no radioactive accidents with ionizing radiation sources that could have serious radiological consequences. Established exposure level for personnel was not exceeded excluding the accident that took place at Chernobyl NPP on 17.07.99 during the work with gamma-detector. It was found that the cause of this accident is the violation of operating manual of this instrument. The rest of incidents in 1999 is connected with ionizing radiation sources illicit trafficking (loss, theft, accidental detection of ionizing radiation sources, illegal import (export, transit) of ionizing radiation sources to the territory of Ukraine etc.) Implementation of the Register would reduce such incidents to considerable extent.

In 1999 the radiation control of scrap metal batches was intensified, in connection with that there were more revealing cases of radioactive or radiation contaminated metal items. Practically at all cases identified contamination was of “Chernobyl” origin, but there was one case of “depleted uranium” identification in metal scrap (05.01.2000, city of Donetsk). Aiming to upgrade radiation control the document “Procedure for radiation control of metal scrap and waste materials” was developed and attested in the Committee for State standards of Ukraine, it is sent to final agreement to the Ministry of Public Health. The problem of legal and normative support of radiation control of scrap and waste metal at home market is actual.

In 1999 the information about 19 accidents and incidents related to ionizing radiation sources, radioactive materials, waste etc has been received. This includes the following: 5 ionizing radiation sources were found, 1 ionizing radiation sources was received in the frames of the contract with foreign company, 12 incidents with radioactive metal and scrap. (Revealing of radioactive or radiation-contaminated fragments of devices or items, steel plates and pipes, slag remained after aluminum melting, etc is typical.)

2.7. Uranium ore mining and milling (uranium facilities)

Uranium ore mining and processing in Ukraine is performed by PO “Eastern Ore Mining and Processing Enterprise” (hereinafter Skhid GZK) beginning from 1950. In condition of 1999, the uranium ore mining is produced at two industrial sites: Ingul and Smolyn mines and it is planned to start mining at new – Novokonstyantynivsk mine.

Uranium ores milling in order to obtain uranium ptorooxide-oxide is effected at Hydro-metallurgical plant, which is situated in industrial zone of the town of Zhovty Vody in Dnepropetrovsk region.

Work with large amounts of material is characteristic for uranium mining and milling, as a result of this a large amount of waste is produced – mining dumps, mining waters, releases and effluents (liquid and gaseous) that are the sources of radioactive contamination for the environment. Voluminous and highly active tailings are the most hazardous for environment and population. Tailings placed at the area of 542 hectares contain radioactive substances of total amount about 65,5 m tons, with gross activity up to 120000 Ki.

The following processes are the main sources of environment contamination caused by uranium mining and milling industry:

- **radon escaping from tailing surface;**
- **radionuclides transfer with dust particles to substantial distances (to 650 m) from the main source;**
- **Radioactive releases from mines, effluents of contaminated mine water and radioactive substance wash-off with surface water from contaminated sites to natural water.**

In 1998 the Ministry for Environmental Protection and Nuclear Safety issued the License on operation of Hydrometallurgic Works and tailing dumps to Skhid GZK, but in the beginning of 1999 was forced to terminate the above-mentioned license. Such situation was developed due to failure to execute the license's conditions and instructions of inspection controls by Skhid GZK.

According to special conditions of the license to solve the problems on radioactive waste (hereinafter RW) management at Skhid GZK, "Program on RW management" was developed and submitted in June 1999 under consideration to State Nuclear Regulatory Administration of Ukraine. However, there was no analysis of existing system for RW management, the system for collection of radiation contaminated scrap metal and its management was described unclearly, the information related to facilities in the submitted documents was insufficient and in this connection the Program was returned for revision. The completed revision of the program is at present under expert assessment of nuclear and radiation safety in State Scientific Technical Center on Nuclear and Radiation Safety.

In order to reduce a level of radiation safety in compliance with the requirements of Standard documents State Nuclear Regulatory Administration of Ukraine has considered a design documentation on reclamation of tailing dump "KBZ" and reclamation of soil at the deposits of underground leaching Devladove and Bratske and appropriate notes to it were made.

State Nuclear Regulatory Administration prepared materials and draft decision for consideration on a session of State Commission for man-caused and ecological safety and emergency situations, issue on radiation condition of Skhid GZK enterprises, regions of their location and measures on its improvement.

In November 1999 State Administration for Ecological Safety in presence of representatives of State Nuclear Regulatory Administration of Ukraine checked up fulfillment of radiation safety requirements at Skhid GZK facilities.

As a result it is stated that significant scope of work on fulfillment of license # 07/5-E-0398-39 special conditions and taking into account notes of act-instructions of General State Ecological Inspection of 17 July 1995, 20 October 1997, 11 November 1998 and 25 June 1999 was performed at Skhid GZK.

In particular, the activities on renewal of system for observation wells and development of database on survey for flow of residual solutions in underground water at PV sectors, on sanitary and radiation monitoring of radiation-hazardous factors at Zhovti Vody territory and reclaimed PV sectors were carried out, first steps on equipping of Skhid GZK enterprises with equipment for individual radiation and radiometric surveillance of the personnel and the public were made.

Taking into consideration the results of Skhid GZK activity during 1999 directed to deviations from requirements of Standards on radiation safety, State Nuclear Regulatory Administration renewed the License for performance of activities on operation of Hydrometallurgical Works and tailing dumps.

To improve qualification of Skhid GZK specialists in the frameworks of bilateral cooperation between the Ministry for Environmental Protection and Nuclear Safety of Ukraine and Council for Nuclear Safety of Spain under TACIS-RAMG project the seminar "Arrangement aspects,

structure and functions of Radiation Protection Services of nuclear plant and enterprises of uranium-mining and uranium-processing industry" was held from 22 to 26 March 1999.

