



UKRAINE

NATIONAL REPORT

**On Compliance with the Obligations under the Joint Convention on the Safety
of Spent Fuel Management and on the Safety of Radioactive Waste
Management**

KYIV 2005

FOREWORD

The participation of Ukraine in the First Review Meeting of the Contracting Parties gave to Ukrainian authorities an unique opportunity to get acquainted with the best practices and to adopt the nuclear safety approaches in the field of spent fuel and radwaste management.

Activity of the Ukrainian society as associated with the political events of autumn 2004 has become an additional essential factor for us to realise the special importance of a consistent and transparent policy of the State pertaining to the safety of spent fuel and radioactive waste management in order to ensure public support to the development of nuclear energy in Ukraine. The experience of other States in communicating with local governments and general public in siting of radioactive waste and spent fuel storage facilities was of particular interest for Ukraine.

The Second National Report of Ukraine has been developed in compliance with the requirements of the Joint Convention and Guidelines Regarding the Form and Structure of National Reports INFCIRC/604 of 10 July 2002.

This Report, as the previous one, results from the collective effort of all responsible governmental authorities and state enterprises.

The main goal of the Second Report is to provide objective information to the Contracting Parties to the Joint Convention and to the general public of Ukraine regarding the status of spent fuel and radioactive waste management, measures taken by the State to protect personnel, the public and the environment against ionising radiation, to highlight changes and achievements of the last three years and identify pending issues to be resolved.

According to the authorities granted by the President of Ukraine, the Chairman of the State Nuclear Regulatory Committee of Ukraine declares the following:

The underlying principles of the state policy of Ukraine in spent fuel and radioactive waste management are the priority to protect the people and the environment against ionising radiation, ensure safety at all phases of spent fuel and radioactive waste management, openness and accessibility of information on these aspects, involvement of citizens and public organisations, regional authorities and local governments in making decisions related to siting of radioactive waste and spent fuel storage facilities.

In this context, Ukraine fulfils its obligations under the Joint Convention as confirmed by the following:

- legislative and regulatory provisions pertaining to the safety of spent fuel and radioactive waste management have been established and are under continuous improvement;

- the State has established the nuclear regulatory body empowered with regulation, licensing and supervision, being independent from other state bodies, the operator and the licensees;

- responsibility for the safety of spent fuel and radioactive waste management rests with the operator and licensees;

- the operator and licensees are obliged to indemnify damages from radiation accidents in spent fuel and radioactive waste management.

The actual data in this Report, except for those specifically stated, are provided as of 1 July 2005. The changes that will take place by May 2006 will be additionally reported by the Ukrainian Delegation at the Second Review Meeting.

Kyiv, 14 October 2005.

Olena Mykolaichuk

Chairperson of the State Nuclear Regulatory Committee of Ukraine

TABLE OF CONTENTS

Section A. INTRODUCTION	8
SECTION A 1. BASIC CONCLUSIONS FROM FIRST REVIEW MEETING	9
Section B. POLICES AND PRACTICES (Article 32, Paragraph 1)	10
B.1. Policy for Spent Fuel Management	10
B.2. Practices Pertaining to Spent Fuel Management	11
B.3. Policy for Radioactive Waste Management	11
B.4. Practices Pertaining to Radioactive Waste Management	12
B.4.1. Radioactive Waste Management at Operating NPPs	12
B.4.2. Radioactive Waste Management at SSE ChNPP and the Shelter.....	13
B.4.3. Radioactive Waste Management at SSE Complex.....	14
B.4.4. Radioactive Waste Management at UkrDO Radon SISP.....	14
B.4.5. Management of Radioactive Waste from Research Reactors.....	14
B.5. Criteria Used to Define and Categorise Radioactive Waste	15
Section C. SCOPE OF APPLICATION (Article 3)	17
Section D. INVENTORIES AND LISTS (Article 32, Paragraph 2)	17
D.1. List of Spent Fuel Management Facilities Subject to This Convention, Their Location, Main Purpose and Essential Features	17
D.2. Inventory of Spent Fuel Subject to This Convention, That Is Being Held in Storage and Has Been Disposed Of	18
D.3. List of Radioactive Waste Management Facilities Subject to This Convention, Their Location, Main Purpose and Essential Characteristics	18
D.4. Inventory of Radioactive Waste Subject to This Convention	18
D.4.1. List of Radioactive Waste in Temporary Storage at Nuclear Fuel Cycle Facilities and Research Reactors.....	18
D.4.2. List of Radioactive Waste That Has Been Disposed Of	18
D.4.3. List of Radioactive Waste Resulting from Past Practices	19
D.5. List of Nuclear Facilities under Decommissioning and Status of Decommissioning Activities at Those Facilities	19
Section E. LEGISLATIVE AND REGULATORY SYSTEM	19
E.1. Implementing Measures (Article 18)	19
E.2. Legislative and Regulatory Framework (Article 19)	19
E.2.1. National Safety Requirements and Regulations for Radiation Safety	19
E.2.2. System of Licensing of Spent Fuel and Radioactive Waste Management Activities	19
E.2.3. System of Prohibition to Operate a Spent Fuel or Radioactive Waste Management Facility without a Licence	20
E.2.4. System of Appropriate Institutional Control, Regulatory Inspection and Documentation and Reporting	20
E.2.5. Enforcement of Applicable Regulations and Terms of Licences	21
E.2.6. Allocation of Responsibilities of Bodies Involved in Different Steps of Spent Fuel and Radioactive Waste Management	21
E.3. Regulatory Body (Article 20)	22
Section F. OTHER GENERAL SAFETY PROVISIONS	23
F.1. Responsibility of Licence Holder (Article 21)	23
F.2. Human and Financial Resources (Article 22)	24

F.2.1. Qualified Staff Needed for Safety-Related Activities During Operational Lifetime of Spent Fuel and Radioactive Waste Management Facility	24
F.2.2. Financial Resources to Support Safety of Facilities for Spent Fuel and Radioactive Waste Management During Their Operating Lifetime and for Decommissioning	24
F.2.3. Financial Provision for Appropriate Institutional Controls and Monitoring Arrangements for Period Following Closure of Disposal Facility	25
F.3. Quality Assurance (Article 23)	25
F.4. Operational Radiation Protection (Article 24)	25
F.4.1. Radiation Protection of Workers and Public	25
F.4.2. Limitation of Discharges and Releases	27
F.4.3. Corrective Measures to Control Unplanned or Uncontrolled Release of Radioactive Materials into Environment and Mitigation of Its Effects	27
F.5. Emergency Preparedness (Article 25)	28
F.5.1. On-site and Off-site Emergency Plans. Testing of Emergency Plans	28
F.5.2. Preparation and Testing of Emergency Plans in Ukraine As Can Be Affected in Radiological Emergency at Spent Fuel or Radioactive Waste Management Facility in Vicinity of Its Territory	28
F.6. Decommissioning (Article 26)	29
F.6.1. Ensuring Qualified Staff and Adequate Financial Resources for Decommissioning	30
F.6.2. Operational Radiation Protection, Minimisation of Discharges, Unplanned and Uncontrolled Releases	31
F.6.3. Emergency Preparedness	32
F.6.4. Records of Information Important to Decommissioning	32
Section G. SAFETY OF SPENT FUEL MANAGEMENT	33
G.1. General Safety Requirements (Article 4)	33
G.1.1. Criticality and Residual Heat Removal	33
G.1.2. Minimisation of Radioactive Waste Generation	34
G.1.3. Interdependencies Among Different Steps in Spent Fuel Management	34
G.1.4. Radiation Protection of Personnel, Public and Environment	34
G.1.5. Biological, Chemical and Other Risks	34
G.1.6. Avoiding Reasonably Predictable Impacts on Future Generations Greater Than Those for Current Generation	34
G.1.7. Avoiding Undue Burdens on Future Generations	34
G.2. Existing Facilities (Article 5)	35
G.2.1. Spent Fuel Management at Nuclear Power Plants	35
G.2.2. ZNPP Dry Spent Fuel Storage Facility	35
G.2.3. ChNPP Spent Fuel Storage Facility	36
G.2.4. Spent Fuel Storage Facility of NASU INR	36
G.2.5. Spent Fuel Management at SUNEI	36
G.3. Siting of Proposed Facilities (Article 6)	36
G.3.1. Evaluation of Site-Related Factors Likely to Affect Safety of Facility During Its Operating Lifetime	36
G.3.2. Evaluation of Likely Safety Impact of Facility on Individuals, Society and Environment	36
G.3.3. Making Information on Facility Safety Available to Members of Public	37
G.3.4. Consulting Contracting Parties in Vicinity of Facility	38
G.4. Design and Construction of Facilities (Article 7)	38
G.4.1. Limitation of Possible Radiological Impact of Spent Fuel Management Facilities	38
G.4.2. Conceptual Plans and Technical Provisions for Decommissioning of Spent Fuel Management Facilities	38
G.4.3. Support of Technologies Incorporated in Design by Experience, Testing or Analysis	38
G.5. Assessment of Safety of Facilities (Article 8)	38
G.5.1. Safety Assessment and Environmental Assessment	38
G.5.2. SAR Reassessment in Construction and Commissioning	39
G.6. Operation of Facilities (Article 9)	39
G.6.1. Licensing of Operation of Facilities	39
G.6.2. Definition and Revision of Operational Limits and Conditions	39
G.6.3. Operating Procedures	39
G.6.4. Engineering and Technical Support in Operation	40
G.6.5. Reporting of Incidents Significant to Safety to Regulatory Body	40

G.6.6. Analysis of Relevant Operating Experience	41
G.6.7. Decommissioning Plans	41
G.7. Disposal of Spent Fuel (Article 10)	41
<i>Section H. SAFETY OF RADIOACTIVE WASTE MANAGEMENT</i>	<i>42</i>
H.1. General Safety Requirements (Article 11).....	42
H.1.1. Subcriticality and Removal of Residual Heat	42
H.1.2. Minimisation of Radioactive Waste Generation	43
H.1.3. Interdependencies between Different Steps of Radioactive Waste Management	43
H.1.4. Effective Protection of Individuals, Society and Environment	43
H.1.5. Biological, Chemical and Other Risks	43
H.1.6. Avoiding Reasonably Predictable Impacts on Future Generations Greater Than Those for Current Generation.....	43
H.1.7. Avoiding Undue Burdens on Future Generations	44
H.2. Existing Facilities and Past Practices (Article 12)	44
H.2.1. Safety of Existing Facilities	44
H.2.2. Past Practices	45
H.3. Siting of Proposed Facilities (Article 13)	45
H.4. Design and Construction of Facilities (Article 14)	45
H.5. Assessment of Safety of Facilities (Article 15).....	46
H.6. Operation of Facilities (Article 16).....	46
H.7. Institutional Measures after Closure (Article 17).....	46
<i>Section I. TRANSBOUNDARY MOVEMENT (Article 27).....</i>	<i>46</i>
<i>Section J. DISUSED SEALED RADIONUCLIDE SOURCES (Article 28).....</i>	<i>47</i>
<i>Section K. PLANNED ACTIVITIES TO IMPROVE SAFETY.....</i>	<i>48</i>
<i>CONCLUSIONS.....</i>	<i>51</i>
<i>Section L. ANNEXES</i>	<i>54</i>
Annex 1. List of Spent Fuel Management Facilities	54
Annex 2. Inventory of Spent Fuel	55
Annex 3. List of Radioactive Waste Management Facilities as of 1 July 2005.....	56
Annex 4. Inventory of Radioactive Waste as of 1 July 2005	59
Annex 5. List of Nuclear Facilities at the Stage of Termination of Operation.....	62
Annex 6. List of Ukrainian Regulations on Nuclear and Radiation Safety Adopted in the Reporting Period	63
Annex 7. National and International Reports and Safety Reports	64
Annex 8. Radiation Protection of Personnel and Public	65
Annex 9. Waste of Uranium Mining and Milling.....	69

List of Abbreviations

AMW	Accident Mitigation Waste
CA	Controlled Area
ChNPP	State Specialised Enterprise “Chornobyl NPP”
ChNPP TC	Training Centre of SSE ChNPP
CMU	Cabinet of Ministers of Ukraine
CP	Cooling Pond
DSFSF	Dry Spent Fuel Storage Facility
EIA	Environmental Impact Assessment
FNRU	First National Report of Ukraine (on compliance with the obligations of the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management)
HLW	High-Level Waste
ICSRM	Industrial Complex for Solid Radioactive Waste Management
IEC	SNRCU Information Emergency Centre
IWSF	Intermediate-Level Waste Storage Facility
KhNPP	Separated Entity “Khmelnitsky NPP”
Liquid Radwaste	Liquid Radioactive Waste
LRSF	Liquid Radioactive Waste Storage Facility
L RTP	Liquid Radioactive Waste Treatment Plant
ME	Ministry of Ukraine for Emergencies and Public Protection against Consequences of Chornobyl Catastrophe
MFE	Ministry for Fuel and Energy of Ukraine
MHU	Ministry of Health of Ukraine
MIAC	Main Information and Analytical Centre of State Radioactive Waste Accountancy System based on UkrDO Radon
MM	Mass Media
NASU INR	Institute for Nuclear Research of National Academy of Sciences of Ukraine
NF	Nuclear Fuel
NNEGC	State Enterprise “National Nuclear Energy Generating Company Energoatom”
NPP	Nuclear Power Plant
NRS	Nuclear and Radiation Safety
NSC KPTI	National Scientific Centre “Kharkiv Physical-Technical Institute”
OA	Observation Area
PSAR	Preliminary Safety Analysis Report
QAG	Quality Assurance Guideline
Radwaste	Radioactive Waste
RCRA	Regional Centre for Radioactive Waste Accountancy
RICP	Radioactive Waste Interim Confinement Point
RL	Reference Level
RNPP	Separated Entity “Rivne NPP”
RNR	Research Nuclear Reactor
RS	Radiation Source
RWDP	Radioactive Waste Disposal Point

SAA	Strict Access Area
SAR	Safety Analysis Report
SE KhNPP	Separated Entity “Khmelnitsky NPP”
SE RNPP	Separated Entity “Rivne NPP”
SE SUNPP	Separated Entity “South Ukraine NPP”
SE ZNPP	Separated Entity “Zaporizhyya NPP”
SF	Spent Fuel
SFA	Spent Fuel Assembly
SFSF	Spent Fuel Storage Facility
SLWSF	Solid and Liquid Waste Storage Facility
SIP	Shelter Implementation Plan
SISP	State Interregional Specialised Plant for Radioactive Waste Management
SNRCU	State Nuclear Regulatory Committee of Ukraine
Solid Radwaste	Solid Radioactive Waste
SPAS-88	Health and Safety Rules for Design and Operation of Nuclear Power Plants (Russian)
SPORO-85	Health and Safety Rules for Radioactive Waste Management (Russian)
SRSF	Solid Radioactive Waste Storage Facility
SSE	State Specialised Enterprise
SSE ChNPP	State Specialised Enterprise “Chornobyl NPP”
SSE Complex	State Specialised Enterprise “Complex”
SSTC NRS	State Scientific and Technical Centre for Nuclear and Radiation Safety
STC CMRW	Scientific and Technical Centre for Decontamination and Complex Management of Radioactive Waste, Material, Radiation Sources
SUNEI	Sevastopol National University for Nuclear Energy and Industry
SUNPP	Separated Entity “South Ukraine NPP”
UkrDO Radon	Ukrainian State Association “Radon”
URTC	Ukrainian Radiological Training Centre
USSE	Uniform State System for Prevention and Response to Man-Induced and Natural Emergencies
ZNPP	Separated Entity “Zaporizhyya NPP”

Section A. INTRODUCTION

The issues of safe management of spent fuel and radioactive waste, minimisation of waste generation, protection of personnel, public and the environment against their negative impact are considered as being of utmost importance for the development of nuclear technologies in Ukraine.

The Second National Report is based upon the principle of updating and supplanting information on the aspects covered by the First Report, in particular, those related to changes in national laws, legislative and regulatory documents and practices pertaining to SF and radwaste management in compliance with item e) of para. 2 of the «Guidelines Regarding the Form and Structure of National Reports» (INFCIRC/604).

For the time being a draft Energy Strategy for the period till 2030 and for further prospects is under active discussion among scientists, experts, general public and is supposed to be adopted in the near future. The Nuclear Energy Section of this Energy Strategy covers, inter alia, creation of modern infrastructure for spent fuel and radioactive waste management. It is planned that after adoption of the Energy Strategy of Ukraine appropriate strategies and state programmes will be prepared and approved for SF and radwaste management, taking into account the best practices of the Contracting Parties to the Joint Convention.

The meanwhile state policy in radwaste management is implemented through the Comprehensive Programme for Radwaste Management for 2002-2005 and till 2010, as approved by a CMU Resolution. Since measures from the Comprehensive Programme are structured depending on radwaste origin, the Second National Report describes the radwaste practices in Ukraine based on this principle.

The Second Report also describes the underlying principles of the state policy in SF and radwaste management, radwaste classification criteria, safety of SF and radwaste management and legislative and regulatory system in this area. Special attention is given to the safety assessment of the Zaporizhyya NPP dry spent fuel storage facility, safety of Chornobyl NPP decommissioning and associated safety of Chornobyl SF management, radwaste management at NPPs, management of radwaste from the exclusion zone, management of radwaste originating from use of radiation sources in medicine, science and agriculture and the Shelter-related safety issues.

SECTION A 1. BASIC CONCLUSIONS FROM FIRST REVIEW MEETING

The following aspects are considered in this Report in addition to the safety issues as identified in the First National Report of Ukraine on compliance with the obligations under the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management and as requiring further resolution:

- establishment of funds for decommissioning and spent fuel and radioactive waste management (paras B.1, B.3, H.7.);
- safety improvement:
 - spent fuel and radioactive waste management at ChNPP (paras B.2, B.4, B.5, F.3, F.4, G.1, G.5, H.1, H.5, K.1);
 - the Shelter (paras B.4, K.2);
 - management of spent fuel and radioactive waste of nuclear facilities under operation (paras B.2, B.4, G.5, H.5, K.3);
 - facilities for radwaste storage and disposal at SSE Complex (para. B.4);
 - radwaste management facilities at UkrDO Radon specialised plants (paras B.4, H.5).

Incorporation of the recommendations of the First Review Meeting is considered in the following sections of the Report:

- spent fuel management policy - B.1;
- radioactive waste management policy - B.3;
- implementation of new waste classification - B.5;
- management of specific waste (graphite) at ChNPP - K.1;
- reassessment of decommissioning policy - F.6.

Section B. POLICES AND PRACTICES (Article 32, Paragraph 1)

B.1. Policy for Spent Fuel Management

The principles of state policy in spent fuel management are identified in Article 5 of the basic nuclear Law of Ukraine “On Nuclear Energy Use and Radiation Safety” (as set forth in the appropriate FNRU section).

In February 2001, the President of Ukraine entrusted the National Academy of Sciences of Ukraine with the development of a long-term energy strategy by his Decree “On Development of Energy Strategy of Ukraine till 2030 and for Further Prospects”. This document is supposed to include contains a section devoted to the development of nuclear energy of Ukraine. The draft strategy, which was widely discussed by experts, members of Parliament, government officials and general public during 2002-2004, includes the following:

- long-term storage of Chernobyl RBMK spent fuel in dry storage facilities;
- implementation of the optimal “cost-benefit” scheme of managing spent fuel from operating NPPs;
- diversification of the management system for WWER-440 and WWER-1000 spent fuel through long-term safe storage of SF on the territory of Ukraine (over 50-100 years), including operation of the dry SFSF at ZNPP and creation of a centralised dry storage facility for WWER-440 and WWER-1000 SF, its commissioning in 2009-2010 and further operation;
- development of a strategy and technologies for SF safe management after the period of long-term storage.

On 6 May 2005 Cabinet of Ministers of Ukraine discussed prospects of the Ukrainian nuclear energy development in the context of the appropriate section of the Energy Strategy to be officially adopted in the near future. The Government supported the nuclear energy development plans proposed by the Ministry for Fuel and Energy of Ukraine.

The general coordination of the development of unified approaches to radwaste management in Ukraine rests with the Interdepartmental Commission for Implementation of the Comprehensive Programme for Radioactive Waste Management, the composition of the Commission being approved by the Government. At the meeting of the Interdepartmental Commission on 3 June 2005, it was decided to entrust the MFE, with involvement of other relevant executive bodies and the National Academy of Sciences of Ukraine to develop a draft strategy for spent fuel management. The strategy determining further management of spent fuel after its temporary storage (immediate disposal or long-term storage with subsequent processing and disposal of high-level radwaste in an appropriate repository) is to be submitted to the Cabinet of Ministers for consideration in 2006.

Article 17 of the Law of Ukraine «On Radioactive Waste Management» determines that spent fuel that is not subject to processing shall be stored, after appropriate cooling, in special spent fuel storage facilities equipped with multi-barrier confinement and protection system and with equipment for retrieval of the fuel from such a storage facility.

Parliament hearings “Perspectives for Development of Fuel Energy System in Ukraine” took place on 15 June 2005 in the Verkhovna Rada of Ukraine, where it was declared about plans to commission a centralised facility for temporary storage of spent fuel from operating WWER NPPs and develop a strategy for safe management of SF after its long-term storage.

The spent fuel management policy of Ukraine could be considered as finally determined only after approval of the «Spent Fuel Management Strategy» by the Government of Ukraine.

B.2. Practices Pertaining to Spent Fuel Management

SF management in Ukraine covers several areas:

- WWER-440 SF of the RNPP is stored in the reactor cooling ponds for not less than 5 years and then transported for processing to the Russian Federation;
- WWER-1000 SF of the KhNPP, RNPP and SUNPP is stored in the reactor cooling ponds for not less than 5 years and then is transported for interim storage and subsequent processing to the Russian Federation.
- WWER-1000 SF of the ZNPP is stored in the reactor cooling ponds for not less than 5 years and then in ventilated storage casks VSC-WWER-1000 (modernised VSC-24) of the first dry interim spent fuel storage facility at the ZNPP;
- RBMK-1000 SF of ChNPP is stored in reactors, reactor cooling ponds and pond-type storage facility for spent fuel (SFSF-1) at the Chornobyl NPP site;
- SF of the research reactor in Kiev is stored in the wet spent fuel reactor storage facility. The transport of this SF to Russia is under consideration.

The research reactor in Sevastopol currently has no spent fuel subject to the Joint Convention.

The construction of the module-type dry spent fuel storage facility (SFSF-2) was underway on the ChNPP site in the exclusion zone. This storage facility is designed to store 21356 SFA according to the NUHOMS technology and will store only SF from the Chornobyl NPP. At present, there is delay in the construction, which was caused, in particular, by inadequate consideration in the design of the specifics related to the management and storage of damaged SF and by the need for additional funding. The substantial delay in the SFSF-2 construction leads to delay in SF storage at the ChNPP site and results in a number of negative consequences for Ukraine. Delays in the construction of the new safe confinement within the SIP project may occur. Moreover, additional expenses from the budget are needed:

- each additional year for maintaining systems and equipment of the power units in the operational mode prior to transition to the decommissioning mode;
- measures intended to reassess and extend the service life of equipment and structures for storage of liquid radwaste and spent fuel in the existing buildings (the designed lifetime will expire in 2007 for the structures and equipment of unit 1, in 2008 for unit 2 and in 2016 for the existing SFSF-1).

Arrangements for the creation of the centralised dry storage facility for WWER SF were underway. This storage facility is supposed to accept 12500 WWER-1000 SFA and 4000 WWER-440 SFA during 100 years. A technical specification was developed and a tender was conducted for a “turn-key” project of the centralised SFSF (design, construction and commissioning). Feasibility study of the project and siting of the centralised SFSF will be the next steps.

B.3. Policy for Radioactive Waste Management

Basic principles of the state policy for radwaste management are set forth in Article 5 of the Law of Ukraine “On Nuclear Energy Use and Radiation Safety” and Article 3 of the Law of Ukraine “On Radioactive Waste Management” as described in the appropriate section of the FNRU.

The Comprehensive Programme for Radioactive Waste Management for 2002-2005 and for the period till 2010 is currently underway, which was approved by a CMU Resolution and is

intended for implementation of the state policy for radwaste management. Measures under the Comprehensive Programme are structured into sections depending on radwaste origin:

- management of radwaste from NPPs and radwaste resulting from decommissioning of existing NPPs;
- management of radwaste in decommissioning of nuclear facilities located at the ChNPP site and conversion of the Shelter into an ecologically safe system;
- management of the Chernobyl accident radwaste ;
- management of radwaste generated at industrial enterprises, medical, research and other institutions.

The main tasks of the Comprehensive Programme are as follows:

- develop the legislative and regulatory framework for radwaste management in all steps and improve radiation safety in radwaste management;
- improve radwaste management systems at NPPs;
- carry out activities pertaining to radwaste management in compliance with legislation and recommendations of international organisations to which Ukraine is a member;
- commission the first stage of the Vector complex for decontamination, transport, processing and disposal of radioactive waste from the territories suffered from radioactive contamination after the Chernobyl accident (henceforth – the Vector complex);
- design and construct the second stage of the Vector complex for processing and long-term storage of long-lived radwaste;
- technical re-equipment and rearrangement of the state interregional specialised plants of the Ukrainian State Association "Radon" (henceforth – the UkrDO Radon) for collection and temporary container storage of radwaste from national industrial, medical, scientific and other enterprises, institutions and organisations;
- create preconditions for dealing with disposal of high-level and long-lived radwaste;
- revise regulations related to the existing radwaste management facilities and those being commissioned in Ukraine, improve the state system for accountancy and control of radwaste movement.

After determination of the strategy for SF management, the next step would be to develop a strategy for radwaste management and a state programme for radioactive waste management for a long-term period to replace the Comprehensive Programme for Radwaste Management (during 2006-2007).

B.4. Practices Pertaining to Radioactive Waste Management

The radwaste management practices implemented in Ukraine are described in the appropriate section of the FNRU.

Additional information and safety improvement activities and measures related to radwaste management as implemented by the licensees in the reporting period are set forth below in B.4.1-B.4.5.

B.4.1. Radioactive Waste Management at Operating NPPs

In order to ensure some reserve of free capacities in the storage facilities for solid radwaste at the Rivne, Khmelnytsky and South Ukraine NPPs, additional storages were commissioned (2003).

In addition, a centrifuge for treatment of radioactive floor drains and a deep evaporation equipment were commissioned (2004) at RNPP.

B.4.2. Radioactive Waste Management at ChNPP and the Shelter

Liquid radwaste, including that from the Shelter, is collected with the ChNPP designed piping system.

High-level solid radwaste is collected into special containers, which are transported in a specialised vehicle to the HLW temporary storage facility. Such waste is stored in transport protective containers.

Low- and intermediate-level solid radwaste is collected into storage containers, which are loaded into a specialised vehicle and are transported for disposal to the Buryakivka RWDP.

Temporary storage of radwaste takes place in designed storage facilities (liquid radwaste is stored in stainless steel tanks and solid radwaste is stored in reinforced concrete tanks), which are equipped with systems for radiation monitoring, specialised ventilation, radioactive drainage, physical protection and alarms. There is a network of observation boreholes along the perimeter of the storage facilities for groundwater monitoring.

Information on management of irradiated graphite in the reactors of power units 1, 2 and 3 is provided in Section K.1.

In the reporting period:

- The building for the liquid radwaste treatment plant was erected, and equipment for the retrieval and evaporation systems, cementation system and on-site transport system is being installed.

- The construction of the industrial complex for solid radwaste management is underway, which includes:

- the retrieval facility for solid radioactive waste;
- the solid radioactive waste processing facility;
- the engineered near-surface disposal facility for low- and intermediate-level short-lived solid radwaste (on the territory of the Vector complex).

- A comprehensive engineering-radiation survey of power units 1 and 2 was carried out.

- The site was prepared for the installation of equipment for decontamination of equipment and tools.

- Equipment and devices were provided for management of high-level radwaste to be generated within the Shelter Implementation Plan.

- Low- and intermediate-level solid radwaste resulting from the work was transported to the Buryakivka RWDP.

- Specific activity and radionuclide composition of groundwater were continuously monitored at the Shelter locality. The specific activity of ^{90}Sr was in the range from $2\text{E}+3$ to $1,42\text{E}+5$ Bq/m³; ^{137}Cs - $4\text{E}+3$ ÷ $9,6\text{E}+4$ Bq/m³; ^3H - $2\text{E}+3$ ÷ $1,88\text{E}+6$ Bq/m³.

Discharges to groundwater from the Shelter were monitored in 23 boreholes and 3 observation points on the Shelter site and 15 boreholes on the adjacent territories.

The Shelter structural integrity was assessed with specific surveys, which revealed a risk of destruction of unstable structures. This risk is being dealt with a special stabilization measures under SIP.

B.4.3. Radioactive Waste Management at SSE Complex

The SSE Complex, based on a current licence, carried out in the reporting period the following activities:

- collection and transport of radwaste in the exclusion zone;
- operation of the Buryakivka RWDP, which accepted radwaste from the exclusion zone, ChNPP, waste resulting from decontamination of the Shelter rooms and other facilities of the exclusion zone for disposal according to the main acceptance criteria (dose rate limit is to 1 R/hour on the waste surface);
- monitoring of preserved RWDP - “Pidlisny” and “ChNPP Stage III” – as well as RICP that were created under extreme post-accident conditions in the exclusion zone after the Chernobyl accident;
- routine activities intended to ensure radiation safety of RWDP and RICP according to current standards and rules;
- rendering such services as radwaste confinement and decontamination of overalls, personal protection means, metal and equipment (according to production programmes under agreements with enterprises and organisations).

Environmental monitoring at places of activities associated with radwaste disposal, on the nearby territories and on the territory of the exclusion zone was conducted by the Centre for Radiation and Environmental Monitoring in the Exclusion Zone of the State Specialised Research and Production Enterprise “Chernobyl Radioecology Centre”.

B.4.4. Radioactive Waste Management at UkrDO Radon SISP

During reporting period State Interregional Specialised Plants of UkrDO Radon rendered services related to radwaste confinement; decontamination of overalls, personal protection means, metal and equipment; collected, transported, sorted and temporary stored solid radwaste¹ and spent radiation sources produced at non-nuclear enterprises.

During this period UkrDO Radon provided the management of radwaste resulting from the implementation of defence programmes, including liquidation of temporary storages.

B.4.5. Management of Radioactive Waste from Research Reactors

Solid radwaste from research reactors – such as WWR-M (NASU INR, Kyiv) and DR-100 (SUNEI, Sevastopol) – is collected in situ, sorted including issue of certificate for certain solid waste types, transported, accounted for and stored in the temporary storage facilities on the sites of the research reactors and then transported to the SISP.

Liquid radwaste is collected through the radioactive drainage system to metal tanks for temporary storage located in underground storages on site of the research reactors.

A facility for liquid radwaste processing with the method of deep evaporation and further cementation of the bottoms was commissioned on the site of the NASU INR.

During 2003-2004, 745 kg of low-level solid radwaste was transported from the NASU INR to the UkrDO Radon Kyiv SISP, including 400 kg of cemented concentrate and ion-exchange resin from the liquid radwaste processing facility. The amount of accumulated intermediate- and high-level solid radwaste has not changed.

SUNEI has no facilities for radwaste processing.

¹ including solidified liquid radwaste

B.5. Criteria Used to Define and Categorise Radioactive Waste

According to Article 1 of the Law of Ukraine «On Radioactive Waste Management», radioactive waste is defined as materials and substances activity of radionuclides or radioactive contamination of which exceeds the limits established by current standards provided that the use of these materials and substances is not envisaged.

According to the criteria for exemption from regulatory control, in compliance with Article 1 of the above law, radwaste is divided into long-lived and short-lived radioactive waste:

long-lived radioactive waste is waste for which the level of exemption from regulatory control is achieved in 300 and more years after disposal;

short-lived radioactive waste is waste for which the level of exemption from regulatory control is achieved earlier than in 300 years after disposal.

The document "Basic Sanitary Rules for Radiation Safety of Ukraine" (OSPU-2005) as approved by the Ministry of Health of Ukraine entered into force 20 May 2005. OSPU-2005 applies to all production (industrial) activities including radwaste management.

The transition to the new classification in compliance with OSPU-2005 is currently underway. During the transition period to the new classification criteria are applied as established by regulatory documents "Health and Safety Rules for Design and Operation of Nuclear Power Plants" (SPAS-88) and "Health and Safety Rules for Radioactive Waste Management" (SPORO-85).

According to OSPU-2005, radioactive waste is divided into solid and liquid. Liquid waste includes inorganic solutions; pulps of filtering material, sludge; salt fusion; organic liquids (oils, solvents).

Depending on classification purposes, all radwaste is divided into types, groups, categories and kinds.

The radwaste types based on acceptance criteria for waste disposal in near-surface (shallow) repositories or in stable deep geological formations are identified according to Table B.5.1.

Table B.5.1. Radwaste classification based on acceptance/non-acceptance criteria for disposal in various repositories

Radwaste type	Potential doses in 300 years after disposal	Types of possible exemption up to 300 years after disposal	Permissible type of radwaste disposal
Short-lived	Lower than level B	Complete, restricted	Shallow, near-surface
Long-lived	Higher than level A	Not considered	Deep stable geological formations

Note: level A corresponds to the annual dose of 50 mSv, level B to 1 mSv.

Depending on the exemption level established for this or another group of radionuclides contained in waste, all radwaste is divided into four groups (Table B.5.2).

Table B.5.2. Classification of solid radwaste by “exemption level” criterion

Radwaste group	Solid radwaste	Exemption level, kBq·kg ⁻¹
1	Transuranium alpha-emitting radionuclides	0,1
2	Alpha-emitting radionuclides (excluding transuranium)	1
3	Beta-, gamma-emitting radionuclides (excluding those from group 4)	10
4	H-3, C-14, Cl-36, Ca-45, Mn-53, Fe-55, Ni-59, Ni-63, Nb-93m, Tc-99, Cd-109, Cs-135, Pm-147, Sm-151, Tm-171, Tl-204	100

Note: if radwaste contains several radionuclides from one group, their specific activities are summed up.

Depending on specific activity, as a criterion for radwaste division into categories, three categories are introduced for solid and liquid radwaste that is not subject to retrieval (Table B.5.3).

Table B.5.3. Categories of solid and liquid radwaste by specific activity criterion

Radwaste category	Range of specific activity of solid radwaste, kBq·kg ⁻¹				Range of specific activity of liquid radwaste, in multiple units PC _B ^{ingest}
	Alpha-radionuclides		Beta-, gamma-radionuclides		
	Group 1	Group 2	Group 3	Group 4	
Low-level	$>10^{-1} \div < 10$	$>1 \div < 10^2$	$>10 \div < 10^3$	$>10^2 \div < 10^4$	$> 1 \div < 10^2$
Intermediate-level	$\geq 10 \div < 10^5$	$\geq 10^2 \div < 10^6$	$\geq 10^3 \div < 10^7$	$\geq 10^4 \div < 10^8$	$\geq 10^2 \div < 10^6$
High-level	$\geq 10^5$	$\geq 10^6$	$\geq 10^7$	$\geq 10^8$	$\geq 10^6$

Notes:

- division into groups 1- 4 corresponds to the classification by “exemption level” criterion;
- if there is mixture of waste of different categories, the category is determined for the higher component;
- the category of high-level radwaste is divided into two sub-categories:
 - “low-temperature” – high-level radwaste, which specific heat generation in places of temporary storage or disposal does not exceed $2 \text{ kW} \cdot \text{m}^{-3}$;
 - “heat-generating” – high-level radwaste, which specific heat generation constitutes $\geq 2 \text{ kW} \cdot \text{m}^{-3}$.

γ -emitting radwaste with unknown radionuclide composition and unknown specific activity can be classified (Table B.5.4) into low-, intermediate- and high-level waste by the criterion of the air absorbed dose at a distance of 0.1 m from the container surface.

Table B.5.4. Classification of radwaste with unknown radionuclide composition and unknown specific activity by criteria of air absorbed dose at distance of 0.1 m

Radwaste category	Absorbed dose rate, $\mu\text{Gy} \cdot \text{year}^{-1}$
Low-level	$>1 \div \leq 10^2$
Intermediate-level	$>10^2 \div \leq 10^4$
High-level	$>10^4$

It is permitted to classify solid and liquid radwaste based on its distribution by types of radwaste-generating technologies or types of radwaste-generating sources resulting from unplanned (e.g. emergency) conditions.

Radwaste is also classified according to the half-life of radionuclides contained in this waste:

- short-lived containing radionuclides with half-lives ≤ 10 years;
- mid-lived containing radionuclides with half-lives > 10 but ≤ 100 years;
- long-lived containing radionuclides with half-lives > 100 years.

Section C. SCOPE OF APPLICATION (Article 3)

The scope of application has not changed in the reporting period (see the appropriate section of the FNRU).

As stated in the FNRU, uranium mining waste, as well as waste resulting from mining of other minerals, is related to technologically-enhanced naturally occurring radioactive material in compliance with NRB-97 and is not declared as radioactive waste in Ukraine. However, taking into account recommendations of the Contracting Parties to the Joint Convention as set forth in the Summary Report of the President of the First Review Meeting, information on uranium mining waste in Ukraine is provided in Annex 9.

Section D. INVENTORIES AND LISTS (Article 32, Paragraph 2)

D.1. List of Spent Fuel Management Facilities Subject to This Convention, Their Location, Main Purpose and Essential Features

In Ukraine, spent fuel is generated at commercial nuclear power plants and research reactors. The list of facilities is provided in Annex 1.

In the reporting period, two WWER-1000 reactors were commissioned – one at KhNPP and one at the RNPP. Therefore, there are WWER-1000 (13 reactors) and WWER-440 (2 reactors) under operation at nuclear power plants of Ukraine. The spent fuel management systems for these reactors are similar and include handling equipment for loading and unloading the reactor and transport containers, as well as cooling ponds for spent fuel.

In the reporting period, a dry interim storage facility for WWER-1000 spent fuel was commissioned at the ZNPP. The designed capacity of the storage facility constitutes 380 storage containers. One storage container is designed to store 24 SFA. 30 storage containers VSC-WWER-1000 have been placed on the storage site. Handling equipment for loading and unloading the storage containers has been installed at all ZNPP units.

There are 3 RBMK-1000 power units at the Chernobyl NPP, where decommissioning arrangements are underway. The spent fuel management systems include handling equipment for loading and unloading the reactors and transport containers, as well as spent fuel cooling ponds used as a process system for loading and reloading the reactors and transport containers and cooling of spent fuel prior to its storage in the pond-type (wet) interim storage facility SFSF-1, which is located at the ChNPP site and designed to store 17280 SFA. After completion of the dry storage facility for ChNPP SF, all SF shall be transferred to the SFSF-2 for interim storage.

The systems for management of spent fuel from the NASU INR and SUNEI research reactors are described in the FNRU.

D.2. Inventory of Spent Fuel Subject to This Convention, That Is Being Held in Storage and Has Been Disposed Of

Pursuant to the Law «On Nuclear Energy Use and Radiation Safety», SF is accounted in compliance with the Provisions on the State System for Accountancy and Control of Nuclear Material (SSAC) as implemented by Resolution of the Cabinet of Ministers of Ukraine NO. 1525 dated 18 December 1996.

The generalized SF inventory taking into account changes for the reporting period is provided in Annex 2.

D.3. List of Radioactive Waste Management Facilities Subject to This Convention, Their Location, Main Purpose and Essential Characteristics

The general description of radwaste management facilities existing in Ukraine is provided in the FNRU.

The radwaste management facilities as of 1 July 2005 are listed in Annex 3.

D.4. Inventory of Radioactive Waste Subject to This Convention

The state system for radwaste accountancy and control is described in the appropriate section of the FNRU.

For continuous update and timely amendment of the state radwaste register and state cadastre of radwaste storage facilities in Ukraine, regular (once per three years) state inventories are taken for:

- radwaste resulting from operation and decommissioning of nuclear facilities;
- spent radiation sources from non-nuclear enterprises;
- radwaste storage facilities, including facilities for radwaste storage on production (industrial) sites.

State radwaste inventory was taken at operating NPPs, ChNPP and UkrDO Radon SISP in 2003.

The radwaste inventories as of 1 July 2005 are provided in Annex 4.

D.4.1. List of Radioactive Waste in Temporary Storage at Nuclear Fuel Cycle Facilities and Research Reactors

Annexes 4.1 – 4.3 provide information on radwaste accumulated in storage facilities located at nuclear power plants of the NNEGEC, ChNPP and research reactors as of 1 July 2005.

D.4.2. List of Radioactive Waste That Has Been Disposed Of

The Buryakivka RWDP of the SSE Complex currently accepts only low- and intermediate-level solid radwaste (Annex 4.4).

D.4.3. List of Radioactive Waste Resulting from Past Practices

Annexes 4.5 and 4.6 provide information on radwaste resulting from past practices at industrial enterprises, research, medical and other organisations, from liquidation of radwaste storage facilities of the Ministry of Defence and for the Chernobyl catastrophe. This radwaste is stored at the UkrDO Radon specialised plants and SSE Complex enterprises and is supervised by the licensees.

D.5. List of Nuclear Facilities under Decommissioning and Status of Decommissioning Activities at Those Facilities

In the reporting period, operation termination activities were underway at the ChNPP power units as planned by the “Comprehensive Programme for Chernobyl NPP Decommissioning” and programmes for termination of the operation of individual power units.

The nuclear facilities being at the stage of operation termination are listed in Annex 5.

Section E. LEGISLATIVE AND REGULATORY SYSTEM

E.1. Implementing Measures (Article 18)

A detailed description of legislative, regulatory, administrative and other measures, as required by the Joint Convention, is given in the appropriate section of the FNRU. New information is provided in the sections below.

E.2. Legislative and Regulatory Framework (Article 19)

E.2.1. National Safety Requirements and Regulations for Radiation Safety

An important law that completed the Ukrainian legislation pertaining to nuclear and radiation safety in the reporting period was the Law of Ukraine “On Settlement of Nuclear Safety Issues”, which establishes legislative and organisational provisions for funding of operation termination and decommissioning of nuclear facilities.

Another important law in the reporting period was the Law of Ukraine “On Decision Making Procedure for Siting, Design, Construction of Nuclear Facilities and Radioactive Waste Management Objects of National Value” that determines clear and transparent procedure for decision making for new facilities of national importance.

Annex 6 presents a list of regulations on NRS and other regulatory documents related to SF and radwaste management, which were implemented after the First Review Meeting of the Contracting Parties and specified requirements pertaining to safety and licensing of appropriate activities

Annex 7 lists national and international safety reports of Ukraine.