2.8. Radioactive Waste Transport Safety

Ukraine carries out considerable activities on transportation of radioactive materials. This transportation can be conditionally grouped in 6 categories according to hazard rating:

- Materials being transported in packages and are of limited radiology risk. These are small quantities of radioactive material, instruments and products, empty package sets;
- uranium ore and its concentrate, fresh nuclear fuel;
- low activity level waste;
- radioisotope mainly for medical purpose;
- industrial sources;
- spent nuclear fuel

Shipment is performed by such transporters as NAEK "Energoatom", "Isotope" enterprise, "Rodon enterprise, SkhidGZK (Zhovti Wody city), "Ukrgasbud", "Ukrgeophisics". Shipments are made with a considerable level of safety.

In 1999 two accidents happened during transportation of radioactive materials – during railway transportation of uranium ore and fresh nuclear fuel by vehicles. Both cases were caused by failure of transport means and neither resulted in damage of package of radioactive material nor radioactive effect to the public, personnel and the environment.

Transit shipments of fresh nuclear fuel are made through the territory of Ukraine from Russia to Slovakia, Bulgaria, Hungary and Check Republic and transportation of spent nuclear fuel from these countries to Russia and transportation natural uranium concentrate. In 1999 there were 8 shipments of fresh nuclear fuel and 2 shipments of spent nuclear fuel. These shipments are made on the basis of multilateral intergovernmental agreements. Some of these agreements, in particular: Ukraine –Russia – Slovakia and Ukraine – Russia – Hungary do not meet modern level of legal relations during international shipments and the legislation of Ukraine and require a revision. Such activities have been conducted with competent authorities of Parties. The Ukrainian party developed drafts of new agreements and submitted them for approval.

According to Provisions on General Principles of radiation materials transport arrangement approved by Ordinance of the Cabinet of Ministers of Ukraine of 29 November 1997 #1332 76 permissions for radioactive materials transport were issued. There are the following between them:

- For transport of fresh nuclear fuel for Nuclear Power Plants of Ukraine – 16;
- For transport of spent nuclear fuel from Nuclear Power Plants of Ukraine to treatment works of Russia – 8;
- For transit transport of fresh nuclear fuel from Russia to Bulgaria, Slovakia, Hungary, Czechia – 8;
- For transport of spent nuclear fuel from these countries to Russia – 2;
- For transport of uranium ore concentrate – 8;
- For transport of other nuclear materials – 34.

To fulfil Law of Ukraine "On Enterpreneurship" and ordinance of the Cabinet of Ministers of Ukraine of 03 July 1998 #1020 the licensing of enterprises and organizations, which deals with radioactive materials transport was held. During 1999 **4 licenses** were issued.

In accordance with Order of safety certificates during radioactive materials transport issue. In the year of 1999 **one safety certificate of package design** was issued.

2.9. Regulatory control of suppliers

In 1999 permissive regulation of activity on equipment supply and service rendering for facilities of nuclear power was fulfilled by:

- licensing of suppliers and applicants for service rendering;
- expert assessment of documentation on products and on service rendering.

During the last year SNRA issued 63 licenses for suppliers and 13 licenses for service rendering.

Among enterprises, which have licenses there are the following:

- Ivano-Frankivsky Armature Works,
- Branch establishments of PC "Pivdenteploenergomontazh",
- Joint Ukrainian-Russian company "INEK",
- Ukrainian-American Joint Venture "Vesrton",
- PC "Interatominstrument",
- PC "Ukrenergoprom",
- "Energotechnoresurcy Ltd.",
- "Skhid " GZK and others.

Besides, the important direction of nuclear facility safety regulation was a permanent monitoring for conditions of previously issued licenses fulfillment, which was performed by State Regulatory Center of supply and service quality. 55 enterprises were inspected.

Conditions of licenses, in general, were met. The disruptions of inspection schedules of knowledge of norms, rules and standards on nuclear and radiation safety, which have specialists engaged to fulfillment of activities specified in the license were discovered at some enterprises. The problems on implementation and function of quality system at enterprises were noted, in this connection programs of measures on improvement and revision of documents of quality systems were additionally developed. These documents with definition of these measure implementation terms were submitted to the SNRA.

It is marked that information on staff changes at enterprises was given untimely. Disruption of inspection schedules was caused by untimely certification of members of permanent-acting commission on knowledge inspection in central commission of the Ministry for Energy, the enterprises had to inform the SNRA about it.

During 1999 six licenses were renewed because of change of legal entities status of enterprises or replacement of person responsible for fulfillment of license conditions.

During the year expert assessment of 23 draft technical conditions was organized, the instructions (7 during the current year) of State Quality Center for participation in acceptance tests of research samples were given, as a result of this the SNRA approved 17 technical conditions for equipment and materials for supply to facilities of nuclear power industry.

3. NON-PROLIFERATION OF NUCLEAR WEAPONS

3.1. State System of Safeguards

In 1999 according to Agreement between Ukraine and the International Atomic Energy Agency for the Application of Safeguards in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons (INFCIRC/550) **120 reports on nuclear materials, which are under jurisdiction of Ukraine were prepared and submitted to IAEA including the following**:

- 70 reports on changes of inventory amount of nuclear materials in Material Balance Zones;
- 26 lists of inventory amount of nuclear materials that are located in Material Balance Zones;
- 24 material and balance reports.

Within IAEA inspection activity there were **135 inspections** in Ukraine, they were arranged on the basis of information on nuclear activity in Material Balance Zones, which is prepared by SNRA and submitted to IAEA every week. The positive conclusions were obtained as results of all IAEA inspections.

In accordance with Provisions on inspection of accountancy and control system for nuclear material at the facility, the State Inspectorate starting from October 1 1999 has commenced inspection of nuclear material accountancy and control system at Nuclear Power Plants and participated in the IAEA inspections as representatives of the State. This facilitates the fulfillment of assumed obligations entailing from Agreement between Ukraine and the International Atomic Energy Agency for the Application of Safeguards in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons.

According to requirements of export control regime **56 conclusions on performance of nuclear export and import were submitted** to State Export Control Service of Ukraine.

In accordance with Resolution of the Cabinet of Ministers of Ukraine the agreement of draft Additional Protocol to Safeguards Agreement was carried out. After negotiations with IAEA concerning agreement of the text of Additional Protocol the documents to obtain authorities for signing "Additional Protocol to Agreement between Ukraine and the International Atomic Energy Agency for the Application of Safeguards in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons " were submitted to the President Administration of Ukraine at the end of this year.