E.2.2. System of Licensing of Spent Fuel and Radioactive Waste Management Activities

The system for licensing of SF and radwaste management is described in the appropriate section of the FNRU.

In order to comply with the legislative requirements, Ukraine established a nuclear insurance pool, which entered into an agreement on insurance of civil liability for nuclear damage with the NNEGC on 27 April 2004. Therefore, the operating organisation has fulfilled the last legislative requirement to obtain operating licences for nuclear facilities. The NPP units are operated under operating licences issued by the SNRCU for each NPP site with individual conditions imposed on radwaste management.

SF and radwaste management activities are carried out under operating licences for nuclear facilities (SFSF) or radwaste storage facilities. In order to apply for a decommissioning licence, the licensee shall develop a decommissioning concept prior to expiry of the operating licence. After a decision on decommissioning is made, a decommissioning programme is developed to determine the individual decommissioning stages. The decommissioning concept and programme are agreed upon by the state regulatory bodies.

The entities that deal with radwaste management resulting from activities other than operation of nuclear facilities or radwaste storage facilities have also obtained appropriate SNRCU licences.

The enterprises that do not directly deal with radwaste but intended to provide services to entities, which are involved with radwaste management – in particular, manufacture of packages for radwaste storage and disposal, shipment packages for the transport of radioactive material – shall appropriately certify their products.

E.2.3. System of Prohibition to Operate a Spent Fuel or Radioactive Waste Management Facility without a Licence

The operation prohibition system as described in the appropriate FNRU section has not changed in the reporting period.

E.2.4. System of Appropriate Institutional Control, Regulatory Inspection and Documentation and Reporting

Institutional control of the safety in SF and radwaste management rests with relevant departments of the licensees. The institutional control involves continuous (daily) monitoring of technologies, safety-related systems and equipment, their compliance with operating documentation, standards, rules and regulations on nuclear and radiation safety.

Legislatively established requirements for submission of reports to the regulatory body by the licensees, appropriate requirements for frequency and content of the reports are set forth in the licensing conditions and regulations approved by the SNRCU.

The SNRCU undertakes state supervision over observance of nuclear and radiation safety requirements in SF and radwaste management based on Article 24 of the Law of Ukraine “On Nuclear Energy Use and Radiation Safety” in accordance with the “Procedure for State Supervision of Ensuring Safety in Nuclear Energy Use” (NP 306.2.01/1.081-2003). This document establishes:

- general principles, procedure, scope and form of state supervision by SNRCU experts and territorial state supervisory bodies;
- supervision organisation and planning;
- types and methods for preparation and conduct of regulatory inspections;
- finalisation of results and application of state supervisory materials;
- record and analysis of state supervision results.

The supervisory activity is carried out in compliance with the annual plan and also monthly plans. The latter are based on the annual plan with the purpose of detailed description of the measures and incorporation of the results from the routine safety assessment of nuclear facilities and radwaste management facilities. Unplanned inspections are conducted as well if safety drawbacks are revealed in planned inspections, or the so-called response inspections are arranged. Inspections are also conducted prior to granting licences or permits for SF and radwaste management in order to verify compliance of the applicant's information with the actual status of things and verify the applicant's capability to ensure safety of the proposed activity.

E.2.5. Enforcement of Applicable Regulations and Terms of Licences

According to the first part of Article 81 of the Law of Ukraine "On Nuclear Energy Use and Radiation Safety", violations of legislation in nuclear energy use by personnel and officials of enterprises, establishments and organisations that operate nuclear facilities or handle radiation sources or carry out any other activities pertaining to nuclear energy use and violations of this legislation by citizens are subject to disciplinary, civil, administrative and criminal liability.

According to Article 25 of the Law of Ukraine "On Nuclear Energy Use and Radiation Safety", the SNRCU is authorised to suspend or cancel a licence or permit for specific activities; restrict, suspend or terminate activities or operations, including construction (installation), commissioning or operation of structures, systems or safety-related equipment; submit official notices to the licensee regarding incompliance of some officials with the occupied position or transfer documents to law-enforcement bodies in separate cases. Pursuant to Article 82 of this Law, state nuclear regulatory bodies can apply penalty measures to organisations, establishments and enterprises which do not comply with safety standards, rules and regulations or conditions of permits.

The Law of Ukraine "On Amendment of the Code on Administrative Infringements of Ukraine" No. 1284-IV dated 18 November 2003 amended the Code on Administrative Infringements of Ukraine regarding authorities of state nuclear regulatory bodies; increase the amounts of penalties and increased the responsibility for actions taken repeatedly within the year after administrative penalty. The law entered into force on 7 June 2004.

According to Article 244-12 of the Code on Administrative Infringements of Ukraine, the state nuclear regulatory bodies consider cases of administrative infringements by individuals associated with violations of standards and rules on nuclear and radiation safety (Article 95) and also incompliance with legal requirements (prescriptions) by officials of the state nuclear regulatory bodies (Article 188-18). The chief state inspector on nuclear safety of Ukraine, his deputies and heads of state nuclear safety inspectorates on-site are authorised to consider cases of administrative infringements and apply penalty measures on behalf of the state nuclear regulatory bodies.

E.2.6. Allocation of Responsibilities of Bodies Involved in Different Steps of Spent Fuel and Radioactive Waste Management

Allocation of responsibilities, rights and obligations among all entities in nuclear energy use is one of the main principles of state policy in nuclear energy use and radiation safety according to Article 5 of the Law of Ukraine "On Nuclear Energy Use and Radiation Safety".

The Ministry for Fuel and Energy of Ukraine and Ministry of Ukraine for Emergencies and Public Protection against Consequences of Chornobyl Catastrophe are executive bodies empowered with control functions in radwaste and spent fuel management.

The MFE deals with administration and coordination of the development and implementation of spent fuel and radwaste management programmes both in the operational period of NPPs and in decommissioning of reactors and other nuclear industrial facilities prior to radwaste transfer to specialised enterprises.

The ME organises and coordinates activities of enterprises, establishments and organisations that deal with radwaste management, excluding those that are subordinated to the MFE.

Since the First Review Meeting of the Contracting Parties to the Joint Convention, responsibilities have been reallocated between central executive bodies regarding decommissioning of the Chernobyl NPP, management of ChNPP spent fuel and radioactive waste resulting from Chernobyl NPP decommissioning. According to the Decree of the President of Ukraine No. 681/2005 dated 20 April 2005 “On the Ministry of Ukraine for Emergencies and Public Protection against Consequences of Chernobyl Catastrophe”, functions of the ChNPP rest with the Ministry of Ukraine for Emergencies and Public Protection against Consequences of Chernobyl Catastrophe. The CMU Resolution No. 588 dated 15 July 2005 amended a number of governmental documents, including the Comprehensive Programme for Radioactive Waste Management in the revision of the CMU Resolution No. 2015 dated 25 December 2002 according to which the ME was responsible for radwaste management in decommissioning of nuclear facilities located at the SSE Chernobyl NPP and conversion of the Shelter into an ecologically safe system. The ChNPP was previously subordinated to the Ministry for Fuel and Energy of Ukraine and now is subordinated to the Ministry of Ukraine for Emergencies and Public Protection against Consequences of Chernobyl Catastrophe.

E.3. Regulatory Body (Article 20)

According to the Decrees of the President of Ukraine No. 1303 dated 5 December 2000 and No. 155 dated 6 March 2001, the State Nuclear Regulatory Committee of Ukraine was designated as the state nuclear regulatory body which is empowered with the implementation of the legislative and regulatory framework in compliance with Article 19 of the Joint Convention and is provided with adequate authority, competence and resources for fulfilment of its functions and responsibilities in compliance with Article 20 of the Joint Convention.

The Ministry of Health of Ukraine participates in state regulation of radiation safety according to the Statute of the Ministry as approved by the Decree of the President of Ukraine No. 918/2000 dated 24 July 2000.

In state regulation of nuclear and radiation safety, the SNRCU is independent of central executive bodies, enterprises and establishments that perform control functions in nuclear energy use and spent fuel and radioactive waste management in compliance with Article 20 of the Joint Convention.

During the last three years, the SNRCU management paid attention to improving the effectiveness and efficiency of the regulation through implementation of a quality control system.

Therefore, the SNRCU Ordinance No. 8 dated 14 January 2005 “On Organisational Measures for Implementation of SNRCU Quality Control System” approved the top-level document “SNRCU Quality Control Guideline” (QA Manual) and assigned a representative of the quality control guideline. The SNRCU quality control system is based on requirements of DSTU ISO 9000-2001. The SNRCU quality control system was implemented in the framework of appropriate TACIS projects intended to improve and strengthen the Ukrainian regulatory body. The documents of the quality control system are under development and revision based on the annual plans.

Activities of the regulatory body are funded from the state budget.

In order to enhance SNRCU staff and involve high-qualified experts, the Government of Ukraine took measures in 2005 to decrease the difference in the remuneration of labour between staff of the regulatory body and operating organisations. Subsequent increase of the remuneration to SNRCU staff starts from 1 January 2006.

Section F. OTHER GENERAL SAFETY PROVISIONS

F.1. Responsibility of Licence Holder (Article 21)

According to the national nuclear legislation, the licensee bears full responsibility for radiation protection and safety of personnel, the public and the environment at any stage of radioactive waste management. The licensee shall submit annual radiation safety reports to the regulatory body and ensure that the radwaste generation is kept to the minimum practicable. In addition to Article 11 of the Joint Convention, ALARA requirements are set forth in the Laws of Ukraine “On Nuclear Energy Use and Radiation Safety” and “On Radioactive Waste Management”.

In the event of an accident, the licensee shall, as required by Article 32 of the Law of Ukraine “On Nuclear Energy Use and Radiation Safety”, keep continuous monitoring and prognosis of radioactive release outside the spent fuel or radwaste facility and keep relevant bodies and organisations informed according to the established procedure.

Pursuant to Article 33 of this Law of Ukraine, the operating organisation submits complete and timely information on operational events at nuclear facilities or radwaste repositories according to the established procedure.

According to Articles 10, 32 and 33 of this Law of Ukraine, the licensee also responsible for keeping the population, national bodies and public organisations informed of the status of nuclear safety and radiation protection.

In compliance with Article 10 of this Law of Ukraine, the citizens of Ukraine have the right to request and obtain complete and reliable information from the operator (licensee) within their competence regarding the safety of a nuclear facility or radwaste management facility, which construction is being planned or is underway and those facilities that are in operation or under decommissioning, excluding data that constitute the state secret. To respect the rights of the citizens in compliance with this article, the operator (licensee) shall:

- periodically provide mass media with official information on radiation conditions on the territory where the indicated facilities are located and operated and also information on their safety, excluding data that constitute the state secret;

- provide the citizens of Ukraine with the possibility to visit the indicated facilities for information purposes upon their request.

SF and radwaste management in Ukraine is undertaken exceptionally by the operating organisation and the licensees.

F.2. Human and Financial Resources (Article 22)

F.2.1. Qualified Staff Needed for Safety-Related Activities During Operational Lifetime of Spent Fuel and Radioactive Waste Management Facility

In the reporting period, the training and professional development system for staff involved in spent fuel and radwaste management, which was described in the FNRU, was further developed and improved.

Qualified staff in nuclear energy are trained by the following higher educational institutions of Ukraine:

- Taras Shevchenko Kyiv National University;
- National Technical University of Ukraine “Kyiv Polytechnic Institute”;
- Odessa National Polytechnic Institute;
- Odessa State Ecological University;
- Sevastopol National University for Nuclear Energy and Industry;
- Kharkiv National University;
- Kharkiv Polytechnic Institute “National Technical University”.

The development of NPP training centres is underway as a basis of the training system. The structure and staff list have been developed taking into account peculiarities of each NPP. The centres have been provided with qualified instructors. Training equipment is under improvement. Simulators are used in NPP training centres. For example, a simulator of telemanipulator MT-200 is used for initial training and professional development of personnel who will be involved in handling operations at SFSF-2 at the ChNPP.

F.2.2. Financial Resources to Support Safety of Facilities for Spent Fuel and Radioactive Waste Management During Their Operating Lifetime and for Decommissioning

According to Articles 33 and 39 of the Law of Ukraine “On Nuclear Energy Use and Radiation Safety”, the operating organisation (NNEGC) includes the expenses for SF storage, processing, storage and disposal of radwaste, decommissioning of nuclear facilities in the net cost of electricity production. On 24 June 2004, the Verkhovna Rada (Parliament) of Ukraine adopted the Law of Ukraine “On Settlement of Nuclear Safety Issues”, which entered into force on 1 January 2005. This law determines legal and organisational provisions for funding the operation termination and decommissioning of nuclear facilities.

The Law of Ukraine “On Settlement of Nuclear Safety Issues” determines that costs shall be accumulated on a special account opened by the bank authorised by the Cabinet of Ministers of Ukraine since commissioning of the first nuclear facility.

For the implementation of this law, a number of by-laws were developed which shall be approved by the Cabinet of Ministers of Ukraine. In 2005, prior to implementation of these by-laws, money from the National Nuclear Energy Generating Company is allocated to a special fund of the state budget. The CMU Resolution No. 405 dated 26 May 2005 envisages compensation of the allocated money to the NNEGC in 2006.

According to Article 10 of this Law, costs from the financial reserve are used only for funding the development of a nuclear facility decommissioning project, for measures related to terminating operation and decommissioning under this project and for investment activity under this law. The use of costs from the special account for other purposes and any deductions from the financial reserve costs are prohibited, operations on the special account are not subject to termination.

The monitoring of the use and investment of financial reserve costs rests with the Supervisory Council established by the CMU and National Bank of Ukraine.

Adoption of such a law should be regarded as the essential achievement in creation and administration of the decommissioning fund.

Radwaste management at UkrDO Radon enterprises is funded by enterprises that transfer radwaste to the specialised plants for storage on a contractual basis and is partially funded from the state budget of Ukraine.

The management of spent fuel and radwaste from the research reactors, Chornobyl NPP and radwaste resulting from the Chornobyl accident is funded from the state budget.

F.2.3. Financial Provision for Appropriate Institutional Controls and Monitoring Arrangements for Period Following Closure of Disposal Facility

Appropriate information was provided in the FNRU.

F.3. Quality Assurance (Article 23)

In order to obtain a licence from the regulatory body, the applicant shall develop and implement a quality assurance programme as to the safety of SF and radwaste management.

General information on the quality systems at the operating organisation and licensees is set forth in the FNRU.

The effectiveness of the licensees' quality system, which shall meet the requirements of the national standard DSTU ISO 9000-2001 is verified by the regulatory body in the licence extension process and in planned inspections.

F.4. Operational Radiation Protection (Article 24)

F.4.1. Radiation Protection of Workers and Public

The legislative framework for regulating radiation protection of personnel and the public is described in the appropriate section of the FNRU.

Regulatory documents are developed by the state nuclear regulatory bodies (SNRCU, Ministry of Health of Ukraine) taking into account international experience, contemporary tendencies and approaches to regulation and protection against exposure and the IAEA and ICRP recommendations.

State health and safety standards named "Radiation Safety Standards of Ukraine" (NRBU-97), which are obligatory, establish the following limits of the individual effective dose

Table F.4.1.1. Dose limits mSv per year

	Category of exposed persons		
	A ^{a) cb)}	B ^{a)}	C ^{a)}
DL_E (limit of an effective dose)	20 ^{c)}	2	1
Limits of an equivalent dose of external exposure:			
- DL_{lens} (for lens)	150	15	15
- DL_{skin} (for skin)	500	50	50
- DL_{extrim} (for hands and feet)	500	50	-

The notices:

- a) - the distribution of dose during a calendar year is not regulated;
- b) - for the women childbearing age (till 45 years) and for the pregnant women the limitations of article 5.6 of NRBU-97 are in force;
- c) - average for any successive 5 years, but no more than 50 mSv for separate year.

In order to ensure radiation protection of the public, dose limit quotas are established for discharges and releases, which constitute 80 $\mu\text{Sv}/\text{year}$ for nuclear facilities and 40 $\mu\text{Sv}/\text{year}$ for operated radioactive waste management facilities. Based on the dose limit quota for each facility, permissible discharges and releases are determined, exceeding of which is not permitted in normal operation.

In the reporting period, Ukraine is in the process of implementation of a new regulatory document – OSPU-2005 (Basic Sanitary Rules for Radiation Safety of Ukraine). The document entered into force in May 2005. OSPU-2005 applies to all activities pertaining to nuclear energy use, including radwaste and spent fuel management, and also to all intervention situations under which people can be exposed to radiation at work and/or at home from any natural and/or artificial sources.

Based on radiation monitoring (radiation monitoring is described in detail in the FNRU) at the radwaste and spent fuel management facilities for 2001-2004, the following can be concluded:

- the reference levels of individual equivalent doses for personnel of categories A and B were not exceeded in the reporting period;
- the reference levels of radionuclide concentrations in the air of working areas were not exceeded at any enterprise;
- the radiation safety of category C individuals (the public) living nearby the associated enterprises met the standards and rules in force.

Efficient protection of individuals, society and the environment is ensured through observance of regulatory requirements for NRS. These requirements are developed according to the criteria and standards approved by the IAEA and other international organisations on nuclear energy.

F.4.1.1. Application of ALARA Principle

The Law of Ukraine «On Nuclear Energy Use and Radiation Safety» and NRBU-97 defines the optimisation principle as one of the main principles of radiation protection. The optimisation principle obliges the licensee to reduce routine exposure to personnel and the public, including collective doses, and also the probability of critical events and potential exposure as low as reasonably achievable, social and economic factors being taken into account.

The SNRCU introduces requirements to implement the optimisation principle into specific terms of the licences. Implementation of the optimisation principle is also a part of the enterprise quality assurance programme to be submitted for licensing of activities related to nuclear energy.

The optimisation principle is implemented through a number of administrative, organisational and technical measures intended to decrease individual and collective doses to personnel, minimise discharges and releases and improve the radiation monitoring system.

The main tools for optimisation of radiation protection in Ukraine are as follows:

- use of reference levels (RL) for personnel exposure and RL for discharges and releases;
- use of administrative-technological levels for discharges and releases (investigation levels) to be 2-3 times lower than RL for additional monitoring of process modes of equipment at each NPP;

- improvement of monitoring system devices and methodological, metrological software and support;

- implementation of a quality system for radiation protection.

In terms of ALARA application, NPP introduced dose limits for each department based on justification of the dose prediction during scheduled repairs (outages).

F 4.1.2. Observation of Basic Dose Limits

The analysis of individual doses of personnel of the Ukrainian NPPs shows that most of the NPP personnel receive doses less than 10 mSv per year and the percentage of NPP personnel that receive doses from 15 mSv to 20 mSv does not exceed 1.4 %. The majority of UkrDO Radon personnel receive doses less than 5 mSv per year. The average individual dose at SSE Complex enterprises as located in the exclusion zone did not exceed 2 mSv per year (the dynamics of average annual individual doses to SSE Complex personnel are shown in Annex 8 Figure 8 L 8.1).

The average individual doses to personnel of NPP departments that deal with operation of radwaste management facilities constituted 1,3-2,5 mSv/year and 0,2-0,8 mSv/year for decontamination and radwaste processing shops and chemical shops respectively in 2004.

Annex 8 Figure L 8.2 shows indicators of collective doses to personnel in operations associated with storage of spent fuel in the ZNPP SFSF for the period from 2001 to 2004.

In practice, the doses to critical groups of the public are less than the dose quota. Based on the dose limit quota for the public, permissible discharges and releases are established and may not be exceeded under normal operation.

F.4.1.3. Prevention of Unplanned and Uncontrolled Releases of Radioactive Materials into Environment

The requirements and measures for prevention of unplanned and uncontrolled discharges and releases of radioactive materials into the environment were provided in the FNRU.

F.4.2. Limitation of Discharges and Releases

In addition to the information provided in the FNRU, it should be noted, that the reference discharges and releases of operating nuclear facilities, including spent fuel storage facilities and radwaste incineration facilities, were not exceeded in the reporting period. The technologies for radwaste storage and disposal at other enterprises operating in 2001-2004 do not provide for radioactive discharges and releases into the environment. Annex 8 shows the dynamics of discharges and releases from Ukrainian NPPs for the period from 2001 to 2004 (Figures L.8.3.-L.8.10.).

F.4.3. Corrective Measures to Control Unplanned or Uncontrolled Release of Radioactive Materials into Environment and Mitigation of Its Effects

Detailed information on this aspect was provided in Section F.4.3 of the FNRU.

F.5. Emergency Preparedness (Article 25)

F.5.1. On-site and Off-site Emergency Plans. Testing of Emergency Plans

Detailed information on the Ukrainian system for emergency preparedness and response in the event of nuclear and radiation accident was provided in the appropriate section of the FNRU.

The improvement of the system was underway in the reporting period.

The regulation named «Provisions on Planning of Measures and Actions in the Event of Accidents in Radioactive Material Transport» entered into force on 1 June 2005 (as approved by SNRCU Ordinance No. 38 dated 7 April 2005 and registered in the Ministry of Justice No. 431/10711 dated 22 April 2005).