SSTC NRS Laboratory for nuclear material measurement together with specialists of Finnish Center for nuclear and radiation safety successfully completed development of SFAT device prototype for spent fuel measurement of WWER-1000 reactors.

During the year activities on determination of nuclear materials at non nuclear were running:

- "Plan of measures for accountancy and control of material located beyond facilities" was developed;
- activities on determining an amount of material amount were performed at 9 enterprises.

Period of validity was prolonged for Agreement Between the US Department of Defense and Ukrainian SCNRS Concerning Development of State System of Control, Accounting and Physical Protection of Nuclear Materials to Promote the Prevention of Nuclear Weapons Proliferation from Ukraine, the Administration developed draft "Plan of Cooperation between the State Administration and the Department of Energy of United States of America till 2005 in the area of accountancy and control nuclear materials in Ukraine", which was submitted to USA.

In connection with the Y2K the inspections of the State accountancy and control system of nuclear materials and accountancy and control of nuclear materials at facilities were carried out.

The work was performed on preparation of documents "Design Information" for nuclear facilities under construction and for centers located beyond the facilities carrying nuclear material.

3.2. Physical Protection of Nuclear Materials and Nuclear Facilities

The main goal of physical protection is to minimize a possibility of unauthorized actions (intentional and unintentional) against to nuclear facilities, nuclear materials, radioactive waste,

other radiation sources, transport means destined for nuclear material transportation that can cause direct or indirect danger for health and safety of the public, the environment due to radiation impact.

Moreover, reliable physical protection is one of the main elements of safeguards and prevention of illegal trafficking of nuclear materials and other radioactive sources.

During the reporting year the modernization of physical protection system at a number of nuclear facilities was proceeded with technical and financial assistance of country-donors. So, with assistance of USA modernization of physical protection system of testing reactor IP-100 was practically completed at Sevastopol institute of nuclear power and industry. This system will be put into operation after a number of administrative issues are resolved.

The modernization of physical protection system at National Scientific Center "Kharkiv Physical and Technical Institute" is at the final stage, it is carried under financial and technical assistance of such countries as USA, Sweden, Japan. Completion of work is planned for the first quarter of 2000.

Owing to financial and technical assistance of USA a number of subsystems (in particular, system for access monitoring) of system for physical protection of MF South-Ukrainian NPP were modernized.

Together with the Ministry for Energy of Ukraine and NEGC "Energoatom" organizational work on attraction of funds of country-donors was performed to modernize physical protection system of Khmelnitsky NPP.

During the year in accordance with general directions of Administration activity and tasks, which were described by Resolution # 226-p of 6 April 1998 of the Cabinet of Ministers of Ukraine together with appropriate subdivisions of the Ministry for Energy and law-enforcement authorities a complex drills were arranged and performed at Scientific Center "Institute for Nuclear Research" of National Scientific Academy of Ukraine, at South-Ukrainian NPP, at Zaporizhya NPP. During this training effectiveness of measures was checked up on physical protection and interaction between NPP personnel, security and forces that should respond to unauthorized actions against nuclear materials.

Taking into account results of this training and in accordance with Resolution of the Cabinet of Ministers of Ukraine # 226-p SNRA together with Ministry for Energy and law-enforcement authorities a complex drills were organized and performed. During these drills the effectiveness of measures for physical protection at mentioned facilities and truthworsy plans for interaction between NPP personnel, security and other subdivisions of Ministry for Internal Affairs and Security Service of Ukraine in case of attempts to perform unauthorized actions against nuclear materials were checked up.

In order to bring in compliance with modern requirements physical protection of research reactor as the organization system component at Sevastopol institute of nuclear power and industry, relevant experts took part in Inter-departmental commission on inspection of physical protection system condition and definition of order to develop special commandant's office of internal forces of the Ministry for Internal Affairs.

To fulfil Order # 1471 # 1471 of the Cabinet of Ministers of Ukraine of # 1471 the materials were considered related to access to special work of specialists of the Ministry for Energy of Ukraine and Scientific and Industrial Enterprise "Hartron-Ukom Ltd.", etc.

In 1999 special attention was paid to training and re-training of specialists on physical protection. In the reporting year training courses and seminars were organized and performed with assistance and participation of DOE (USA) and GRS/BMU (Germany). As result of this activity about 100 specialists on nuclear facilities, law-enforcement and environmental authorities, scientific and technical and design institutes, etc. passed training in Training Center

of physical protection, accountancy and control of nuclear materials and nuclear facilities as well as in training centers abroad (Czech Republic, Russia).

The agreement with representatives of International Legal Expert Group (ILG) was achieved regarding cooperation in the development of standard documents, required according to provisions of the Law of Ukraine "On Physical Protection of Nuclear Facilities, Nuclear Materials, Radioactive Waste, other Radiation Sources", which is planned to adopt in 2000.

3.3. Prevention of Illegal Trafficking of Nuclear Materials and other Radiation Sources

Within TACIS project for Ukraine "Transfer of effective assistance in combating of illicit trafficking of nuclear material" the demonstrative drill was carried out in Odessa with participation of foreign specialists to develop procedure for initial response of organizations and Departments involved in this process in cases of nuclear material detection in illegal trafficking. As result of this training the analysis was made and propositions related to improvement of specified procedure were made taking into account recommendations of International Technical Group on issues of nuclear smuggling. Representatives of this Group took part in discussions of drill results.

Moreover, under the mentioned project the training was arranged at modern analytic equipment in Institute of transuranium elements (Karlsruhe, Germany) for collaborators of Scientific Center "Nuclear Research Institute" which is general expert organization of Ukraine on issues of illegal smuggling of nuclear materials and other radiation sources.

During the year information exchange with IAEA database was performed on incidents related to illegal trafficking of nuclear materials and other radioactive sources. **According to established form the information on 3 cases of nuclear and radioactive material detection in illegal trafficking in Ukraine was submitted to the IAEA.** These cases include the following:

- on 20 May 1999 in Beregovo, Zakarpatiya region powder of uranium concentrate in amount of 20 kg was detained and criminal group comprising of citizens of Russia was arrested;
- on 23 September 1999 in Uzhgorod two containers with Sr-90 were detained and several persons including Russia citizen were arrested (Daghestan);
- in Kyiv a citizen of Ukraine was arrested for illegal possession of radioactive material (Sr-90), the incident that took place on 23 September 1999 in Uzhgorod city.

In the reporting year the SNRA participated in training for national communication centers on issues of illegal trafficking of nuclear materials, which was held by IAEA to inspect a functioning of communication channel between national communication centers and the Agency database.

4. EMERGENCY RESPONSE PREPAREDNESS

Presently the Government of Ukraine has concluded agreements on mutual notification and subsequent information exchange in case of a nuclear or radiation accident with Hungary, Germany, Austria, Norway, Finland, Poland, Slovakia, and Sweden. There is an agreement concluded with Russian Government on scientific-technical and economic cooperation in the field of nuclear power engineering, this agreement also envisages exchange of on-line information on NPP operational issues and incidents. A draft agreement to be concluded with Turkey is at a preparatory stage.

The State Nuclear Regulatory Administration of Ukraine also carries out international exchange of on-line information within the INES which is destined to provide on-line information on nuclear events to nuclear industry experts, mass media and the public. Notifications about events are submitted to the IAEA via communication network "INES information system" in a special

format – "Event rating sheets" and then the IAEA distributes them among national coordinators of participating countries within 24 hours.

In December 1999 the State Nuclear Regulatory Administration of Ukraine was included in the USS ES as a central executive authority responsible for implementation and operation of a USS ES functional subsystem – subsystem of state regulation of nuclear and radiation safety. In accordance with the provisions on this subsystem, the State Nuclear Regulatory Administration of Ukraine carries out:

- surveillance and monitoring of environmental radiation situation, situation on potentially hazardous nuclear power facilities and territories adjacent to them;
- development and fulfillment of special-purpose and scientific-technical programs and measures for prevention of emergencies, assurance of nuclear and radiation safety and public protection, provision of stable functioning nuclear power facilities.

In order to ensure the fulfillment of these tasks and in accordance with IAEA recommendations an Information Crisis Center (ICC) was created in the Administration and was opened on 28 February 1998. The project of the ICC was developed taking into account the advanced western countries' experience, first of all the feedback of United States of America that have a wide experience in creation and operation of similar crisis centers.

Like in other countries, the ICC is equipped with up-to-date computers including computerized information systems that function in real-time mode:

- the "Gamma-1" system for early notification on radiation accidents which allows to receive information on radiation state of the environment within the 30-km zone of Zaporizhya and Rivne Nuclear Power Plants. The "Gamma-1" system represents a set of monitoring stations, which automatically transfer data to local response centers via wireless channels. The system local response centers are situated in regional state offices of the Ministry for Environmental Protection and Nuclear Safety of Ukraine in Zaporizhya and Rivne. In turn, the local centers automatically transfer information via specified telephone channels to the system national response center situated at the ICC in Kyiv. If established levels of gamma-radiation doses are exceeded in regions being monitored, emergency warning signals are initiated in the response centers. The Ministry for Emergencies of Ukraine in Kiev and its regional departments in Zaporizhya and Rivne have constant access to the "Gamma-1" system in the real-time mode. Sanitary-epidemiological stations in Zaporizhya and Nikopol as well as the Nuclear Research Institute in Kiev receive information from the system in the switching mode. In 1999 the software of the "Gamma-1" system was prepared in good time for the 2000-year problem that allowed to pass the crisis change of dates without failure of the system;
- the NPP remote monitoring system (RMS) which main functions are presentation of process and radiation parameters of Ukrainian NPP units, monitoring of parameters as to permissible values and assessment of the status of safety critical functions, presentation of current parameters as a process flow chart, presentation of the state of summarized parameters, collection and storage of obtained information. In 1999 the RMS of Zaporizhzha-5 was completed and commissioned in trial operation and the RMA of Rivne NPP units was being developed.

In order to maintain constant emergency preparedness, twenty-four-hour duty is carried out in the ICC, that is a requirement of the Convention on Early Notification on Nuclear Accident. The Supervisory Department of the Main State Inspectorate on Supervision carries out the duty over Nuclear Safety. On-line connection with Ukrainian Nuclear Power Plants is maintained during the duty, information is analyzed and registered on radiation incidents occurred within Ukraine and beyond its boundaries. Information on malfunctions at Ukrainian Nuclear Power Plants is registered and stored in the database "Malfunctions at Ukrainian Nuclear Power Plants". Based on this information monthly, quarterly and annual reports are developed on malfunctions at Nuclear Power Plants and statistical analysis is performed on malfunctions for a certain period of the current year in comparison with the same period for the two previous years.

In 1999 in the frames of the Convention on Early Notification on Nuclear Accident the connection with the IAEA crisis center was tested, and in accordance with bilateral intergovernmental agreements – with communication centers of Austria, Germany, Poland, Hungary and Finland.

Within the IAEA project "Harmonization of Regional Preparedness for Response to Nuclear Accidents" in 1999 connection was tested with Albania, Byelorussia, Bulgaria, Greece, Estonia, Latvia, Lithuania, Moldova, Rumania, and Turkey.

Regularly conducted emergency training and exercises are the essential factors of emergency preparedness maintenance. **On 25 November 1999 emergency training was conducted in the ICC where an accident at South-Ukrainian NPP was stimulated.** The training program envisaged initiating response of the Deputy Chief Engineer, the IAEA, other organizations, and their answers were prepared in advance. The ICC was activated during the training where 23 experts were involved from different departments of the Ministry. In total 23 experts participated in the training headed by Head of the State Nuclear Regulatory Administration of Ukraine. Representatives of the Ukrainian Committee for Hydro-meteorology participated in the training as observers.