In order to fulfil Resolution of the Cabinet of Ministers of Ukraine No. 122 dated 7 February 2001 “On Comprehensive Measures for Efficient Implementation of State Policy in Protection of Population and Territories against Man-Made and Natural Emergencies, Prevention and Immediate Response to Them till 2005”, the SNRCU developed a plan of response to radiation accidents (hereinafter – the Plan). The Plan was approved by Joint Ordinance of the SNRCU and ME No. 87/211 of 17 May 2004 and registered in the Ministry of Justice of Ukraine, reg. No. 720/9319 of 10 June 2004. The Plan is intended for coordinated efficient response of control bodies, means and forces of functional and territorial subsystems of the Uniform State System for Prevention and Response to Man-Induced and Natural Emergencies (henceforth – the USSE) in the event of a threat or occurrence of a radiation accident. The Plan was developed taking into account the IAEA recommendations on the basis of the plan of response to state emergencies as approved by the Resolution of the Cabinet of Ministers of Ukraine No. 1567 dated 16 November 2001 as regards radiation accidents. The Plan was developed to provide the USSE with an individual top-level regulatory document to govern aspects of emergency planning and response to radiation accidents and to harmonise the regulatory and legal framework on emergency response in force in Ukraine with the current European Union framework through incorporation of universally accepted IAEA recommendations.

In 2004, the SNRCU considered and agreed the “Standard Plan of Response to Accidents and Emergencies at Ukrainian NPPs” as developed by the NNEGC instead of the old standard plan for personnel protection. Based on the new standard plan, appropriate response plans of NPPs and NNEGC emergency technical centre were developed.

In order to train NPP personnel in emergency conditions, improve their knowledge and skills in accident confinement and mitigation and also test emergency response plans, full-scale common-plant emergency exercises are arranged.

F.5.2. Preparation and Testing of Emergency Plans in Ukraine As Can Be Affected in Radiological Emergency at Spent Fuel or Radioactive Waste Management Facility in Vicinity of Its Territory

According to the “Provisions on Notification and Communication in case of Emergencies”, the Ukrainian notification system is integrated into the unified national communication system.

Taking into account recommendations of the IAEA guideline EPR-ENATOM-2000 regarding distribution of functions among competent national bodies and communication points in terms of the “Convention on Early Notification of a Nuclear Accident” and the “Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency”, the CMU adopted the Resolution No. 1570 dated 2 October 2003 “On Designation of Competent National Bodies

Regarding Fulfilment of International Conventions on Nuclear Energy Use". According to this Resolution, the SNRCU performs functions of a unified competent national communication point with 24-hour duty and also functions of a competent national body for international information exchange. The ME performs functions of a competent national body and is authorised to send and receive requests for assistance in the event of a nuclear and radiation accident and receive proposals on assistance.

In order to fulfil the above CMU Resolution and further improve cooperation between the ME and SNRCU in notification of emergencies, joint Ordinance No. 154/487 was issued on 9 December 2003 to establish a procedure of interaction between the duty services of the ME and SNRCU in the occurrence or threat of an emergency.

In addition to the indicated international conventions, the SNRCU is responsible for the fulfilment of intergovernmental agreements with other countries, which provide for mutual early notification and further information exchange in the event of a nuclear accident or radiological emergency. In 2003, appropriate resolutions of the Cabinet of Ministers approved two such agreements: one between the Cabinet of Ministers of Ukraine and the Government of Bulgaria No. 1308 dated 20 August 2003 and the other between the Cabinet of Ministers of Ukraine and the Government of Latvia No. 1309 dated 20 August 2003. Therefore, as of 1 July 2004, Ukraine concluded and implemented 12 such agreements: with Sweden, Turkey, Byelorussia, Slovakia, Hungary, Finland, Norway, Poland, Germany, Austria, Bulgaria and Latvia. In September 2004, an agreement with Romania was signed, and internal procedures are underway to implement the agreement. In order to fulfil these agreements, SNRCU IEC personnel periodically tests communication with competent points of the above countries.

In order to test communication between its own emergency centre and competent organisations in terms of the above conventions, the IAEA conducts periodic emergency exercises ConvEx. The SNRCU IEC participated in two such exercises in 2003, in four in 2004 and in five from the beginning of 2005. The largest of them was the ConvEx-3 exercise conducted by the IAEA on 11-12 May 2005 according to the scenario of an accident at the Cernavoda NPP in Romania. More than 60 IAEA member states and 7 international organisations were involved in ConvEx-3. The SNRCU, Ministry of Health and services of the Ukrainian Hydrometeorological Centre took part in the exercise from Ukraine. In the exercise, Ukrainian organisations tested mechanisms of interaction in the event of a nuclear or radiation accident outside Ukraine with a threat of contamination of its territory. Experts of the SNRCU IEC and SSTC NRS analysed on-line data, evaluated the situation taking into account the actual meteorological data provided by the Ukrainian Hydrometeorological Centre. Conclusions were immediately submitted to the ME for evaluation of the situation and making decisions on appropriate measures for protection of the public and territories. Based on the exercise ConvEx-3, the participant organisations developed measures to eliminate the drawbacks and further improve the emergency preparedness and response system. At the international level, results of the exercise were considered at the meeting of representatives of the national competent bodies in the IAEA Headquarters in July 2005.

The emergency response system is ready for response to emergencies in other states with a threat of radiation impact on the territory of Ukraine.

F.6. Decommissioning (Article 26)

As stated in the FNRU, three RBMK units are being decommissioned at the ChNPP prior to expiration of their design service life. ChNPP Unit 4 which was destroyed in the beyond design-basis accident (the Shelter) is being converted into an ecologically safe system.

The design service life of the first three power units at the Ukrainian NPPs will expire after 2010 (RNPP-1, WWER-420/213 – December 2010; RNPP-2, WWER-420/213 – December 2011, SUNPP-1, WWER-1000/302 – December 2012). The service life of other 10 WWER-1000 units will expire within 2014-2025. The design service life of two new WWER-1000 units (Khmelnitsky Unit 2 and Rivne Unit 4) will expire in 2034.

Current regulations provide for the development of conceptual and programme documents on decommissioning of nuclear facilities at different life cycle stages.

The NNEGC developed the “Concept for Decommissioning of Operating Nuclear Power Plants of Ukraine”, which was implemented by the MFE Ordinance No. 249 dated 12 May 2004.

In order to fulfil specific conditions of the decommissioning licence issued by the SNRCU to the ChNPP (Series EO No. 000040), the “Concept for Chernobyl NPP Decommissioning” was developed and implemented (on 11 October 2004).

The objective of the Concept is to identify a preferable solution for ChNPP decommissioning taking into account current regulatory requirements; comprehensive engineering and radiation surveys of ChNPP units; the status of construction of decommissioning facilities.

According to the objective, tasks of the Concept are as follows:

- determine the final objective of ChNPP decommissioning taking into account peculiarities of the power units and the exclusion zone;
- justify the selection of the optimal solution to ChNPP decommissioning;
- determine the general structure of expenses and resources for ChNPP decommissioning;
- develop an outline plan for implementation of the option selected in the Concept;
- justify the main provisions of the decommissioning strategy (as regards decommissioning procedure, sequence and basic content of the decommissioning stages).

ChNPP routine decommissioning activities were planned on the basis of the "Comprehensive Programme for Chernobyl NPP Decommissioning" (approved by CMU Resolution No. 1747 dated 29 November 2000). Since the "Comprehensive Programme for Chernobyl NPP Decommissioning" is going to be revised, the ChNPP developed a draft document containing a detailed description of tasks and measures for 2006-2010 and covering ChNPP decommissioning activities, implementation of the Shelter Implementation Plan and social aspects associated with this activity.

The objective of the revised Comprehensive Programme is the extensive resolution of issues associated with Chernobyl NPP decommissioning and the Shelter conversion into an ecologically safe system.

In order to achieve this objective, the draft Comprehensive Programme for Chernobyl NPP Decommissioning determines:

- the content and sequence of measures related to Chernobyl NPP decommissioning and the Shelter conversion into an ecologically safe system;
- aspects of radwaste management;
- the scope of financial expenses, human resources and funding sources.

At present, the revised draft Comprehensive Programme is under co-ordination at relevant ministries of Ukraine.

F.6.1. Ensuring Qualified Staff and Adequate Financial Resources for Decommissioning

In the reporting period, measures were taken to provide qualified staff and adequate financial resources for decommissioning.

In the preparation of the report, the number of personnel at the SSE Chernobyl NPP constituted approximately 2500 people, so there is no deficit of personnel for ChNPP decommissioning. The main task is to retrain personnel for decommissioning of Units 1-3 and ensure operation of new decommissioning facilities. This is resolved through training of personnel at the ChNPP Training Centre, which educational basis is under continuous extension and improvement.

The personnel training programme constitutes a part of the Chernobyl NPP work programme. It is intended to satisfy the needs for personnel of certain qualifications. This programme includes the whole range of personnel training for the ChNPP – from briefings before admission to work to training for new professions. For example, there is a manipulator in the Training Centre to train personnel in operations with spent fuel at the SFSF-2. In 2004, two training buildings of this centre were commissioned: a training building on the Shelter site and a training building in Slavutich. In order to improve safety of the Shelter activities, personnel involved in the SIP are undergoing extensive training, also including subcontract personnel.

The legal and organisational provisions for funding of operation termination and decommissioning of nuclear facilities are described in Section F.2.2 of this Report.

F.6.2. Operational Radiation Protection, Minimisation of Discharges, Unplanned and Uncontrolled Releases

According to the current regulatory framework, radiation protection of personnel, the public and the environment throughout the decommissioning period is ensured by licensee. Monitoring procedure includes continuous monitoring of discharges and releases with stationary systems and laboratory for radiation-ecological monitoring. Dose limit quotas for the air and water dose pathways for the public in decommissioning (under normal operation and incidents) do not differ from quotas for normal operation.

In the reporting period, the ChNPP developed and implemented the following documents:

- Provisions on radiation protection at the ChNPP;
- Programme of Chernobyl NPP radiation protection at the stage of the final closure (implemented on 17 November 2004);
- Programme for the Shelter radiation protection.

In 2004, the limits were revised for permissible releases of radioactive materials to the atmosphere and permissible discharges to water bodies based on the effective dose limit quota for the Chernobyl NPP and the value of 40 $\mu\text{Sv}/\text{year}$ for inhalation intake and 10 $\mu\text{Sv}/\text{year}$ for ingestion intake. The relevant documents were agreed by the Ministry of Health of Ukraine. The reference levels for discharges of radionuclides with drain waters and releases to the atmosphere do not exceed 70% of the permissible levels.

After termination of Unit 3 operation, the permissible annual dose to personnel of 20 mSv/year and the reference level of the individual dose to personnel of 17 mSv/year were not exceeded.

Since the Chernobyl power units are not in operation and are in the decommissioning process, radioactive releases to the environment contain only long-lived radionuclides, which average daily release constituted, in particular in 2004, 152 kBq/day , this is approximately 1% of the reference level for releases of long-lived radionuclides at the ChNPP.

In the reporting period, radioactive discharges to open water bodies were absent. Discharges of radioactive materials to the cooling pond constituted only residual accident contamination drains, which were discharged through the industrial storm sewage system with monitoring of activity concentration of radionuclides.

Permissible concentrations and reference levels were not exceeded.

F.6.3. Emergency Preparedness

According to the decommissioning licence (series EO No. 00040 of 22 March 2001), the ChNPP revised the "Personnel Protection Plan" in the reporting period. The revision of the "ChNPP Plan of Response to Accidents and Emergencies" was developed. The document passed the appropriate agreement procedure and is being implemented at the Chornobyl NPP.

In order to ensure emergency preparedness in accordance with the document "General Requirements for Ensuring Safety in the Course of Decommissioning", joint use by ChNPP and NNEGC of the off-site emergency centre of the NNEGC is planned.

F.6.4. Records of Information Important to Decommissioning

The ChNPP has an archive of design and operational documentation significant for decommissioning. The available information is put in a systematic order. According to the Law of Ukraine "On Insurance Fund of Ukrainian Documentation" No. 2332 dated 22 March 2001, the "Programme for Establishment of Insurance Fund of Documentation on ChNPP Facilities for 2005-2007" and "Programme for Bringing the Design Documentation on ChNPP Facilities into Compliance with the Actual State of Facilities and Regulatory Requirements of the Insurance Fund of Documentation for 2005-2007" were agreed and approved by the Minister for Fuel and Energy of Ukraine. The "Programme of ChNPP Activities for 2005» includes creation of the insurance fund of ChNPP documentation according to the above documents.

In order to collect additional information, the Chornobyl NPP conducts comprehensive engineering and radiation surveys and specialised investigations of equipment (first of all, reactor structures) and structures of power units. Comprehensive engineering and radiation surveys at power units 1, 2, 3 have been completed at the Chornobyl NPP. The surveys of units 1 and 2 were conducted during 1998-2002. The comprehensive engineering and radiation survey of unit 3 was conducted from September 2003 to June 2005. 125 working programmes were developed for comprehensive engineering and radiation surveys for the main types of equipment, and such surveys were carried out on equipment, piping, civil engineering structures and structural components in situ, and 137 reports were prepared with the results of surveys of individual systems and equipment items. Based on these reports, the "Summary Report on Comprehensive Engineering and Radiation Surveys" was prepared and approved on 21 June 2005. The programme of comprehensive survey of the Chornobyl NPP reactors is underway, according to which metal structures and structural components of the unit 2 reactor, which core is free of nuclear fuel are being examined. This work is carried out to obtain reliable information on the reactor status and evaluate the residual service life of metal structures. Since 2003, samples were taken and fuel channels, reflector cooling channels, metal structures of the scheme "E" (upper and lower plates, serpentinite), graphite GR-125 and GR-280 were examined. The work under this programme is going to be completed in 2008.

The data obtained in the comprehensive engineering and radiation surveys represent the input information for developing programmes and projects of decommissioning activities and permit essential reduce of expenses and doses for operation termination and decommissioning of the Chornobyl NPP units.

The NNEGC currently develops an enterprise standard to determine requirements for the structure, procedure for collection, processing and storage of information needed for decommissioning of NPP units. The document is going to be implemented by the end of 2005.

Section G. SAFETY OF SPENT FUEL MANAGEMENT

G.1. General Safety Requirements (Article 4)

As stated in the FNRU, general safety requirements at all stages of spent fuel management are established by the Laws of Ukraine “On Nuclear Energy Use and Radiation Safety” and “Permissible Activity in Nuclear Energy Use”.

The design principles, requirements and rules for SF management are established by regulations that cover issues of sent fuel management at NPP sites and units, research reactors and interim SFSF. Taking into account regulations accepted in the reporting period, these documents are as follows:

- “General Provisions for Safety Assurance of Nuclear Power Plants” (NP 306.1.02/1.034-00);
- «Rules for Nuclear Safety of Research Reactors» (PBYa-02-78);
- «Safety Rules for Nuclear Fuel Storage and Transport at Nuclear Power Facilities» (PNAE G-14-029-91);
- «Basic Safety Rules for Dry Interim Spent Fuel Storage Facilities» (NP 306.2.105-2004);
- «Recommendations on the Structure and Content of the Safety Analysis Report for Spent Fuel Storage Facilities» (RD 306.8.02/2.067-2003);
- «Requirements for Modifications of Nuclear Facilities and Procedure of Their Safety Assessment» (NP 306.2.106-2004).

G.1.1. Criticality and Residual Heat Removal

According to the requirements of the above regulations, the effective neutron multiplication factor in SF management shall not exceed 0.95 in normal operation and design-basis accidents to be ensured by appropriate characteristics of the facilities. Subcriticality in SF storage is ensured by limitation of the FA layout pitch; fuel burnup control (if burnup is used as a parameter in nuclear safety justification); use of heterogeneous and homogenous absorbers and control of their absorbing capabilities; monitoring of the presence, status and composition of the cooling media in dry storage facilities; monitoring of process parameters of the SF management systems. According to the document «Basic Safety Rules for Dry Interim Spent Fuel Storage Facilities» (NP 306.2.105-2004), subcriticality in dry interim SFSF shall be mainly ensured by the SF location geometry.

The design of spent fuel management systems provides for systems for residual heat removal and appropriate chemical composition of the heat-removing media to prevent increase of fuel cladding temperature and uncontrolled level of corrosion greater than the design values for normal operation and design-basis accidents. For facilities where SF is stored in water (reactor cooling pond, interim pond-type storage facility for ChNPP SF), devices and systems are provided for supply, treatment and cooling of water, ventilation, monitoring of radioactivity, temperature, level, chemical composition of water and, if necessary, hydrogen concentration.

G.1.2. Minimisation of Radioactive Waste Generation

The requirements for minimisation of radioactive waste generation associated with spent fuel management have not changed in the reporting period (see Section G.1.2 of the FNRU). According to the current document «Basic Safety Rules for Dry Interim Spent Fuel Storage Facilities» (NP 306.2.105-2004), the operating organisation shall develop a radwaste management programme to determine measures on minimisation of radwaste generation and ensure safety during radwaste collection, sorting, processing, storage and transfer for disposal.

G.1.3. Interdependencies Among Different Steps in Spent Fuel Management

The requirements for interdependencies between different steps in SF management have not changed. The approaches adopted in Ukraine are reflected in Section G.1.3 of the FNRU.

G.1.4. Radiation Protection of Personnel, Public and Environment

The radiation protection system of Ukraine is described in Section F.4 of this Report.

G.1.5. Biological, Chemical and Other Risks

Biological, chemical and other risks that can be associated with SF management shall be taken into account in safety analysis and assessment of SF management facilities. Information on such risks is provided in accordance with RD 306.8.02/2.067-2003 «Recommendations on the Structure and Content of the Safety Analysis Report on Spent Fuel Storage Facilities». In compliance with the document “Procedure for Approval of Investment Programmes and Construction Designs and Their Comprehensive State Review” as approved by the CMU Resolution No. 438 dated 11 April 2002, assessment of biological, chemical and other risks is also carried out within the comprehensive state review.

G.1.6. Avoiding Reasonably Predictable Impacts on Future Generations Greater Than Those for Current Generation

Protection of future generations is considered in the safety analysis reports for SF management facilities, which should demonstrate that future protection of the public and personnel will not be lower than that at the beginning of operation. If necessary, processes are inside the containment and degradation of fuel claddings and SFSF components are researched during operation with the purpose of taking timely corrective measures (if needed).

G.1.7. Avoiding Undue Burdens on Future Generations

The policy of avoiding undue burdens on future generations is implemented in accordance with the Law of Ukraine “On Nuclear Energy Use and Radiation Safety”. It envisages the reduction of risk associated with nuclear energy use through developing and implementing safety improvement measures at appropriate facilities and reducing financial burden in decommissioning by creation and replenishment of decommissioning and radwaste management funds. In the reporting period, Ukraine started to establish the decommissioning fund in compliance with the Law of Ukraine “On Settlement of Nuclear Safety Issues” of 24 June 2004.

G.2. Existing Facilities (Article 5)

SF management in Ukraine is carried out at facilities listed in Annex 1.

G.2.1. Spent Fuel Management at Nuclear Power Plants

As stated in the FNRU, principal drawbacks, which would require modernisation of the SF management systems at NPP were not revealed in the safety verification at the Ukrainian NPPs. However, measures associated with SF management safety were taken. Modernisation of the fuel cladding integrity monitoring system was started at the Rivne and Zaporizhyya NPPs. This modernisation is intended to implement a sipping system for efficient monitoring of fuel cladding integrity. This monitoring will take place directly in the refuelling process and will include sampling from the refuelling machine rod.

G.2.2. ZNPP Dry Spent Fuel Storage Facility

In the reporting period, the Zaporizhyya NPP SFSF was commissioned, and it is now in the commercial operation. The results of the pilot operation provided by the operating organisation demonstrate that the SFSF complies with safety criteria set forth in the SFSF SAR and licensing conditions for ZNPP SFSF. In the SFSF commissioning process, compliance of the SFSF design with basic safety principles and standards and rules on nuclear and radiation safety was confirmed. SFSF pilot operation showed that all SFSF systems properly perform their functions.

Taking into account operating experience and considering components of domestic production, the ZNPP SFSF design was adopted. At present, ventilation concrete casks and multiplace sealed baskets for SF storage are manufactured solely at the Ukrainian enterprises, using local materials. The safety of the ZNPP SFSF design changes was properly justified in appropriate technical decisions, which were reviewed and agreed by the SNRCU.

Starting from the 14th container, all subsequent ZNPP SFSF containers were loaded with use of the burnup credit method. The method was tried and implemented in Ukraine for spent fuel management for the first time on the basis of the technical decision agreed by the SNRCU “On Use of WWER-1000 Nuclear Fuel Burnup as Nuclear Safety Parameter in ZNPP SFSF VSB Fuel Loadings (Trial Commercial Operation)”. Based on the experience in this method, a technical decision was agreed in December 2004 for use of the nuclear fuel burnup credit method in commercial operation.

Since in case of full SFSF loading, the design-basis dose rate on-site can be exceeded, the construction of a protective wall was planned. Design of the protective wall along the SFSF site perimeter and amendments to the safety justification were developed in the reporting period. All ZNPP SFSF design changes (that are properly justified in appropriate technical decisions) will be properly included in the SAR in its next revision. The protective wall is currently under construction.

G.2.3. ChNPP Spent Fuel Storage Facility

The pond-type storage facility (SFSF-1) for RBMK-1000 spent fuel located on the Chernobyl NPP site has been in operation since 1986. The designed term of its operation expires in 2016. As stated in the FNRU, this storage facility does not fully meet the requirements of current standards and rules on nuclear and radiation safety, though a number of measures were taken to compensate for safety drawbacks (the SFSF-1 ventilation system and monitoring and control system were upgraded).