In addition, **participation was taken in emergency training at Khmelnitsky NPP conducted on 25 to 27 August 1999 in accordance with the NNU "Energoatom" schedule.** The main goal of the State Nuclear Regulatory Administration of Ukraine participated in this training was to improve the information exchange under emergency conditions between the ICC, NPP emergency personnel and NPP resident inspector from the Main State Inspectorate on Supervision over Nuclear Safety (MSI). Based on training results the agreement with NAEC "Energoatom" was achieved as to organization in Ukrainian NPP crisis centers of the work place for an inspector of the MSI as well as to appoint a person of NPP responsible for providing on-line information to the ICC in case of emergencies. The State Nuclear Regulatory Administration of Ukraine and NAEC "Energoatom" agreed to include these issues into the program of the next training to be conducted at Rivne NPP in 2000 in accordance with the NNU "Energoatom" schedule.

In 1999 a paging communication system was introduced in the ICC which provided on-line notification to experts of different departments of the Ministry and subordinated organizations included in the ICC.

In accordance with the "Regulations for Interaction of Central and Local Executive Authorities within Governmental Information-Analytical System for Emergency Situations (GIAS ES)", the State Nuclear Regulatory Administration of Ukraine carried out work on preparation for providing information to GIAS ES central and standby stations for information-analytical processing of data.

In order to implement the decision of the State Committee for prevention and elimination of possible negative consequences of the Y2K, Head of the Nuclear Regulatory Administration of Ukraine and Head of the Main State Inspectorate on Supervision over Nuclear Safety took part in

the work of Interim Group for organization and coordination of executive authorities' actions in case of national-level emergencies associated with the Y2K.

In order to provide the on-line responding to possible negative consequences of the 2000-year computer crisis, **the State Nuclear Regulatory Administration of Ukraine created Response Team to be on duty in the ICC during change of data in the new century.** For this period the ICC organized temporary satellite communication channel with the crisis center of the US Department of Energy. Experts from the ICC, officials of the State Nuclear Regulatory Administration of Ukraine, representatives of the US embassy in Ukraine, and an American satellite communication operator took part in the duty. **Information on passing dates by the Ukrainian Nuclear Power Plants was immediately transmitted to the IAEA and to the specially created web-site in Internet network.**

5. INTERNATIONAL COOPERATION

Assistance to Eastern and Central European countries in the field of nuclear power was started after publication of the resolution of the G7 countries Summit held in London in 1991. This resolution dealt with strengthening of mutually agreed actions of western countries in the field of nuclear safety in the countries of Eastern Europe and the former USSR.

The action program envisaged solving the following issues:

- improvement of operational safety of soviet-designed nuclear power reactors;
- technical modernization of Nuclear Power Plants basing on safety analysis reports;
- improvement of the regulatory regime;
- study of possibilities to replace more safe Nuclear Power Plants with alternative power sources and reduce of power consumption by means of implementation of power-saving technologies;
- study of the possibility to upgrade Nuclear Power Plants with relatively new design.

International assistance to the Ukrainian Regulatory Authority was started in 1992. During these years great assistance was provided in creation and establishment of the Regulatory Authority on the basis of internationally accepted approaches. Many efforts were made to train personnel, analyze drafts of legislative and regulatory acts in the field of nuclear and radiation safety, to transfer safety assessment methodologies to arrange scientific support to the regulatory activity.

Certain results of this activity were discussed during two international conferences held in 1999. In April the Ukrainian delegation participated in the first meeting held to consider national reports on fulfillment of obligations described in the Convention on Nuclear Safety. In June an International Conference on strengthening nuclear safety in Eastern European countries was conducted.

It was noted that the Ukrainian position has been sufficiently advanced in many aspects. *Legislation* in the field of safety use of nuclear power in Ukraine is completely consistence with the practice of European Union countries and includes the best examples of international practice. The Decrees of the President of Ukraine No. 250 of 13 March 1999 and 605 of 3 June 1999, which considered the matters of *independence*, *authorization* and *resource supporting* of the Regulatory Authority for nuclear and radiation safety were mentioned by the participants of these forums as an important step towards established international practice. *Normative regulation* of safe use of nuclear power is brought in compliance with the international practice. *Licensing of nuclear facilities* and great modifications are carried out with the use of modern methodology.

During the recent years many international forums pointed out the importance of transfer from assistance to the countries with transient economy to direct cooperation with these countries. In practice it means joint realization of certain projects that allows to train experts during specific work. Last year technical supporting organizations of the Regulatory Authority participated in work by this principle, they performed a part of work on the contracting basis in such important areas as crisis response and licensing activities related to decommissioning of Chornobyl NPP.

The international community pays great importance to intensification of bilateral relations between countries receiving assistance. Some of them have already created powerful potential in the field of nuclear safety. Expansion of collaboration, international cooperation, exchange of work experience in difficult economic conditions are very useful for countries of the region since this allows to optimize approaches to regulation of nuclear and radiation safety.

During previous years such cooperation has been started with Regulatory Authorities of Poland and Bulgaria. In 1999 the delegation of the Regulatory Authority of Armenia visited Kyiv. During a week the Armenian specialists studied present situation of regulation activity in Ukraine, structure of the Regulatory Authority, legislative and standard basis of regulation, methodologies of expert assessments, work of separate subdivisions. Exchange of experience was useful for both parts. It was agreed to continue such experts' exchange in future.

5.1. Cooperation with International Atomic Energy Agency (IAEA)

Ukraine is a one of the IAEA founders and takes an active part in its activity beginning from Agency's foundation in 1957. Contribution in nonproliferation of nuclear weapons due to implementation of safeguards regime, participation in technical cooperation programs, participation in annual sessions of IAEA General Conference are main areas of cooperation with IAEA.

The 43rd session of IAEA General Conference was held 27 September - 1 October 1999. Head of SNRA was appointed Deputy Head of Governmental delegation of Ukraine. Issues on implementation of regime of nonproliferation of nuclear weapons in the world, upgrading of nuclear and radiation safety, technical cooperation between countries and the Agency were discussed at the Conference. During the Conference negotiations with management of IAEA and Agency Department of Safeguards took place, the problems related to fulfillment of the Agreement on safeguards between Ukraine and IAEA were discussed. Meetings with the members of delegations from other countries were held.

Ukraine participates in programs of IAEA technical cooperation.

In 1999 to 2000 the Agency financed the implementation of 14 national projects for Ukraine. State Nuclear Regulatory Administration subdivisions are responsible for the implementation of three of them (UKR/0/006 – *Personnel training and nuclear technology assurance*, UKR/9/006 – *Strengthening of national system for nuclear regulation*, and UKR/9/016 – *Prevention of nuclear material illegal circulation*).

Our country participates in 27 IAEA regional projects. The SNRA is the national coordinator in 8 projects and participates in 11 regional projects as yet.

In 1999 26 official journeys of SNRA specialists and 27 official journeys of SSTC NRS specialists took place to participate in conferences, workshops, seminars, training courses and other activities of the Agency.

5.2. Cooperation with European Union Commission

European Commission participates in the fulfillment of the strategy for nuclear safety upgrading in Ukraine within TACIS program.

The main priorities in the Commission activity are decommissioning of Soviet designed old power units, CHORNOBYL NPP units are among them, as well as construction of safe radioactive waste storage and treatment facilities. TACIS project *Assistance to SNRA in licensing activities related to decommissioning of ChNPP that is financed by TACIS/NSA is established for this purpose*.

Great attention is paid to development and consolidation of the Regulatory Authority of Ukraine. The project *RAMG: Transfer of West-European Regulatory methodology and practices to the Regulatory Authority of Ukraine* is established for this aim. The first stage of the project was fulfilled from1994 to 1997. In 1998 the fulfillment of the second stage of the project was started, it is planned for 3 years. Training of 43 specialists of the Regulatory Administration, SSTC NRS, MSI staff was carried out within this project during 18 month. Western specialists have provided advisory assistance during development of regulatory documents in such important areas as personnel licensing, personnel radiation protection, inspection activity, monitoring of releases, etc.

Fulfillment of project *Consolidation of analytic basis for regulatory authority of Ukraine to perform complex calculations concerned to radiation protection at nuclear facilities of Ukraine under normal operation and in emergency situations* is continued. Within improvement of system for emergency preparedness the financing of project *Implementation of "Rodos" system for assurance of autonomous preparedness to emergency situations* is opened. In the nearest future opening of Gamma-3 project *Development of early notification system in cases of off- site accidents for Ukraine and Byelorussia* is anticipated.

In 1999 fulfillment of project *Rendering of effective assistance in counteraction against unauthorized circulation of nuclear materials* is started, it has been planned for 3 years. European Commission informs the Regulatory Authority of Ukraine on results of joint project *EC technical organization assistance to State regulatory authorities and their technical supporting organizations of Central and West European countries and Commonwealth of Independent States in respect of safety evaluation of experimental qualification project for bubble condenser of VVER 440-213 reactor.*

5.3. Group for Agreement of Nuclear Regulation Tasks in Europe (CONCERT)

Within the European Commission work of the Group for agreement of nuclear regulation tasks in Europe (CONCERT) is carried out. Ukraine participates in the work of this group starting from its foundation in 1992. General purpose of the group is the exchange of experience in regulation of nuclear and radiation safety in Europe. Twice a year meetings of top-level management of the Regulatory Authorities of European countries are organized, one of such meeting is held in Brussels and another – in one of West European countries.

During these meetings the most present-day issues of regulation are discussed. In 1999 the issue of emergency preparedness, reviewing procedure for reports on safety analysis, regulative control of modifications at Nuclear Power Plants, informing of the public, 2000-year computer problem, factors that influence efficiency of the Regulatory Authority activity were discussed.

The last meeting of CONCERT group is to be held in June 2000 in Kyiv.

5.4. G-24 NUSAC The Nuclear Safety Co-ordination Group

The nuclear safety co-ordination group (G-24 NUSAC) was founded in September 1992 according to initiative of G-7 leaders. The group is gathered every year to discuss urgent problems in nuclear industry and Regulatory Authorities in state-recipients of assistance.

NUSAC bureau consisting of Head at the level of the Head of CEC directorate and two co-heads – from the side of donors and from the side of recipients leads activity of group. In March 1999 Head of State Nuclear Regulatory Administration, Mr. Smyshliaiev, was appointed Co-Head of NUSAC.

Day-to-day activity between annual meetings is performed by NUSAC Secretariat, which is located in Brussels in the headquarters of the European Commission. The maintenance of database on assistance projects, G-24 forum supporting in Internet and information of the public are the main responsibilities of NUSAC.

5.5. Cooperation within Intergovernmental and Interdepartmental Agreements

The Ministry for Environmental Protection and Nuclear Safety of Ukraine (State Nuclear Regulatory Administration) is the main coordinator for fulfillment of 14 agreements and treaties concluded at the intergovernmental level. In 1999 two agreements were concluded: the Agreement between the Cabinet of Ministers of Ukraine and the Government of Kingdom of Sweden on early notification on nuclear accidents and radiation protection and the Agreement between the Cabinet of Ministers of Ukraine and the Government of Kingdom of Sweden on cooperation in the field of nuclear safety. The first Agreement is already come into force. Documents for ratification of the second Agreement were submitted to Verkhovna Rada of Ukraine.

Agreements on cooperation in the field of nuclear and radiation safety at the intergovernmental level are prepared with the Russian Federation, Belorussia, Latvia, Rumania, Turkey as well as Agreement between the Cabinet of Ministers of Ukraine and the Government of Belorussia Republic on cooperation in the field of nuclear material transport. Revision of the Agreement between the Government of Ukraine and the Governments of Russia and Hungary on nuclear materials transport via territory of Ukraine is scheduled.

For fulfillment of the main tasks the State Nuclear Inspectorate and its successor - the Ministry for Environmental Protection and Nuclear Safety of Ukraine concluded agreements, signed memorandums and protocols on cooperation (total amount is 23) with appropriate foreign organizations. In 1999 two agreements have been concluded: the Agreement between the Ministry for Environmental Protection and Nuclear Safety and the State Nuclear Inspectorate of Armenia republic on technical cooperation and information exchange and the Agreement Prolongation between the Ministry for Defense of United States of America and the Ministry for Environmental Protection and Nuclear Safety on development of State system for accountancy, control and physical protection of nuclear materials in order to prevent proliferation of nuclear weapons from Ukraine.