Supply of spent fuel to the SFSF-1 has been terminated. After SFSF-2 at the Chernobyl NPP has been constructed and a commissioning licence has been granted, SF from SFSF-1 will be transferred to SFSF-2 for storage.

The ChNPP is preparing for SFSF-1 reconstruction in order to transfer the SFA to SFSF-2 for further storage and timely SFSF-1 preparation for decommissioning. The ChNPP currently develops an appropriate conceptual decision with the purpose of comprehensive safety justification of the reconstruction.

G.2.4. Spent Fuel Storage Facility of NASU INR

The safety of SF management on the NASU INR site is justified in the Technical Safety Substantiation for the research reactor WWR-M agreed by the SNRCU. SF is stored in the reactor pond with demineralised water ensuring biological shielding and heat removal from the SFA by convection. The required water quality in the pond is maintained by the ion-exchange filter. The SFA are placed in the pond in two layers. The subcriticality is ensured by the SFA layout pitch in the pond and by boron carbide absorbers. Modernization of the spent fuel management system is underway at the research reactor site in order to make this system more flexible, reliable, safe and cost-efficient. A package of documents justifying the safety of the SF management system modernisation at the research reactor was considered and agreed by the SNRCU. A tender is going to be conducted in the near future to identify the contractor for modernisation of the SF management system.

G.2.5. Spent Fuel Management at SUNEI

Spent fuel as defined by the Joint Convention is currently absent on the site of the Sevastopol University. If spent fuel was present there it would have been stored in the wet reactor storage facility for spent fuel.

G.3. Siting of Proposed Facilities (Article 6)

G.3.1. Evaluation of Site-Related Factors Likely to Affect Safety of Facility During Its Operating Lifetime

In the reporting period, the requirements for site-related factors that can affect safety of the facility during its service life have not changed. The information provided in Section G.3.1 of the FNRU is valid at the present moment.

G.3.2. Evaluation of Likely Safety Impact of Facility on Individuals, Society and Environment

The information provided in the FNRU is valid at the present moment.

G.3.3. Making Information on Facility Safety Available to Members of Public

As stated in the FNRU, current legislation provides for public hearings devoted to nuclear energy use and radiation safety. The associated procedure is determined by the Resolution of the Cabinet of Ministers of Ukraine "On Approval of Procedure for Public Hearings on Nuclear Energy Use and Radiation Safety" No. 1122 dated 18 July 1998. The main objective of the public hearings on nuclear energy use and radiation safety is to respect the rights of citizens and public organisations for involvement in the discussion on siting, design, construction, operation and decommissioning of nuclear facilities, enterprises for uranium ore mining and milling and facilities for management of radioactive waste, radiation sources etc.

During public hearings and public consultations, the main design aspects are subject to a detailed and independent analysis by the interested audience. Taking into account comments of the public, additional measures are identified to protect public and the environment etc. This builds confidence in the fact that any potential negative impact on the environment will be minimised.

The public hearings conducted to fulfil the order of the President of Ukraine «On Informing the Public on the SFSF» No. 1-14/1559 of 11 December 2000 regarding the construction and commissioning of the ZNPP SFSF in Energodar, Marganets and Nikopol can be set as an example of keeping the public informed and taking into account public opinion in decision making.

The public comments as incorporated by the NNEGC included those related to the compensation of a potential risk for the people living in the region adjacent to the Zaporizhya NPP. According to current legislation, this issue was raised before the NNEGC management and state bodies in preparing the Certificate of SFSF Zaporizhya NPP acceptance to operation of the State Acceptance Commission. The Cabinet of Ministers of Ukraine accepted Resolution No. 282 of 13 December 2002 to establish the source and mechanism for funding the completion and commissioning of social infrastructure facilities in Energodar, satellite town of the Zaporizhya NPP. According to the Resolution, life-supporting objects of the town infrastructure are funded as determined by resolutions of the sessions of the Energodar municipal council.

For informing the public on ZNPP SFSF safety:

- regular publications on the SFSF are issued in regional mass media and regular information is provided on the local TV channel;
- lectures and visits are regularly arranged for students and inhabitants of the 30-km zone: Nikopol, Marganets, Kamianka-Dniprovskia etc.;
- a booklet on the SFSF has been prepared, copied and distributed. Each visitor of the ZNPP information centre receives a booklet and brochure titled «Zaporizhya NP and the Environment».

In order to establish and maintain a systematic dialogue with the public and increase the role of the public opinion in the decision-making process and coordination of measures related to public consultations as to formation and implementation of the state policy in nuclear and radiations safety, the public board was established by the SNRCU by Ordinance No. 84 on 10 August 2005. The public board includes representatives of ecological public organisations, political parties, mass media, professional bodies, scientific establishments and institutions.

In accordance with the newly adopted Law of Ukraine "On Decision Making Procedure for Siting, Design, Construction of Nuclear Facilities and Radioactive Waste Management Objects of National Value" the public consultation, including local referendum, is an obligatory part of decision making process.

G.3.4. Consulting Contracting Parties in Vicinity of Facility

In the reporting period, the requirements for the procedures for consulting the neighbouring states have not changed. The information provided in Section G.3.4 of the FNRU is still valid. Information on the site for the centralised storage facility for WWER spent fuel will be provided to any Contracting Party to the Convention upon request.

In accordance with the newly adopted Law of Ukraine “On Decision Making Procedure for Siting, Design, Construction of Nuclear Facilities and Radioactive Waste Management Objects of National Value” the consultation with Contracting Parties in the vicinity of facility is an obligatory part of decision making process.

G.4. Design and Construction of Facilities (Article 7)

G.4.1. Limitation of Possible Radiological Impact of Spent Fuel Management Facilities

In the reporting period, the requirements for limitation of possible radiological impact on SF management facilities have not changed (see Section G.4.1 of the FNRU). In order to limit possible radiological impact from the Zaporizhyya NPP DSFSF, a protective wall is under construction (see Section G.2.2).

G.4.2. Conceptual Plans and Technical Provisions for Decommissioning of Spent Fuel Management Facilities

Requirements for consideration of future decommissioning needs in the design are established in Article 42 of the Law of Ukraine “On Nuclear Energy Use and Radiation Safety” and in the document «Basic Safety Rules for Dry Interim Spent Fuel Storage Facilities» (NP 306.2.105-2004), which was implemented in the reporting period. Information on conceptual plans for decommissioning of the ZNPP DSFSF and ChNPP SFSF-2 is provided in Section G.4.2 of the FNRU.

G.4.3. Support of Technologies Incorporated in Design by Experience, Testing or Analysis

Pursuant to the document «Basic Safety Rules for Dry Interim Spent Fuel Storage Facilities» (NP 306.2.105-2004) as implemented in the reporting period, the SF storage technologies shall be the proven technologies. Such proven technologies were used in developing the ZNPP SFSF and ChNPP SFSF-2, information on which is provided in Section G.4.3 of the First National Report. The same approach will be used for future facilities.

G.5. Assessment of Safety of Facilities (Article 8)

G.5.1. Safety Assessment and Environmental Assessment

In the reporting period, the requirements for safety assessment and environmental assessment have not been changed. The document «Basic Safety Rules for Dry Interim Spent Fuel Storage Facilities» (NP 306.2.105-2004) as implemented in the reporting period for dry interim SFSF establishes the main safety principles and criteria for dry interim SFSF, classification of systems and components of interim SFSF and safety requirements for the following life stages of interim SFSF: siting, design, construction, commissioning, operation and

decommissioning. The structure and content of the safety analysis report for spent fuel storage facilities shall comply with the document «Recommendations on the Structure and Content of the Safety Analysis Report for Spent Fuel Storage Facilities» (RD 306.8.02/2.067-2003).

G.5.2. SAR Reassessment in Construction and Commissioning

Pursuant to the document «Recommendations on the Structure and Content of the Safety Analysis Report for Spent Fuel Storage Facilities» (RD 306.8.02/2.067-2003), to obtain a licence for a specific life stage of the SFSF (construction, commissioning, operation, decommissioning), appropriate SAR is submitted to the SNRCU (preliminary, interim, final and for decommissioning).

Upon completion of the construction, it shall be proved that the safety level of the SFSF as constructed complies with the design safety level. The interim SAR submitted to the SNRCU for a commissioning licence shall contain the indicated data and also justification of the safety of changes, modifications and amendments to the design made in construction, pre-commissioning inspections and tests of the SFSF. The final SAR as revised on the basis of the commissioning results is added by the applicant to the licence application for SFSF operation. Final SAR is analysed by SNRCU before operation license issuing. License includes terms for SAR reassessment.

G.6. Operation of Facilities (Article 9)

G.6.1. Licensing of Operation of Facilities

In the reporting period, the procedure for licensing of operation has not changed. As required by the document «Basic Safety Rules for Dry Interim Spent Fuel Storage Facilities» (NP 306.2.105-2004) as implemented in the reporting period, the operating organisation, prior to the SFSF operation, shall submit the final SFSF SAR to justify the safety of the DSFSF operation and duly approved operating procedure for the DSFSF.

In the reporting period, the SNRCU issued Licence No. EO 000196 of 10 August 2004 for operation of the ZNPP units, which permits commercial operation of the ZNPP DSFSF.

G.6.2. Definition and Revision of Operational Limits and Conditions

Information on the establishment and revision of operational limits and conditions of nuclear facilities is provided in Section G.6.2 of the FNRU. As required by the document «Basic Safety Rules for Dry Interim Spent Fuel Storage Facilities» (NP 306.2.105-2004), the design shall provide for operational limits and conditions to be revised by the operating organisation with the periodicity determined by the SNRCU. Ukraine has been operating only DSFSF for WWER-1000 SF at the ZNPP for a short period of time. The first safety verification of the ZNPP DSFSF shall be conducted in 2006. Further periodicity of the safety verification in the operational stage will be determined by the SNRCU separately.

G.6.3. Operating Procedures

As stated in the FNRU, pursuant to the Law of Ukraine "On Permissible Activity in Nuclear Energy Use", the operating licence, in particular, determines conditions of the operation, which are largely based on operational and technical documentation submitted by the applicant.

The documentation establishes operating procedures, procedures for maintenance, monitoring, inspection and testing of equipment of the facility, limits and conditions of its operation.

Operation of nuclear facilities, including the ZNPP DSFSF, is carried out according to specific operating regulations and procedures agreed upon with the SNRCU.

There are the following examples of such documents:

- technical specifications on safe operation of a power unit;
- operating procedure for a nuclear facility;
- emergency operating procedure for a power unit;
- nuclear safety procedure for transport, reloading and storage of nuclear fuel;
- procedure for maintenance and monitoring of spent fuel and storage containers on DSFSF site;
- procedure for management of spent fuel in its transfer to ZNPP DSFSF for storage;
- emergency operating procedure for DSFSF.

G.6.4. Engineering and Technical Support in Operation

Since the preliminary review meeting, the system of engineering and technical support to the operating organisation has been in the process of improvement.

In order to ensure consistent and efficient system for scientific and engineering support to operation of the nuclear power plants, the Scientific and Technical Centre (SE STC) – which is a division of the NNEGC – was established in 2003.

For further development of fundamental and applied research in NPP safety, the Institute for NPP Safety Issues of Ukraine was established by the Ordinance of the Presidium of the National Academy of Sciences on 18 February 2004. The main scientific activities of this institute are as follows:

- safety and effectiveness of NPP operation;
- technologies for radwaste disposal;
- technologies for decommissioning of NPP units.

The NNEGC maintains permanent communication with organisations of the Russian Federation that participated in the NPP design and continue to provide engineering support.

In order to investigate conditions of safe storage of WWER-1000 spent fuel, the NNEGC has developed and continues implementing of the long-term “Programme for Investigation of Spent Fuel Storage Conditions”. This programme is intended to obtain results for SFSF operational limits and is intended for experimental justification of the maximally acceptable service life of the dry SFSF.

G.6.5. Reporting of Incidents Significant to Safety to Regulatory Body

The information on all events under normal operation and accidents at nuclear facilities is reported to the state regulatory body. Events are regarded as violations if they caused deviations from limits and/or conditions of safe operation or deviations from normal operation and are characterised by certain consequences. Violations are investigated in compliance with the “Provisions on Procedure for Investigation and Record of Operational Events at Nuclear Power Plants”, which determines:

- categories of operational events;

- procedure for investigation of operational events (determination of their direct and root causes, assessment of their safety impact, development of corrective measures);
 - procedure for record of operational events;
 - form for notification of events to be submitted to the regulatory body.
- The following is provided after each operational event:
- immediate notification of operational event (within an hour);
 - preliminary notification of operational event (within a day);
 - INES classification of operational event;
 - report on event investigation (within 15 days from its occurrence).

If necessary, the commission on investigation of the operational event at the facility includes representatives and experts of the state regulatory body.

G.6.6. Analysis of Relevant Operating Experience

In the reporting period, the requirements and approaches to collection and analysis of operational data on the facility have not changed.

The Nuclear Facility Safety Assessment Department applies 15 inspection procedures to inspect equipment, control and monitoring systems at nuclear facilities.

G.6.7. Decommissioning Plans

Prior to the construction of a nuclear facility, a plan of measures for its decommissioning shall be developed in compliance with the Law of Ukraine "On Nuclear Energy Use and Radiation Safety". Such a plan is revised and specified in more detail with time. The operational licence for the facility establishes terms of the revision of the plan.

As required by the document «Basic Safety Rules for Dry Interim Spent Fuel Storage Facilities» (NP 306.2.105-2004), the operating organisation shall make arrangements within different DSFSF lifetime stages for future DSFSF decommissioning. During the whole DSFSF service life, the operating organisation shall collect, process, record and store information on the DSFSF as required for developing a DSFSF decommissioning programme.

The main aspects of the interim SFSF decommissioning shall be reflected in the appropriate SAR for each step of the licensing process (construction, commissioning, operation, decommissioning) according to the document «Recommendations on the Structure and Content of the Safety Analysis Report for Spent Fuel Storage Facilities» (RD 306.8.02/2.067-2003).

G.7. Disposal of Spent Fuel (Article 10)

According to Article 17 of the Law of Ukraine «On Radioactive Waste Management», high-level radwaste (including waste originating from processing of spent fuel from Ukrainian NPPs at foreign enterprises and then returning to Ukraine) is subject to long-term storage and/or disposal in deep geological formations. A decision on management of spent fuel after its interim storage will be made after approval of the spent fuel management strategy (see B1).

Section H. SAFETY OF RADIOACTIVE WASTE MANAGEMENT

H.1. General Safety Requirements (Article 11)

A list of regulations setting forth general safety requirements for radwaste management is provided in Section H.1 of the FNRU.

For the time that passed since the First Review Meeting, the following regulations have been implemented:

- Recommendations on Establishing Criteria for Acceptance of Conditioned Radioactive Waste for Disposal in Near-Surface Repositories, as approved by Ordinance No. 75/04 dated 28 October 2004;

- Safety Conditions and Requirements (Licensing Conditions) for Processing, Storage and Disposal of Radioactive Waste (NP 306.5.04/2.060-2002), as approved by SNRCU Ordinance No. 110 dated 22 October 2002 and registered in the Ministry of Justice of Ukraine, reg. No. 874/7162 dated 6 November 2002;

- Safety Conditions and Requirements (Licensing Conditions) for Design of Nuclear Facility or Radioactive Waste Disposal Facility (NP 306.5.02/2.069-2003), as approved by SNRCU Ordinance No. 50 dated 4 April 2003 and registered in the Ministry of Justice No. 322/7643 dated 23 April 2003.

Compliance of the licensees with the requirements for radwaste safe management is confirmed in the licensing process through preparing and reviewing the safety analysis reports and also annual reports. In addition, the operating organisation carries out a periodic safety assessment upon request of the regulatory body.

In the framework of the annual safety assessment, operating experience is analysed both by the licensees and regulatory body.

The licensees take measures to ensure safety of radwaste management according to the radwaste management programmes agreed by the MFE / ME and SNRCU. The general objective of the programmes is technical and organisational support to the implementation of the state policy in radwaste management in compliance with the basic areas of the Comprehensive Programme for Radioactive Waste Management.

H.1.1. Subcriticality and Removal of Residual Heat

In addition to the information on the requirements for assurance of proper subcriticality and residual heat removal as provided in Section H.1.1 of the FNRU, it should be noted that the Basic Sanitary Rules for Radiation Safety of Ukraine were implemented to replace the Basic Sanitary Rules for Radiation Protection of Ukraine.

According to OSPU-2005, the storage of radwaste containing fissile materials and materials with high specific activity shall:

- be ensured by nuclear safety measures in compliance with requirements of special technical regulations;

- provide for a cooling system.

Such requirements are included in technical specifications on equipment for radwaste management. Recommendations on fulfilment of the above requirements, which are based on the IAEA recommendations, are set forth in the document «Recommendations on Establishing Criteria for Acceptance of Conditioned Radioactive Waste for Disposal in Near-Surface Repositories» (see H.1).

H.1.2. Minimisation of Radioactive Waste Generation

Information on minimisation of radwaste generation is set forth in Section H.1.2 of the FNRU.

In the reporting period, measures on radwaste minimisation were taken in compliance with the radwaste management programmes as developed by the operating organisation according to branch requirements and by other licensees according to the regulatory document «Requirements for Radwaste Management prior to Disposal. General Provisions» (ND 306.607.95).

The most efficient measures provided by these programmes for NPPs to reduce the amount of solid radwaste supplied to temporary storage facilities include: radiometric survey of metal scobs with subsequent sorting, reuse of thermal insulation material, rational use of material for cleaning, reuse of tools and equipment after decontamination.

As a result of administrative and technical measures and improvement of monitoring the implementation of the radwaste management programmes, there is a tendency towards decreasing the annual rate of radwaste accumulation.

For example, the amount of radwaste generated at operating NPPs was reduced as follows in 2004 as compared to 2003:

- ZNPP - by 250 m³ of liquid radwaste;
- RNPP - by 500 m³ of liquid radwaste and by 60 m³ of solid radwaste;
- SUNPP - by 60 m³ of liquid radwaste.

The SSE Complex operates facilities for decontamination of radioactive contaminated materials and, as a result, certain part of them is exempt from regulatory control and another is sent for disposal as a radwaste.

H.1.3. Interdependencies between Different Steps of Radioactive Waste Management

The information on interdependencies between different steps of radwaste management was provided in the appropriate section of the FNRU.

H.1.4. Effective Protection of Individuals, Society and Environment

Appropriate information is provided in Section F. 4 of this Report.

H.1.5. Biological, Chemical and Other Risks

In addition to the information on consideration of biological, chemical and other risks as presented in Section H. 1.5 of the FNRU, it should be noted that the safety analysis reports submitted by the licensees in the reporting period for operational licences for radwaste management facilities took into account and assessed biological, chemical and other risks as required by NP 306.3.02./3.038-2000 «Requirements for the Structure and Content of the Safety Analysis Report for Near-Surface Radwaste Repositories» (3.3 and 3.6) and NP 306.3.02./3.043-2001 «Requirements for the Structure and Content of the Safety Analysis Report for Radioactive Waste Processing» (3.9).

H.1.6. Avoiding Reasonably Predictable Impacts on Future Generations Greater Than Those for Current Generation

Appropriate information was provided in Sections H.1.6 and G.1.6 of the FNRU.

It should be added that the principle of avoiding reasonably predictable impacts on future generations is considered in the safety analysis reports for radwaste management facilities. The SNRCU requires justification that the future level of protection of the public and personnel will not be lower than that at the beginning of operation. In particular, it is required – in operation of radwaste storage or disposal systems – to investigate the degradation of protective barriers and the relevant processes in order to identify corrective measures as appropriate and to provide for decommissioning of radwaste management facilities with subsequent radwaste disposal.

H.1.7. Avoiding Undue Burdens on Future Generations

The legislative framework and the principle of avoiding undue burden on future generations are set forth in Section G.1.7 of the FNRU.

It should be noted that the measures implemented in the reporting period in Ukraine for improvement of the radwaste management system and minimisation of radwaste amounts were intended, among other objectives, to reduce undue burden on future generations.

According to the decision of the Interdepartmental Commission for fulfilment of the Comprehensive Programme for Radioactive Waste Management of 3 June 2005, the ME with involvement of other relevant ministries shall develop the draft Law of Ukraine «On State Fund for Radioactive Waste Management» and submit it to the CMU for review by July 2006. The Law shall establish organisational and legal basis for the financial reserve to be used for radwaste management.

H.2. Existing Facilities and Past Practices (Article 12)

In the reporting period, radwaste management activities took place on the sites of operating NPPs, research nuclear reactors, ChNPP, specialised enterprises of the exclusion zone and UkrDO Radon SISP.

A list of the existing radwaste management facilities is provided in Annex 3.

Regarding radwaste resulting from past practices – see D.4.3.

H.2.1. Safety of Existing Facilities

Information on the safety of radwaste management facilities located on the sites of operating NPPs, ChNPP, SSE Complex, UkrDO Radon specialised plants and research reactors is given in Section H.2.1 of the FNRU.

A list of measures taken by the licensees and operating organisations to enhance safety of the existing radwaste management facilities is provided in Sections B.4 and B.5 of this Report.