The permission of the Cabinet of Ministers of Ukraine for signing of Agreement between State Nuclear Regulatory Administration and State Institution on Nuclear Safety of Czech Republic on cooperation in the field of state safety regulation under nuclear power use is obtained. Memorandums on mutual understanding on cooperation in the field of nuclear and radiation safety with National Commission of Rumania and Korean Institute on Nuclear Safety of Korea Republic are prepared for signing.

In 1999 the cooperation with Regulatory Authorities of USA, Germany, France, Spain, Italy, Canada, Japan, Sweden, Finland was successfully performed. This cooperation includes training

for experts of the Regulatory Authority of Ukraine in the field of licensing, inspection, methodologies of expert assessment. Ukrainian specialists participated in seminars and workshops, where draft regulatory documents were discussed.

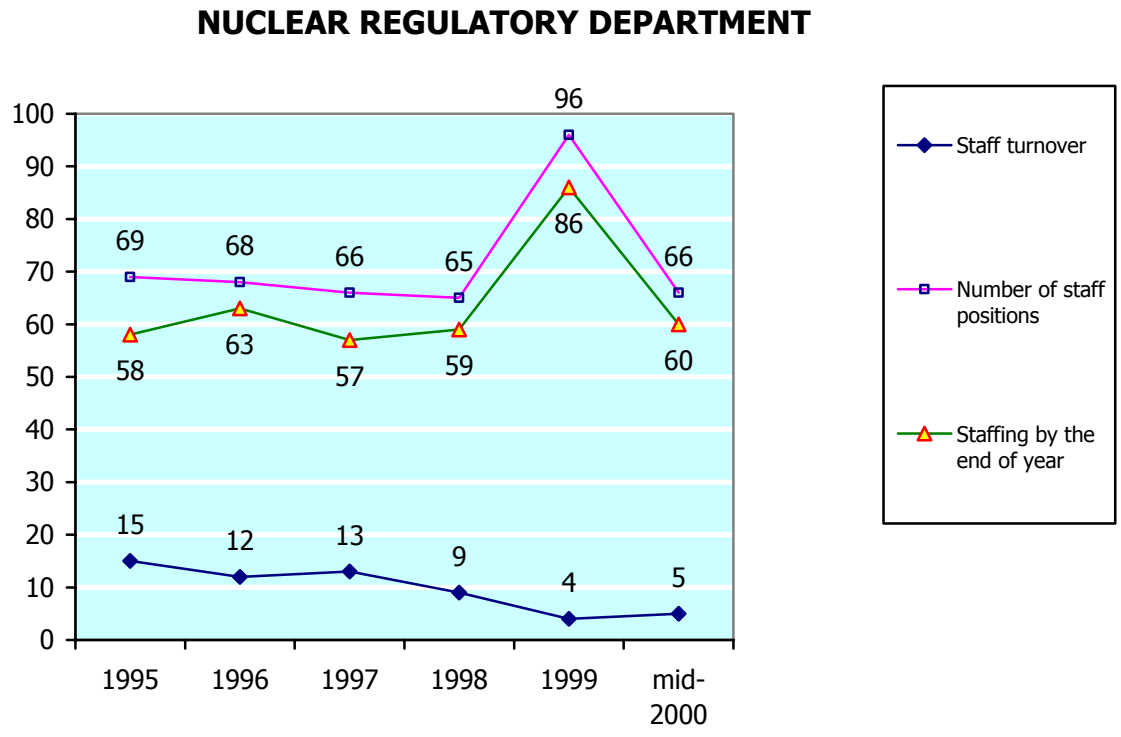
During that year Heads of the regulatory authorities of France and USA visited Ukraine. Distinguished guests were familiarized with the recent achievements of the Ukrainian Regulatory Authority and technical supporting organizations. Technical visits to Chornobyl NPP were carried out. The French delegation visited Rivne NPP as well.

6. RESOURCE AVAILABLE FOR REGULATORY ACTIVITIES

In accordance with Article 8 of the Convention on Nuclear Safety the Regulatory Authority should be provided with appropriate funding and human resources to perform its established obligations.

Creation of the Ukrainian State Nuclear Regulatory Administration resulted in positive changes in respect of the number of the main personnel and remuneration for their work as well as obtaining the premises that comply with current sanitary standards.

So, the number of personnel performing regulatory functions increased from 65 to 73 in 1999. In accordance with item 1 of the Order of the CMU of Ukraine No 1037 of 15 June 1999 “On Issues of the State Nuclear Regulatory Administration” the number of personnel should increase up to 83 persons.



In addition, according to item 4 of the same Order, **salaries of the main personnel increase almost by 1,5 times**, and in the second semester of 1999, average salary was about 294 hryvnyas. Since the conditions of remuneration for executive authorities were changed by Ordinance of the CMU of Ukraine No 2288 of 13 December 1999, remuneration for work in the Regulatory Authority became closer to those of the managerial staff at the utility and as a result skilled experts with big experience in nuclear power engineering gave their applications to include them into the personnel reserve and to obtain vacancies in the main divisions.