In addition, the following should be noted regarding the safety of radwaste storage at operating NPPs:

- liquid radwaste is stored in metal tanks of stainless steel. Liquid waste tanks are leak-tight, comply with all requirements of safe operation and are equipped with an automated leakage alarm system. Visual inspection of tanks is carried out monthly. In order to prevent emergency liquid waste leakage, all tanks of the LRSF system are located in leak-tight concrete rooms coated with stainless steel sheets. There were no leakages from the liquid waste tanks in the reporting period.

In the event of damage of any tank or its repair, the LRSF design permits the use of a free spare tank.

Additional safety monitoring of the tanks is ensured by monthly monitoring of groundwater contamination in boreholes located on the perimeter of the storage facility.

- solid radwaste at NPP is held in storage facilities located in waste processing buildings and separate buildings. A solid radwaste storage facility is a reinforced concrete structure consisting of individual compartments equipped with the fire alarm system, automatic fire extinguishing system and exhaust ventilation with air treatment. Some compartments are additionally equipped with a system for detection and removal of moisture.

The storage facilities are monitored in accordance with their operating regulations. All operations in the storage facilities are carried out with obligatory dosimetry work order. A sanitary certificate is drawn up for each SRSF.

In addition, the KhNPP has a site for temporary storage of salt fusion in «BB-cube» containers, which is intended for storage of 100 containers.

- according to OSPU-2005, salt fusion is classified as a liquid radwaste and cannot be transferred for disposal. A technology for immobilisation of salt fusion in a solid matrix is being developed.

The salt fusion is currently stored in KRO-200 containers that are located in special SRSF compartments. Regular selective monitoring (once per month) of the surface of these containers is carried out. For this purpose, some containers are removed from the compartments, and results of their visual examination are recorded. It is determined that the external surface of the container does not corrode because of high inhibitory capability of the salt fusion.

All rooms for storage of containers with the salt fusion are equipped with a radioactive ventilation and drainage system.

The strategy for salt fusion management will be determined under the Tacis Project «Development of National Strategy and Concept of State Programme for Radioactive Waste Management in Ukraine». The project is included in the TACIS Nuclear Safety Action Programme 2004 (Section «Design Safety»).

H.2.2. Past Practices

Appropriate information is set forth in Sections H.2.2.1 – H.2.2.3 of the FNRU.

H.3. Siting of Proposed Facilities (Article 13)

Sufficiently complete information on assessment of site-related factors that can affect the safety of the facility during its service life and after its closure, probable impact of the facility on individuals, public and the environment and informing the public on safety of facilities and consulting the neighbouring states was provided in Sections H.3.1 – H.3.3.4 of the FNRU.

In the reporting period, siting of new radwaste management facilities did not take place.

H.4. Design and Construction of Facilities (Article 14)

The requirements of current regulations for restrictions of radiological impact of radwaste management facilities in design, application of conceptual plans and technical provisions for decommissioning, establishment of technical conditions for closure of radwaste management facilities and use of proven technologies for radwaste management in design, which are fully enough given in Sections H.4.1 - H.4.4 of the FNRU, were taken into account in the designs of the ICSRMs, additional solid radwaste storage facilities at operating NPPs, facilities for

determination of solid waste activity, deep evaporation and centrifugation at the RNPP and radioactive water treatment facility at the NASU INR.

H.5. Assessment of Safety of Facilities (Article 15)

In the reporting period, the requirements of current regulations as to updated and revised versions of the safety assessment and environmental assessment of the radwaste management facilities during their service life and also the safety assessment and environmental assessment of the radwaste management facility after its closure, which are sufficiently completely stated in Section H.5 of the FNRU, were taken into account in the safety analysis of the ICSRM, additional solid radwaste storage facilities, facilities for determination of solid radwaste activity, deep evaporation and centrifugation at the RNPP and facility for liquid radwaste processing at the NASU INR.

H.6. Operation of Facilities (Article 16)

Information on the operation of radwaste management facilities is given in Section H.6 of the FNRU – namely, licensing of facility operation; revision of operational limits and conditions based on the safety assessment and pre-commissioning testing; compliance with procedures established during operation; maintenance, tests and inspections; engineering and technical support for operation; procedures for characterisation and segregation of radwaste; reporting to the regulatory body on violations of radiation safety standards and rules; incorporation of operational experience; update of plans for decommissioning and closure of radwaste storage facilities.

H.7. Institutional Measures after Closure (Article 17)

Information on institutional measures after closure of a radwaste management facility as associated with storage of reporting documents and institutional control of a radwaste disposal facility after closure, implementation of intervention measures during active institutional control period is provided in the appropriate section of the FNRU.

In the reporting period there were no changes in the information provided.

Section I. TRANSBOUNDARY MOVEMENT (Article 27)

As stated in the FNRU, the legislative framework for transboundary movement of radioactive material is represented by laws of Ukraine, international agreements and conventions. A list of these documents is provided in Section I of the FNRU.

The following documents were revised and implemented in the reporting period:

- “Provisions on Planning of Measures and Actions in the Event of Accidents in Radioactive Material Transport” (NP 306.6.108-2005), which establishes requirements for the content, procedure for development and approval of emergency measure in the transport of radioactive material;

- “Procedure for Issuing Certificates on Approval of Package Designs and Radioactive Materials, Special Conditions and Some Shipments” (NP 306.5.06/2.071-2003), which establishes the procedure for issuing certificates in compliance with the rules on nuclear and radiation safety in radioactive material transport (henceforth – PBPRM-2001);

- “ Safety Conditions and Requirements (Licensing Terms) for Radioactive Material Transport” (NP 306.6.095-2004), which establishes conditions and requirements to be met by the licensee in the radioactive material transport;

- “Requirements for the Safety Analysis Report on Radioactive Material Transport” (NP 306.6.096-2004), which determines the structure and content of the safety analysis report on radioactive material transport as attached to the licence application along with the documents that confirm the licensee’s capability to comply with safety requirements and conditions in radioactive material transport;

- “Procedure for Submitting Conclusions of the State Nuclear Regulatory Committee of Ukraine in International Transfer of Radioactive Material” (NP 306.6.097-2004), which determines the procedure for obtaining conclusions in export, import and transit of radioactive materials subject to state supervision.

Transboundary spent fuel movement in the reporting period was carried out according to bilateral and multilateral international agreements of Ukraine on cooperation in transport.

Transboundary movement of spent fuel is associated with its transit through the territory of Ukraine and its transfer from Ukrainian NPPs to Russia. In compliance with Article 27 of the Joint Convention, permission of the regulatory body shall be issued for each spent fuel movement and radiation monitoring at the border or NPP before shipment of packages. Radiation monitoring includes measurement of radiation levels from the package, its surface contamination, exposure levels from the transport vehicle and its contamination level. In doing so, a necessary condition for issuing permission is an import license of the Russian consignee, a written consent of the Russian state nuclear regulatory body for such movement and a licence for nuclear material management issued by the state nuclear supervisory body of Russia to the Russian operator.

Section J. DISUSED SEALED RADIONUCLIDE SOURCES (Article 28)

Information on the system for regulating the management of disused sealed radionuclide sources to ensure safety both of their possession and storage is set forth in Section J of the FNRU.

Sealed sources were not processed in Ukraine in the reporting period.

In 2003-2004, more than 1000 disused sealed high-level sources as mentioned in the FNRU were stored at facilities of scientific institutions and non-medical enterprises of Ukraine. They are the owners of such RS and ensure conditions of their temporary storage in such facilities. The medical enterprises deliver all used high-level sources to the supplier in a timely manner.

In 2004-2005, 13 radioisotope thermoelectrogenerators «RITEG» were removed from places of their use as power supply sources for sea lighthouses and were transferred for temporary storage to the Odessa SISP of the UkrDO Radon.

In 2005 the concept of a State Programme for Safe Disposal of Spent High-Level Sources has been developed.

Section K. PLANNED ACTIVITIES TO IMPROVE SAFETY

K.1. Improvement of Safety in Spent Fuel and Radioactive Waste Management at Chernobyl NPP

The key project for ChNPP decommissioning is SFSF-2 construction and commissioning. According to the contract, the project was to be completed on 12 September 2003. There were certain problems in the SFSF-2 project, which require development and implementation of measures to eliminate them. The SFSF-2 construction has been terminated since April 2003, the design is under modification. Analysis of the causes of this situation showed that the contractor (FRAMATOME) made certain mistakes in the SFSF-2 design.

At the Assembly of Donors in May 2005, the Client and Contractor presented their agreed proposal that was based on the following approach:

- use of two-barrier system for storage of spent fuel assemblies (SFA);
- placement of only group 1 SFA (without water) in SFSF-2, which will be stored in sealed cartridges.

For further implementation of the project, the Chernobyl NPP undertook development of methodology to divide spent fuel into two groups: with and without the water (group 1 and group 2). Storage of nuclear fuel without water will be ensured first and then, with certain modifications in the facility design, a technology will be developed for treatment of fuel with potential presence of water.

Following the Assembly of Donors, the following decisions were made on 20 July 2005:

- conduct an independent audit of the SFSF-2 design to find out technical reasons for the change in the scope of work starting from 1999 and associated increase in the cost;
- in parallel with the audit, continue some safety justification activities for the SFSF-2 design.

In order to improve safety of radwaste management, the Chernobyl NPP planned the following for the next period:

- complete installation of equipment and commission the LRTP – 2006;
- commission the temporary storage facility for low- and intermediate-level long-lived and high-level waste – 2006;
- commission the solid radwaste retrieval facility – 2007;
- commission the ICSRM – 2007; in particular, complete and commission the engineered near-surface repository for low- and intermediate-level short-lived radwaste on the territory of the Vector system;
- further develop the Vector system and construct its second stage.

It is also planned (2006) to take samples and research graphite GR-280 (graphite stack) of power unit 2 with the purpose of:

- determining the graphite radioactivity and its distribution by core height and radius;
- determining desorption of radionuclides in the temperature range to 500 °C;
- measuring the exposure dose rate along the graphite column height.

Based on the research, correction shall be made to plans of Chernobyl NPP RBMK graphite management. It should be noted that unit 1 graphite stack is contaminated with fission products and transuranium elements near cell 62-44 resulting from the accident in 1982 as caused by break of the fuel channel.

K.2. Shelter Safety Improvement

In order to enhance the Shelter's safety according to the Comprehensive Programme for Radwaste Management and Shelter Implementation Plan (as funded from the Chernobyl Shelter Fund supported by the G-7 and European Commission and other donor states), the following basic projects are planned (their status is indicated in parenthesis):

- stabilization of the existing Shelter structures (under construction);
- integrated automated monitoring system for the Shelter (detailed design is under completion);
- dust-suppression system (trial commercial operation is under completion);
- the Shelter water management system (design stage);
- fire protection system (tender for detailed design and installation is underway);
- physical protection system (installation is under preparation);
- changing room and air lock (under operation);
- external engineering service lines and auxiliary structures (construction is under completion);
- the Shelter integrated database (detailed design is underway);
- new safe confinement (tender for detailed design and construction is underway).

K.3. Improvement of Safety in Spent Fuel and Radioactive Waste Management at Operating NPPs

The existing scheme for operational radwaste management at NPPs needs to be improved. The first-priority tasks in this area for the next 3 years are as follows:

- modernise the existing ones and install new equipment for preliminary and extensive processing of solid and liquid radwaste at NPPs;
- create systems for retrieving and sorting of non-processed solid radwaste accumulated in solid radwaste storage facilities at NPPs;
- start retrieval from storage and processing of accumulated radwaste at all NPPs;
- improve the radwaste on-site transport systems;
- develop and implement tools and methodologies for monitoring of radwaste physical characteristics;
- improve and complete a fleet of containers for radwaste collection, transport and storage.

K.4. Improvement of Radiation Protection of Personnel and Public

The "Programme for Reconstruction of Radiation Monitoring Systems at Ukrainian NPPs" will be continued. In order to enhance monitoring over observance of dose limits in Ukraine, the creation of the uniform state system for control and account of individual doses to personnel and the public will be continued.

K.5. International Cooperation on Improvement of Safety in Spent Fuel and Radioactive Waste Management

Exchange of operational experience and implementation of new technologies for safety improvement at spent fuel management facilities and radwaste processing facilities are carried out according to the cooperation programme between Ukraine and the IAEA in the framework of

regional and national projects, TACIS Nuclear Safety Programme of the European Commission, bilateral cooperation programmes between the operating organisations of Ukraine and other countries. The following important projects are planned to be implemented in the subsequent years in the framework of international cooperation:

- construct facilities for processing of solid radwaste that was generated previously and will be generated in the course of operation of the Rivne and Zaporizhya NPPs;
- support the development of the radwaste management infrastructure in the Chernobyl exclusion zone;
- licensing activities associated with construction and performance of Chernobyl NPP decommissioning facilities (SFSF-2, liquid radwaste treatment plant, industrial complex for solid radwaste management).

Ukraine pays great attention to strengthening of international cooperation in the safe management of spent fuel and radioactive waste and associates the prospects of developing the national infrastructure of radwaste and spent fuel management with application of the best practices of other states in this field.

CONCLUSIONS

Summarising the description of the main activities and measures taken by Ukraine to fulfil obligations under the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, the following can be stated:

1. Ukraine implements a comprehensive national nuclear programme in compliance with the main principle of state policy in nuclear energy use – priority to human and environmental protection against ionising radiation, including all steps of spent fuel and radioactive waste management.

The acceptable level of nuclear and radiation safety in spent fuel and radioactive waste management is maintained through permanent improvement of national measures and through international technical cooperation.

Ukraine has created a system for emergency preparedness and response in the event of nuclear and radiation accidents, which is under continuous improvement with the purpose of mitigating consequences of radiological accidents should they occur.

Therefore, Ukraine makes significant efforts to achieve the objective of the Joint Convention as set forth in Article 1.

2. Ukraine has created a legislative and regulatory framework for complete fulfilment of obligations and authorities by all entities of legal relations in spent fuel and radioactive waste management.

Since the First Review Meeting, national legislation has been complemented by a number of laws intended to implement and further develop the main law of the Ukrainian nuclear legislation «On Nuclear Energy Use and Radiation Safety», eliminate contradictions and inconsistencies between requirements of different legislative documents. The Law of Ukraine «On Settlement of Nuclear Safety Issues» is especially important and governs financial and economic relations associated with operation termination and decommissioning of nuclear facilities, determines legal provisions for creating a financial reserve and establishes the procedure for its use for decommissioning of a nuclear facility.

The Law of Ukraine «On Amendment of the Law of Ukraine «On Nuclear Energy Use and Radiation Safety» of 3 February 2004 establishes requirements for preliminary agreement of radioactive material shipments by the state nuclear regulatory body with competent bodies of other states where such shipments shall take place.

Another important law in the reporting period was the Law of Ukraine “On Decision Making Procedure for Siting, Design, Construction of Nuclear Facilities and Radioactive Waste Management Objects of National Value” that determines clear and transparent procedure for decision making for new facilities of national importance.

For developing the national legislation, a number of Decrees of the President of Ukraine and Resolutions of the Cabinet of Ministers of Ukraine have been developed. In particular, they relate to enhancement and improvement of functions of the state regulatory body and differentiation of its authorities with other central executive bodies, safety of radioactive material transport, emergency response, strategy for ChNPP decommissioning and conversion of the Shelter into an ecologically safe system etc.

3. Since the First Review Meeting of the Contracting Parties to the Joint Convention, the legislative status of the SNRCU – as an independent national nuclear regulatory body – has

substantially strengthened. This was due to the reform of the central executive bodies and support from higher officials of the State.

The SNRCU functions were performed on the basis of systematic planning in the framework of annual and strategic plans. During the last three years, the SNRCU management paid attention to improving the effectiveness and efficiency of the regulation through implementation of the quality control system. Planned development and implementation of quality assurance documents have permitted optimisation of the regulatory activity.

Supervisory functions of the regulatory body have been strengthened. Inspection procedures and programmes have been implemented, additional authorities have been granted to state inspectors and enforcement measures as applied to infringers of regulatory requirements and licensing conditions have been enhanced.

The policy of nuclear and radiation safety regulation is open and transparent to the public. The SNRCU Public Board has been established, which involves representatives of non-governmental organisations, scientists, representatives of mass media and political parties. Therefore, the general public of Ukraine can participate in regulatory decision-making process, including discussion of draft regulations on nuclear and radiation safety. Hot lines are regularly organised, through which the citizens of Ukraine can receive qualified answers to their questions from SNRCU management.

4. Spent fuel and radioactive waste management in Ukraine is carried out only by the operating organisation and the licensees which bear full responsibility for radiation protection and safety of personnel, public and the environment at any stage of spent fuel and radioactive waste management.

Permission for operation of the dry spent fuel storage facility at the ZNPP site was issued by the state nuclear regulatory body on the basis of safety assessments and environmental impact assessment. The regulatory document «Basic Safety Rules for Dry Interim Spent Fuel Storage Facilities» established the main safety principles and criteria, classification of SFSF systems and components, requirements for ensuring safety at all SFSF service life stages. The requirements for the structure and content of the SFSF safety analysis reports are set forth in the appropriate regulatory document. The first safety verification of the ZNPP SFSF will be carried out in 2006.

The licensees' compliance with safety requirements in radwaste management is confirmed in the licensing process through review of the safety analysis reports, annual reports submitted to the regulatory body and periodic safety assessment. Operational experience is annually analysed by both the licensees and regulatory body, and corrective measures are taken.

The operating organisation and licensees implement safety measures in spent fuel and radioactive waste management according to appropriate programmes as agreed by the SNRCU. The objective of the programmes is technical and organisational provisions for the state policy in spent fuel and radioactive waste management.

Implementation of the quality assurance programme for safe management of spent fuel and radioactive waste is required to obtain a licence from the regulatory body. Effectiveness of the quality assurance system is verified by the regulatory body in the course of inspections.

Since the First Review Meeting, all elements of the personnel training system have been improved.

5. Ukraine has completed implementation of the recommendations from the International Commission on Radiological Protection in national legislation and regulatory documents. Dose limit quotas, permissible discharges and releases, intervention level and levels for non-intervention comply with the main IAEA safety standards and IAEA recommendations.

During the last three years, individual doses to personnel from the operating organisation and the licensees were much lower than the dose limit quota. The licensing conditions require implementation of the optimisation principle through a number of administrative, organisational and technical measures to reduce individual and collective doses to personnel, minimise discharges and releases and to improve the radiation monitoring systems.

6. Progress has been achieved in developing the system for emergency preparedness and response in the event of nuclear and radiation accidents.

A number of regulations have been implemented, which identify competent national bodies, control bodies, means and forces involved in response to state emergencies, classification of radiation accidents and hazard categories of facilities and activities. The emergency response plans are tested on a regular basis and the emergency preparedness system is verified for actions in emergencies.

Therefore, Ukraine has successively taken the required measures to achieve the objectives of the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management.

The information set forth in the Second Report confirms that Ukraine fulfils all obligations under appropriate articles of the Joint Convention.

Section L. ANNEXES

Annex 1. List of Spent Fuel Management Facilities

Facility	Location	Purpose	Note
Cooling pond of unit 1 at Zaporizhya NPP	SE ZNPP, 71500, Energodar, Zaporizhya Region	Temporary storage to reduce heat release	Under operation
Cooling pond of unit 2 at Zaporizhya NPP	”	”	Under operation
Cooling pond of unit 3 at Zaporizhya NPP	”	”	Under operation
Cooling pond of unit 4 at Zaporizhya NPP	”	”	Under operation
Cooling pond of unit 5 at Zaporizhya NPP	”	”	Under operation
Cooling pond of unit 6 at Zaporizhya NPP	”	”	Under operation
DSFSF at Zaporizhya NPP	”	Interim spent fuel storage	Under operation
Cooling pond of unit 1 at Khmelnytsky NPP	SE KhNPP, 30100, Neteshin, Khmelnytsky Region	Temporary storage to reduce heat release	Under operation
Cooling pond of unit 2 at Khmelnytsky NPP	”	”	Under operation
Cooling pond of unit 1 at Rivne NPP	SE RNPP, 34400, Kuznetsovsk, Rivne Region	Temporary storage to reduce heat release	Under operation
Cooling pond of unit 2 at Rivne NPP	”	”	Under operation
Cooling pond of unit 3 at Rivne NPP	”	”	Under operation
Cooling pond of unit 4 at Rivne NPP	”	”	Under operation
Cooling pond of unit 1 at South Ukraine NPP	SE SUNPP, 55000, Yuzhnoukrainsk, Nickolaiev Region	Temporary storage to reduce heat release	Under operation
Cooling pond of unit 2 at South Ukraine NPP	”	”	Under operation
Cooling pond of unit 3 at South Ukraine NPP	”	”	Under operation
Cooling ponds of unit 1 at Chornobyl NPP	SSE ChNPP, 07100, Slavutich, Kyiv Region	Temporary storage to reduce heat release	Preparation for decommissioning
Cooling ponds of unit 2 at Chornobyl NPP	”	”	Preparation for decommissioning
Cooling ponds of unit 3 at Chornobyl NPP	”	”	Preparation for decommissioning
SFSF-1 at Chornobyl NPP	”	Interim spent fuel storage	Under operation
SFSF-2 at Chornobyl NPP	”	Interim spent fuel storage	Under construction
SFSF of WWR-M research reactor	NASU INR, 03680, Kyiv, 47 Nauki Avenue	Temporary storage to reduce heat release	Under operation
SFSF of IR-100 research reactor *	SUNEI, 99033, Sevastopol, Gollandia village, 7 Kurchatova St.	Temporary storage to reduce heat release	Under operation

* Currently, there is no spent fuel in the storage facility.

Annex 2. Inventory of Spent Fuel

Material	Number of SFA*	Weight of heavy metal (t)
RBMK SFA	21284	2396, 0
WWER SFA	5522	1936,8
SFA of research reactors	321	0,05

* Data are of 30 June 2005

Annex 3. List of Radioactive Waste Management Facilities as of 1 July 2005

3.1. List of radioactive waste management facilities at operating NPPs

Facility	Location	Main purpose	Design capacity	Year of commissioning
UGV-1-500	ZNPP	Deep evaporation of bottoms	500 dm ³ /year	1987
UGV-1-500	ZNPP	Deep evaporation of bottoms	500 dm ³ /year	2000
UGV 1-500	KhNPP	Deep evaporation of bottoms	500 dm ³ /year	1990
UGV-1-500	RNPP	Deep evaporation of bottoms	500 dm ³ /year	2004
Incineration facility	KhNPP	Incineration of radioactive oil	5 - 10 kg/year	1994
Bituminization facility*	RNPP	Bituminization of liquid radwaste	150 dm ³ /year	1995
Centrifuge	RNPP	Treatment of floor drains	3-5 m ³ /year	2004
Incineration facility	ZNPP	Incineration of low-level radwaste	40 kg/year – solid waste 12 kg/year – liquid waste	1992
Compaction facility VNR-500	ZNPP	Minimisation of low-level waste	P = 500 kN Volume reduction factor = 5	1993
Compaction facility C-26	SUNPP	Minimisation of low-level waste	P = 200 kN Volume reduction factor = 2,8	1997

* - preserved in 2002

3.2. List of radioactive waste management facilities at SSE ChNPP

Facility	Location	Main purpose	Year of commissioning
Solid waste storage facility	SSE ChNPP site	Temporary storage of solid waste in operation of power units and decommissioning	1978 Acceptance of high-level solid waste was terminated on 9 May 2003
Storage facility for liquid and solid waste	SSE ChNPP site	Temporary storage of liquid waste in operation of power units and decommissioning	1981 Compartments for solid waste storage were not operated
Temporary storage facility for solid high-level waste	SSE ChNPP site	Temporary storage of solid high-level waste	2004
Liquid waste processing plant	SSE ChNPP site	Management of liquid waste accumulated in operation of the Chernobyl NPP and waste that will be generated in decommissioning and SIP	Planned - 2006 Construction is completed. Equipment is being installed.
Industrial complex for solid waste management consisting of: solid waste retrieval solid waste treatment	SSE ChNPP site	Management of waste accumulated in operation of the Chernobyl NPP and waste that will be generated in decommissioning and SIP	Planned - 2007 Under construction.

3.3. List of radioactive waste management facilities at UkrDO Radon and SSE Complex

Facility	Location	Main purpose	Design capacity of storage facilities	Year of commissioning
Kyiv SISP	Kyiv, 1 Kommunalna St.	Transport, processing, storage of radwaste	SRW – 1800.0 m ³ Hangar with containers – 219.0 m ³ LRW – 1000.0 m ³ Spent RS – 120 kg-equiv. Ra	1962
Central operational service of Kyiv SISP	Kyiv, 1 Kommunalna St.	Transport, storage of decontamination radwaste	SRW -36090,0 m ³ *	1987-1995 (mitigation of Chernobyl accident consequences)
Dnipropetrovsk SISP	23 km highway “Dnipropetrovsk – Zaporizhya”	Transport, storage of radwaste	SRW – 450.0 m ³ LRW – 200.0 m ³ Spent RS – 50 kg-equiv. Ra	1961
Odessa SISP	75 km highway “Odessa – Kyiv”	Transport, storage of radwaste	SRW – 583.0 m ³ LRW – 400.0 m ³ Spent RS – 50 kg-equiv. Ra	1961
Lviv SISP	Buda Village, Yavorivsky District, Lviv Region	Transport, processing, storage of radwaste	SRW – 1140.0 m ³ LRW – 200.0 m ³ Spent RS – 80 kg-equiv. Ra	1962
Kharkiv SISP	Dergachiv District, Kharkiv Region	Transport, processing, storage of radwaste	SRW - 2384,6 m ³ ** LRW – 1000.0 m ³ Spent RS – 60 kg-equiv. Ra	1962
SSE Complex	Chernobyl NPP exclusion zone	Operation of radwaste management facilities	Buryakivka RWDP – 690000 m ³ Pidlisny RWDP *** RWDP “Stage III ChNPP” *** RICP***	1986 (mitigation of Chernobyl accident consequences)

* the designed capacity for storages of the Chernigiv Region, data for other storages are absent

** not taking into account the designed capacity of the building for storage of tubing, which is 650 t

*** design documentation is absent

Annex 4. Inventory of Radioactive Waste as of 1 July 2005

4.1. Information on radioactive waste of NNEGC in storage at sites of operating NPPs

Material	Location	Amount, m ³	Activity, Bq	Main radionuclides
Filtering materials	KhNPP	147,0	4,9E+12	- *
Evaporation bottoms	KhNPP	397,1	3,4E+13	¹³⁴ Cs, ¹³⁷ Cs, ⁶⁰ Co
Salt fusion	KhNPP	650,0	1,7E+14	- *
Low-level solid waste	KhNPP	3126,1	- *	"
Intermediate-level solid waste	KhNPP	107,7	"	"
High-level solid waste	KhNPP	7,9	"	"
Filtering materials	ZNPP	245,0	9,1E+10	¹³⁴ Cs, ¹³⁷ Cs, ⁶⁰ Co, ¹²⁴ Sb, ⁵⁴ Mn
Evaporation bottoms	ZNPP	2080,0	2,1E+13	¹³⁴ Cs, ¹³⁷ Cs, ⁶⁰ Co, ¹²⁴ Sb
Salt fusion	ZNPP	4521,1	4,3E+13	¹³⁴ Cs, ¹³⁷ Cs, ⁶⁰ Co
Low-level solid waste	ZNPP	6253,9	4,6E+12	¹³⁴ Cs, ¹³⁷ Cs, ⁶⁰ Co, ⁵⁴ Mn
Intermediate-level solid waste	ZNPP	207,2	1,38E+12	¹³⁴ Cs, ¹³⁷ Cs, ⁶⁰ Co, ⁵⁴ Mn
High-level solid waste	ZNPP	75,73	- *	- *
Filtering materials	SUNPP	238,8	"	"
Evaporation bottoms	SUNPP	3106,0	1,2E+14	¹³⁴ Cs, ¹³⁷ Cs, ⁶⁰ Co
Low-level solid waste	SUNPP	15098,6	2,4E+13**	- *
Intermediate-level solid waste	SUNPP	524,3	1,47E+15**	"
High-level solid waste	SUNPP	12,1	8,1E+14**	"
Filtering materials	RNPP	515,61	- *	"
Evaporation bottoms	RNPP	6270,5	1,1E+14	¹³⁴ Cs, ¹³⁷ Cs, ⁶⁰ Co
Salt fusion	RNPP	124,0	8,03E+10	¹³⁴ Cs, ¹³⁷ Cs, ⁶⁰ Co
Low-level solid waste	RNPP	3035,46	4,3E+9**	- *
Intermediate-level solid waste	RNPP	251,3	- *	"
High-level solid waste	RNPP	67,25	"	"

* activity and radionuclide composition are not determined due to absence of appropriate equipment and facilities

** data are tentative as obtained in calculation

4.2. Information on radioactive waste in storage on site of ChNPP

Material	Location	Amount, m ³	Activity, Bq	Main radionuclides
Low-level solid waste	SRSF	1069,0	1,4E+11	Mixture*: Cs, Sr, Co, Pu, Am
Intermediate-level solid waste	SRSF	926,5	4,11E+12	"
High-level solid waste	SRSF	506,9321	1,2816E+14	"
High-level solid waste	HLW temporary storage	0,329	3,2E+11	"
Evaporation bottoms	LRSF	9738,0	2,4805E+14	¹³⁷ Cs, ¹³⁴ Cs, ⁶⁰ Co
Ion-exchange resins	LRSF	2770,4	1,42E+12	¹³⁷ Cs, ¹³⁴ Cs
Pulp	LRSF	1598,97	1,01E+12	¹³⁷ Cs, ¹³⁴ Cs, ⁶⁰ Co
Evaporation bottoms	Liquid and solid waste storage	3910,0	1,0921E+14	"
Ion-exchange resins	Liquid and solid waste storage	1225,25	0,4,5E+11	"
Pulp	Liquid and solid waste storage	636,99	0,4,3E+11	"
Spent radioactive oil	Temporary storage	32,80	3,5967E+14	¹³⁷ Cs

* waste radionuclide composition was not determined due to absence of equipment, methodological and metrological basis

4.3. Information on radioactive waste in storages of research reactors

Material	Location	Amount, m ³	Weight, t	Activity, Bq	Main radionuclides
NASU INR					
High-level solid waste	Solid waste storage No. 8	- *	0,11	1,67E+9	¹³⁷ Cs, ⁶⁰ Co, ⁵⁹ Fe, ⁵⁴ Mn
High-level solid waste	Solid waste storage No. 9	"	0,32	4,25E+9	"
Intermediate- and low-level solid waste	Solid waste storage No. 10	"	1,47	4,0E+9	"
Intermediate-level solid waste	Solid waste storage No. 11	"	0,25	6,7E+8	¹³⁷ Cs, ⁶⁰ Co, ⁵⁹ Fe
Low-level solid waste	Solid waste storage No. 12	"	4,9	1,2E+8	¹³⁷ Cs, ⁶⁰ Co, ⁴⁵ Ca, ¹²⁴ Sb
Low-level liquid waste	Tank No. 1	206,2	- *	1,92E+10	¹³⁷ Cs, ¹³⁴ Cs, ⁶⁰ Co
Low-level liquid waste	Tank No. 2	150,1	"	1,47E+10	"
Low-level liquid waste	Tank No. 3	104	"	9,7E+9	"
SUNEI					
Intermediate-level solid waste	Storage No. 8	15	2,54	9,7E+10	⁵⁵ Fe, ⁵⁹ Ni, ⁶⁰ Co, ¹⁴ C, ⁵⁴ Cu, ¹³⁷ Cs, ⁹⁰ Sr, ⁹⁰ Y
Low-level solid waste	Storage No. 8	10	1,69	3,7E+7	"
Low-level liquid waste	Storage No. 3	8,0	- *	2,3E+6	¹³⁷ Cs, ⁹⁰ Sr+, ⁹⁰ Y

* not measured

4.4. Information on radioactive waste disposed at Buryakivka RWDP* (exclusion zone)

Material	Amount, m ³	Weight, t	Activity, Bq
Low- and intermediate-level short-lived solid waste	554000**	1048600**	2,464E +15**

* the FNRU indicates the amount of radwaste accepted for disposal (~600000 m³) not taking into account subsequent waste sorting and compacting

** data obtained in evaluation

4.5. Information on radioactive waste storage in UkrDO Radon

Material	Location	Amount, m ³	Weight*, t	Activity, Bq
Low- and intermediate-level solid waste	Kyiv SISP	1940.0	2600.0	7,21E+15
	Dnipropetrovsk SISP	431.0	1100	7,06E+15
	Odessa SISP	496	300	1,5E+15
	Lviv SISP	571	1490	1,18E+14
	Kharkiv SISP	1406**	2170***	3,9E+14
Low- and intermediate-level liquid waste	Kyiv SISP	413	****	2,03E+12
	Dnipropetrovsk SISP	70	"	4,4E+10
	Odessa SISP	137,5	"	2,5E+11
	Kharkiv SISP	28	"	3,69E+10
Spent sealed sources	Kyiv SISP	****	"	3,03E+14
	Dnipropetrovsk SISP	"	"	1,48E+14
	Odessa SISP	"	"	2,26E+15
	Lviv SISP	"	"	4,51E+14
	Kharkiv SISP	"	"	4,52E+13
Spent sealed sources of high power	Odessa SISP	"	"	2,41E+16

* taking into account weight of radwaste placed in containers for temporary storage (considering only waste weight)

** not taking into account the volume of tubing

*** taking into account the weight of tubing

**** not measured

4.6. Information on solid radioactive waste of SSE Complex

Solid waste category	Location	Volume, m ³	Weight, t	Activity, Bq
Low- and intermediate-level and long-lived	RWDP "Stage III"	26200	41900	3,91E+14
High-level and long-lived	RWDP "Pidlisny"	3960	7920	~1,0E+15
Low- and intermediate-level and long-lived	RWDP "Pidlisny"	7040	14080	~2,5E+12
Low- and intermediate-level	RICP "Pischane Plato"	57300	91700	6,86E+12
Low- and intermediate-level	RICP "Naftobaza"	102000	181000	40E+12
Low- and intermediate-level	RICP "Yaniv Station"	30000	15000	37E+12
Low-, intermediate- and high-level	RICP "Rudy Lis"	500000	250000	3,74E+14
Low- and intermediate-level	RICP "Stara Budbaza"	171000	316000	1,099E+15
Low- and intermediate-level	RICP "Nova Budbaza"	150000	70000	185E+12
Low- and intermediate-level	RICP "Kopachi"	110000	90000	33,3E+12
Low- and intermediate-level	RICP "Pripyat"	16000	11000	25,9E+12
Low- and intermediate-level	RICP "Chistogalivka"	160000	150000	3,7E+12

* evaluation data based on investigations (require specification and complete investigation)

Annex 5. List of Nuclear Facilities at the Stage of Termination of Operation

Facility	Unit	Location	Reactor type	Date of operation termination
Nuclear facility	No. 1	ChNPP	RBMK-1000 (modification RBM-K2)	30.11.1996
Nuclear facility	No. 2	ChNPP	RBMK-1000 (modification RBM-K2)	11.10.1991
Nuclear facility	No. 3	ChNPP	RBMK-1000 (modification RBM-K7)	15.12.2000

Annex 6. List of Ukrainian Regulations on Nuclear and Radiation Safety Adopted in the Reporting Period

6.1. Laws of Ukraine

1. On amendments of some Laws of Ukraine associated with adoption of the Law of Ukraine "On Physical Protection of Nuclear Facilities, Nuclear Material, Radioactive Waste, Other Radiation Sources" (Law of Ukraine No. 747-IV of 15 May 2003)
2. On Settlement of Nuclear Safety Issues (Law of Ukraine No. 24.06.2004 No. 1868-IV)
3. On Decision Making Procedure for Siting, Design, Construction of Nuclear Facilities and Radioactive Waste Management Objects of National Value (Law of Ukraine No. 2861- IV of 08.09.2005).

6.2. Resolutions of the Cabinet of Ministers of Ukraine

1. Procedure for Shelter Implementation Plan (CMU Resolution No. 421 of 31 March 2003)
2. Procedure for determining the level of physical protection of nuclear facilities, nuclear materials, radioactive waste, other radiation sources according to their category (CMU Resolution No. 625 of 26 April 2003)
3. Provisions on procedure for radioactive material transport through the territory of Ukraine (CMU Resolution No. 1373 of 15 October 2005).
4. Procedure for state inspection of physical protection systems for nuclear facilities, nuclear materials, radioactive waste, other radiation sources and interaction plans in case of nuclear terrorist acts (CMU Resolution No. 327 of 12 March 2003)
5. Procedure for interaction of executive bodies on nuclear energy use in case of detection of radionuclide sources in illicit trafficking (CMU Resolution No. 813 of 2 June 2003)
6. Provisions on Nuclear Insurance Pool of Ukraine (CMU Resolution No. 953 of 23 June 2003)
7. On obligatory insurance of civil liability for nuclear damage (CMU Resolution No. 953 of 23 June 2003)

6.3. Regulations and Other Documents

1. Fundamental safety principles within the Shelter Implementation Plan (NP 306.1.102-2004), approved by SNRCU Ordinance No. 199 of 30 December 2004
2. Safety Conditions and Requirements (Licensing Terms) for Radioactive Material Transport (NP 306.6/095-204), approved by SNRCU Ordinance No. 141 of 31 August 2004, registered in the Ministry of Justice, No. 1125/9724 of 9 September 2004
3. Requirements for the safety analysis report on radioactive material transport (NP 306.6.096-2004), approved by SNRCU Ordinance No. 141 of 31 August 2004, registered in the Ministry of Justice of Ukraine No. 1127/9726 of 9 September 2004
4. Safety requirements and conditions (licensing terms) for design of a nuclear facility or radioactive waste disposal facility (NP 306.5.02/2.069-2003), approved by SNRCU Ordinance No. 50 of 4 April 2003 and registered in the Ministry of Justice No. 322/7643 of 23 April 2003
5. Basic Safety Rules for Dry Interim Spent Fuel Storage Facilities (NP 306.2.105-2004), approved by SNRCU Ordinance No. 198 of 29 December 2004 and registered in the Ministry of Justice, reg. 49/10329 of 17 January 2005

6. Plan of response to radiation accidents (NP 306.5.01/3.083-04), as approved by Joint Ordinance of the SNRCU and ME No. 87/211 of 17 May 2004 and recorded in the Ministry of Justice, reg. No. 720/9319 of 10 June 2004
7. Provisions on Planning of Measures and Actions in the Events of Accidents in Radioactive Material Transport (NP 306.6.108-2005), approved by SNRCU Ordinance No. 38 of 7 April 2005 and registered in the Ministry of Justice of Ukraine No. 431/10711 of 22 April 2005
8. Procedure for state inventory of radioactive waste (NP 306.5.04/2.059-2002), approved by SNRCU Ordinance No. 27 of 11 February 2003 and registered in the Ministry of Justice No. 160/7481 of 25 February 2003
9. Procedure for inspection and verification of radioactive waste disposal facilities in stages of operation and closure (NP 306.6.01/1.074-2003), approved by SNRCU Ordinance No. 75 of 19 June 2003
10. Procedure for issuing certificates on approval of package designs and radioactive materials, special conditions and some shipments (NP 306.5.06/2.071-2003), approved by SNRCU Ordinance No. 51 of 7 April 2003 and registered in the Ministry of Justice No. 392/7713 of 23 May 2003
11. Basic sanitary rules for radiation safety of Ukraine, approved by the Ministry of Health of Ukraine No. 54 of 2 February 2005 and registered in the Ministry of Justice No. 552/10832 of 20 May 2005
12. Procedure for issuing permits for radioactive material transport (NP 306.6.06/2.080-03), approved by SNRCU Ordinance No. 125 of 24 September 2003 and registered in the Ministry of Justice No. 916/8237 of 9 October 2003
13. Procedure for inspections of radioactive waste disposal facilities in operation and closure, approved by SNRCU Ordinance No. 75 of 19 June 2003
14. Recommendations on the Structure and Content of the Safety Analysis Report for Spent Fuel Storage Facilities (RD 306.8.02/2.067-2003), approved by SNRCU on 20 February 2003
15. Recommendations on Establishing Criteria for Acceptance of Conditioned Radioactive Waste for Disposal in Near-Surface Repositories (RD 306.4.098-2004), approved by SNRCU Ordinance No. 160 of 25 October 2004

Annex 7. National and International Reports and Safety Reports

1. National Report of Ukraine on Compliance with Obligations under the Convention on Nuclear Safety, Kyiv, 2004.
2. Report on Nuclear and Radiation Safety of Ukraine for 2003, Kyiv, 2004.
3. Report on Nuclear and Radiation Safety of Ukraine for 2004, Kyiv, 2005.