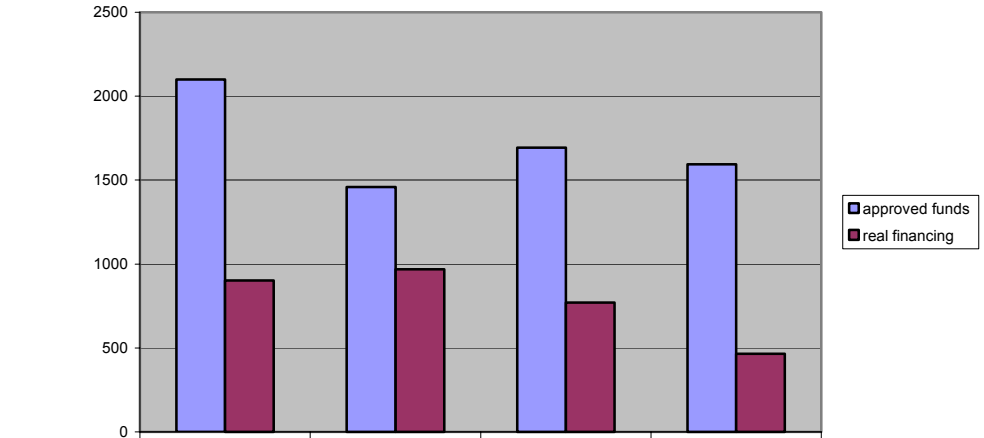
On 31 December 1999 7 vacancies left in the SNRA (head of department – 1, deputy head of department –1, head of division – 1, chief expert - 3, expert of the 1st category – 1). 72 experts of the SNRA were graduates of universities, 4 – had scientific degree of candidate of sciences.

During 1999 38 experts improved their skill, 5 of them were trained abroad.

Moreover, in order to involve leading scientists and well-known experts in nuclear power in making the most important decisions in nuclear and radiation safety and specification of the strategy for reformation and development of the system for state regulation of nuclear and radiation safety, in accordance with item 10 of the Provisions on the Ukrainian State Nuclear Regulatory Administration **an Expert-Consulting Council was created**. The Expert-Consulting Council was headed by G. Kopchinsky – well-known in Ukraine and world-wide expert in the field of nuclear power, who occupied leading positions at nuclear power enterprises and was head of nuclear power and industry department in the Council of Ministers of the USSR, he was at the beginning of creation of the Regulatory Authority for nuclear safety in the independent Ukraine. The organization includes both well-known scientists and experts of practical activity who have sound authority in the nuclear field but presently they do not occupy positions which would cause conflicts of interests with obligations of the Council's member.

Funding of the newly created State Nuclear Regulatory Administration of Ukraine was provided under conditions envisaged in item 2 of the Order of the CMU of Ukraine No. 1037 of 15 June 1999. Positive changes should be pointed out in funding of the main activity of the Regulatory Authority in 1999 that allowed to provide required amount of service material and funding of business trips of experts to nuclear power facilities in accordance with approved plans.

The only acute problem left presently is systematic absence of appropriate funding for scientific-expert support of the regulatory activity from the state budget:



	1996	1997	1998	1999
approved funds	2100	1458	1692	1593,6
real financing	902,6	968,8	770,8	465,6

This status of funding for scientific-expert support to the Regulatory Authority first of all negatively influences early developed plans for review of nuclear safety standards and rules inherited from the former USSR taking into account operational experience and up-to-date concepts for safety regulation established in the standards of the International Atomic Energy Agency. In addition, the absence of budget funding along with inability of the operating organization to pay for expert review of safety-substantiating materials under crisis conditions of non-payments for electric energy causes the risk of loss of expert potential and failure of established terms for making regulatory decisions.

In order to provide appropriate scope of funding for the regulatory activity during 1999 the Ukrainian State Nuclear Regulatory Administration have taken the following measures:

1) in accordance with the Order of the President of Ukraine No. 605 of 3 June 1999, on the basis of summary of European Union countries' experience and with involvement of skilled experts of the International Center of perspective research draft law "On the fees to implement measures of state regulation of nuclear and radiation safety" was developed and agreed with concerned central executive authorities and then passed to the Verkhovna Rada of Ukraine, this draft introduced the mechanism for compensation of budget expenses for the regulatory activity at the expense of entities which activity in the field of nuclear power requires the State to create appropriate regulatory mechanisms;
2) Negotiations were conducted with the US Nuclear Regulatory Commission and the US State Department and as a result an agreement was signed between the Ukrainian State Regulatory Administration and the US Nuclear Regulatory Commission. In accordance with this agreement the American side will pay a considerable part of scientific-expert work, which is of interest to the Ukrainian Regulatory Authority. In particular, this work includes expert review of reports of safety reassessment for NPP units under operation in the process of their licensing for permanent operation.

CONCLUSIONS

During the reporting year the Ukrainian State Nuclear Regulatory Administration as an organization responsible for state regulation of nuclear and radiation safety achieved positive results in the basic areas for implementation of the state policy related to assurance of nuclear and radiation safety, protection of public and the environment against hazardous impact of ionizing radiation.

An important indicator for this is the fact that because of the strict position maintained by the SNRA and the State Nuclear Inspectorate, in despite of the economic problems in this country, there were no compromises in issues that can negatively influence the safety and as a result there were no considerable deteriorating performances of the nuclear-power field compared to the last year and other countries operating Soviet-designed power units both from the productive point of view (the total production of Ukrainian Nuclear Power Plants in 1999 was 72,06 milliard kW-hours or 42,1 percent from the total energy production) and as regards malfunctions (4,79 safety-related events per NPP unit, only one event was rated 2 according to the INES).

It should also be noted that high confidence of the international community and independence of regulatory decisions relieved the stress as regards prolongation of Chornobyl NPP Unit 3 operation for the year 2000.

The most serious problem in the reporting year that influenced the efficiency of the system for state regulation of nuclear and radiation safety was a gap in permissive and surveillance activities that potentially can result in system and hidden problems in assurance of nuclear and radiation safety in the State. Special attention should be paid to solve this problem in the year 2000.

In order to optimize the ways of development and reformation of the system for state regulation of nuclear and radiation safety taking into account gained experience, requirements of international conventions in the field of nuclear and radiation safety and positive practice of European Union's experts, the Ukrainian State Nuclear Regulatory Administration has developed a Concept on development of the system for state regulation of nuclear and radiation safety in Ukraine that is attached to this Report. The Concept was discussed and agreed at a meeting of the Expert-Consulting Council and approved by the Head of the Ukrainian State Nuclear Regulatory Administration. The Concept has proposed specific measures aimed at improving efficiency of state regulation system on nuclear and radiation safety during the year 2000 and up to the year 2004.