Annex 8. Radiation Protection of Personnel and Public

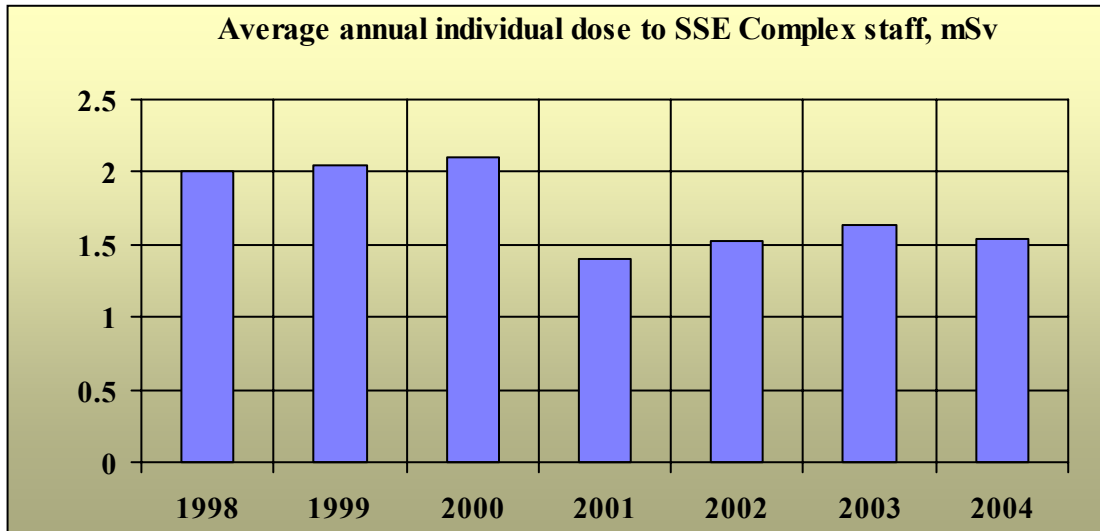


Figure L.8.1 – Dynamics of average annual individual doses to SSE Complex staff

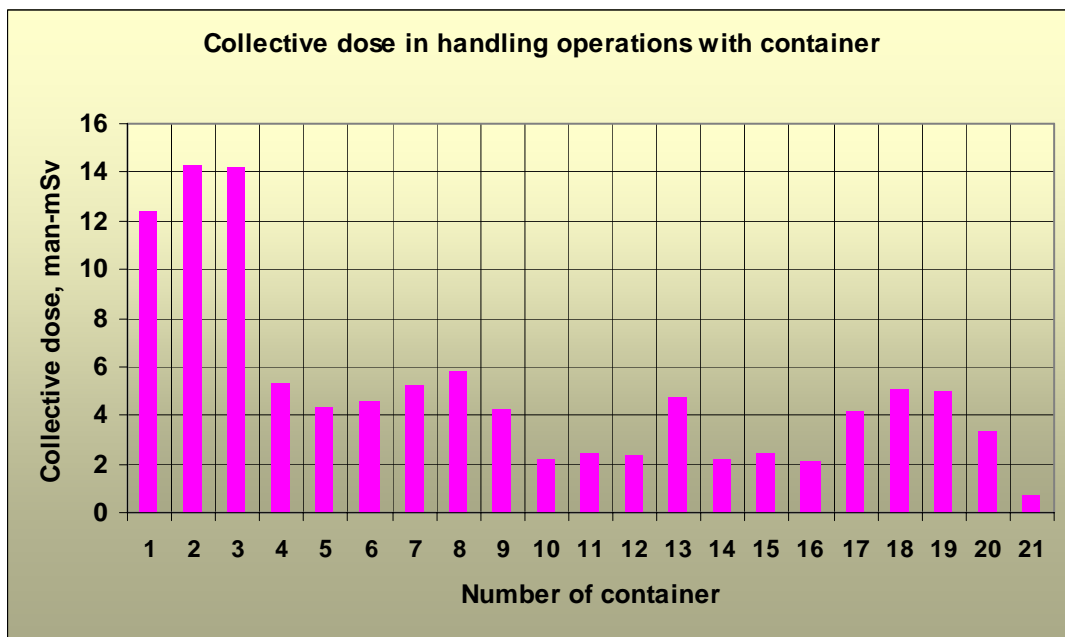


Figure L.8.2 – Collective dose to Zaporizhyya NPP staff in all handling operations with containers for nuclear fuel storage

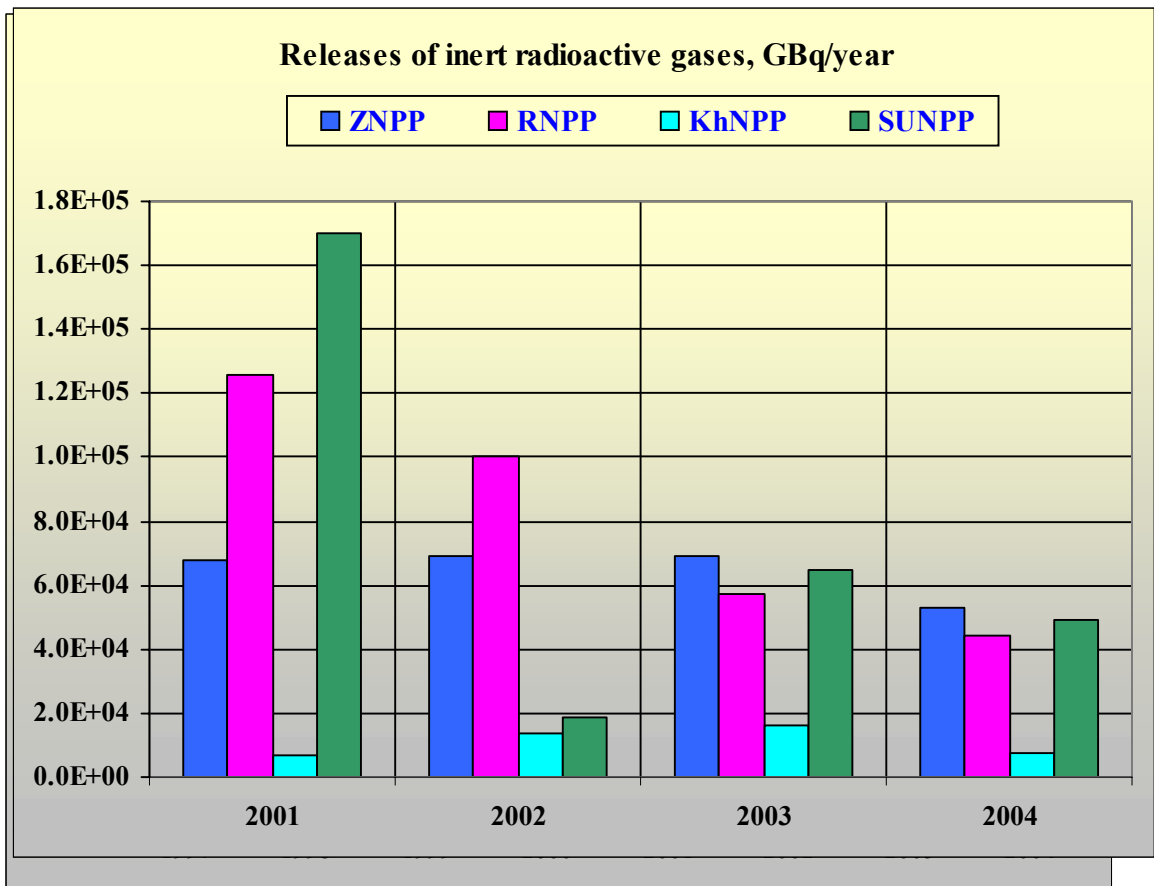


Figure L.8.3 Dynamics of releases of inert radioactive gases from Ukrainian NPPs

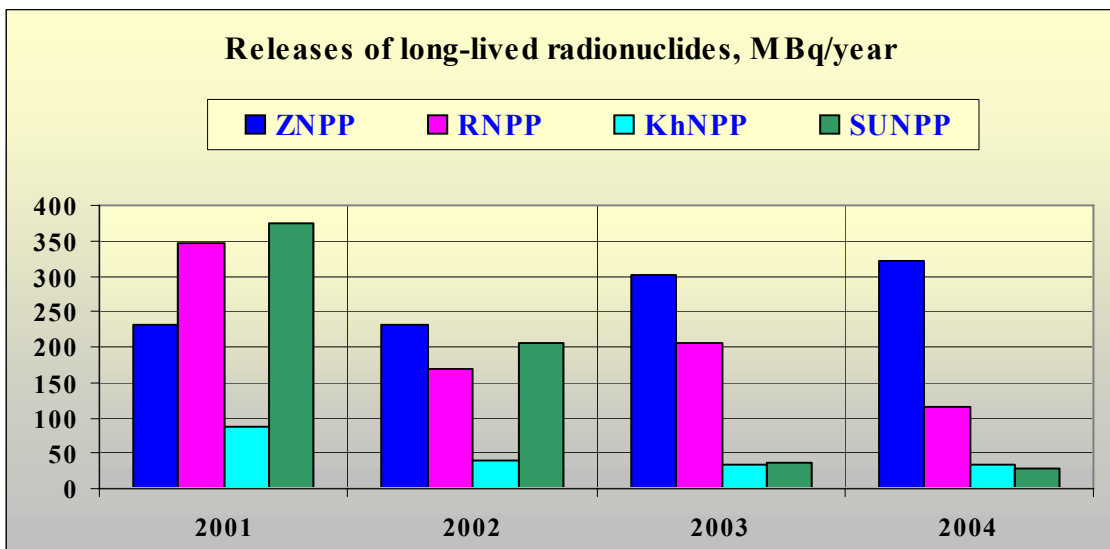


Figure L.8.4 Dynamics of releases of long-lived radionuclides from Ukrainian NPPs

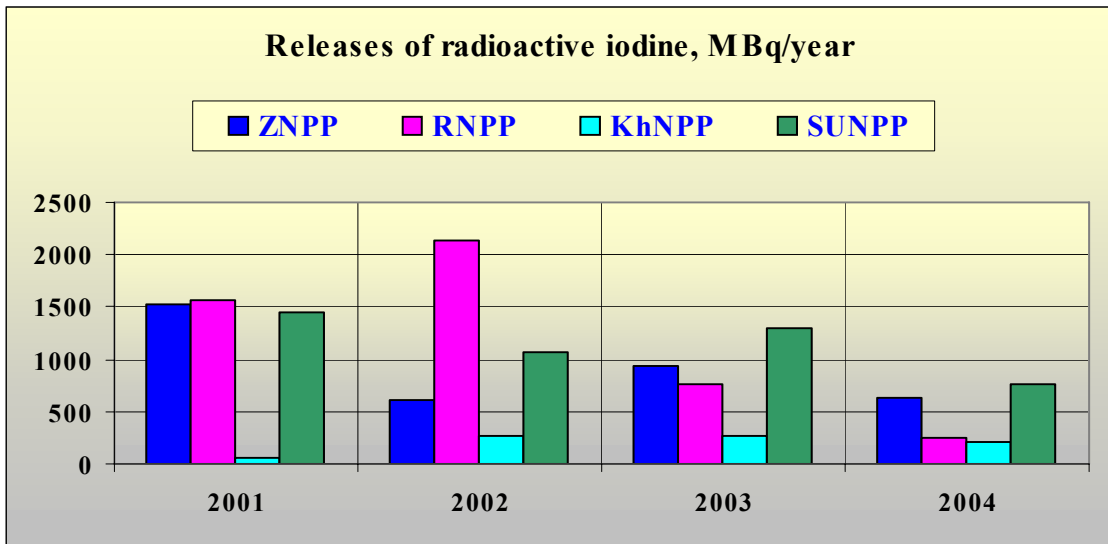


Figure L.8.5 Dynamics of releases of radioactive iodine from Ukrainian NPPs

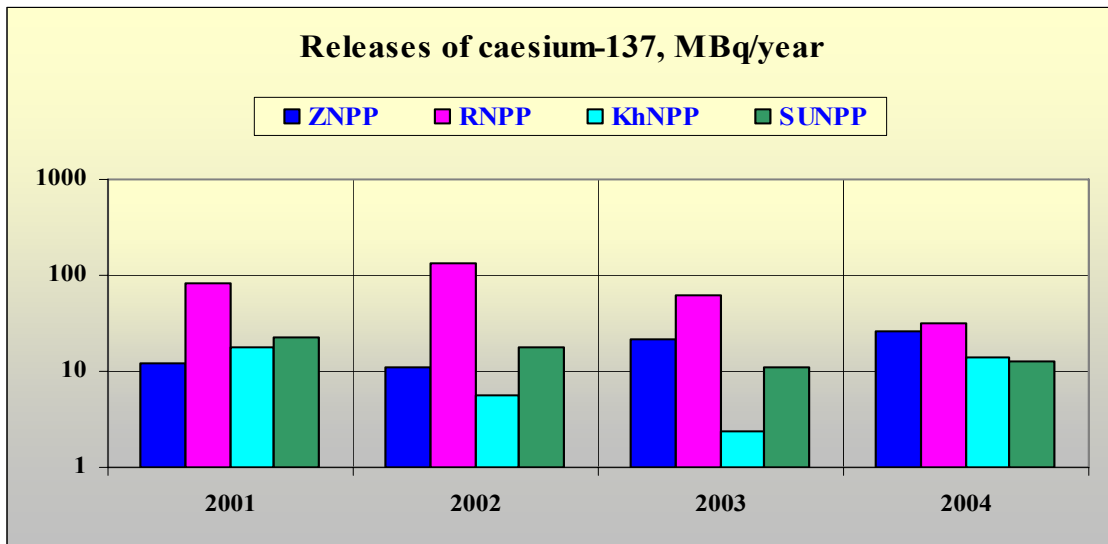


Figure L.8.6 Dynamics of releases of caesium-137 for Ukrainian NPPs

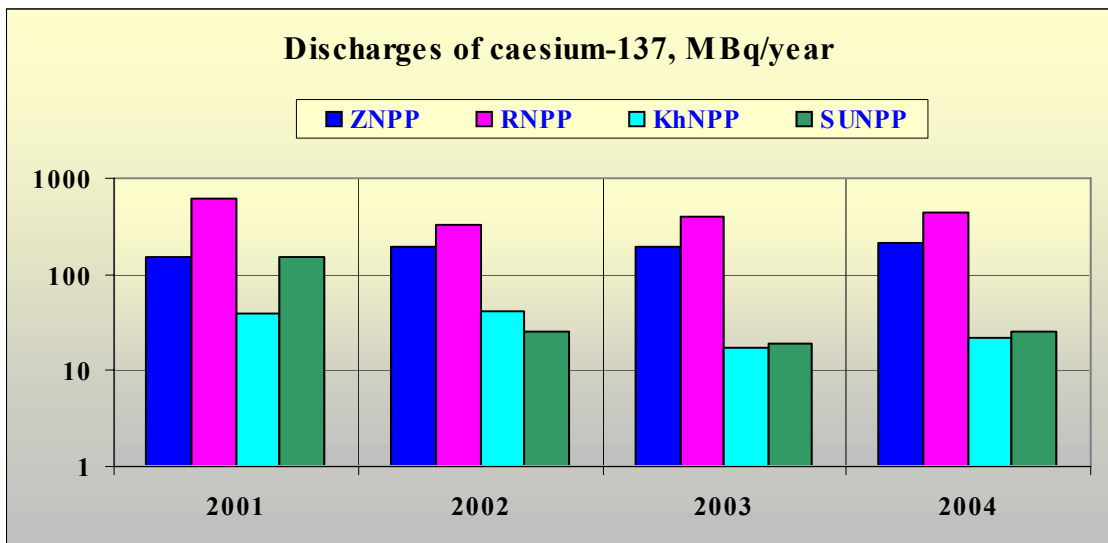


Figure L.8.7 Dynamics of liquid discharges of caesium-137 from Ukrainian NPPs

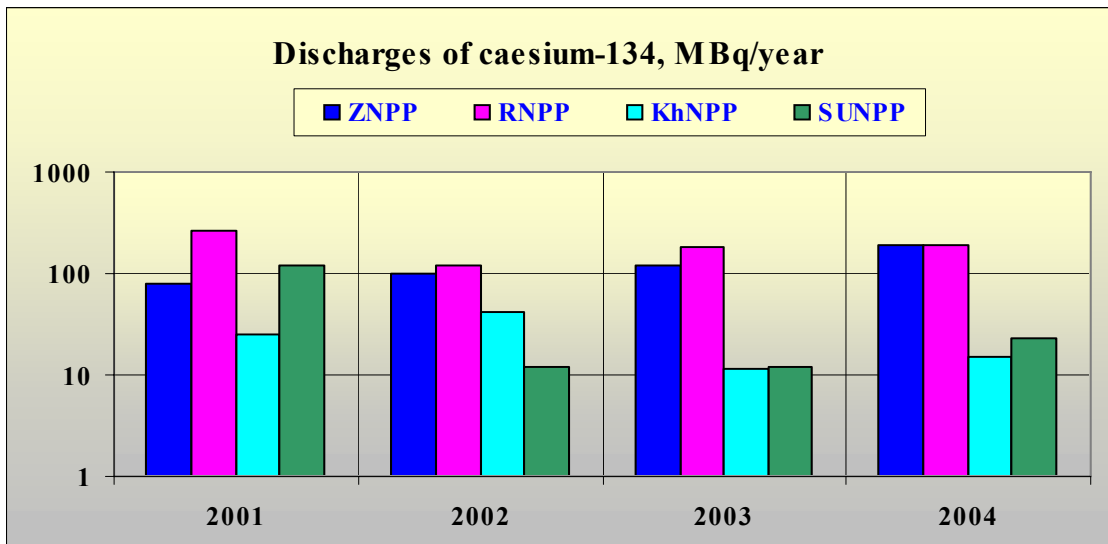


Figure L.8.8 Dynamics of liquid discharges of caesium-134 from Ukrainian NPPs

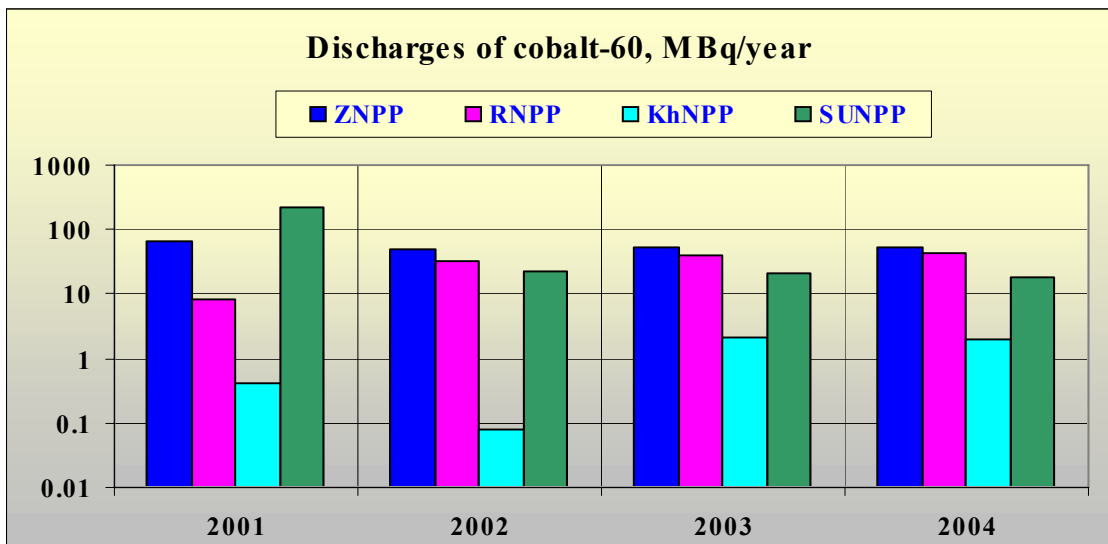


Figure L.8.9 Dynamics of liquid discharges of cobalt-60 from Ukrainian NPPs

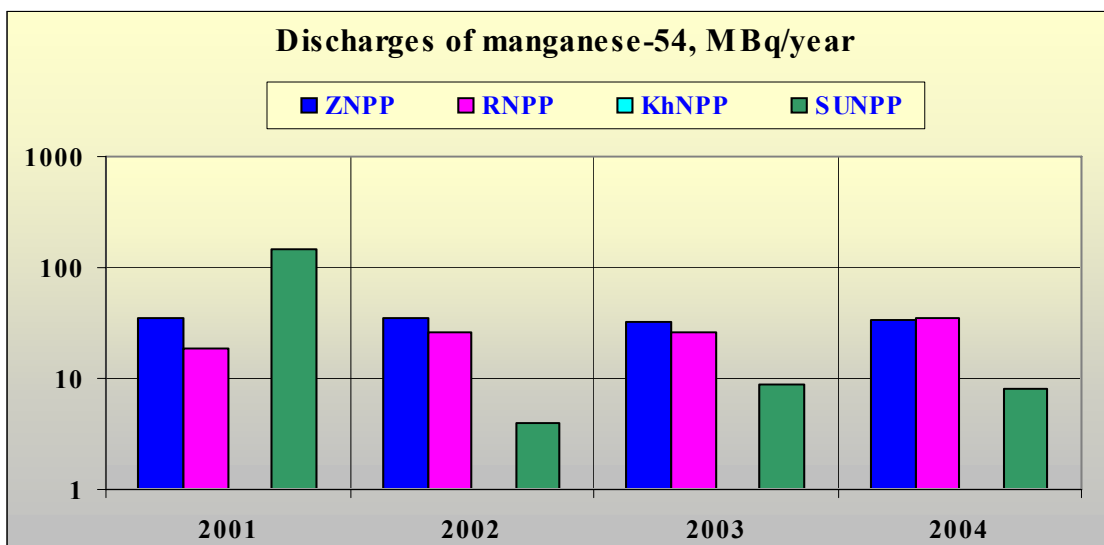


Figure L.8.10 Dynamics of liquid discharges of manganese-54 from Ukrainian NPPs

Annex 9. Waste of Uranium Mining and Milling

Operating period	Tail pit	Area, hectare	Volume of tailing pits, mln. t/mln. m ³	Total activity, 10 ¹² Bq	Uranium content, mg/kg
Tailing pits of SE "SkhidGZK"					
1964- 1991	"KBZ"	55,6	19,3/12,4	990	700
1959- 1979	Scherbakivske Section 1	86,0	47,16/31,1	2534	Not available
1979-till present	Scherbakivske Section 2	139,0			
Tailing pits of IA "PKhZ"					
1949- 1954	Western	4,0	0,77/0,35	180	700
1951 - 1954	Central Yar	2,4	0,22/0,10	104	630
1956- 1980	South-eastern	3,6	0,33/0,15	67	22
1968- 1983	Sukhachivske, Section 1	90,0	19,0/8,60	710	80
1983-till present	Sukhachivske, Section 2	70,0	9,60/5,50	270	80
1960- 1990	Base C	25,0	0,15/0,10	440	100-1000
1954- 1968	Dniprovske	73,0	12,0/5,84	1400	230
1982	Blast furnace No. 6	0,2	0,04/0,02	11	No data
1965- 1988	Lanthanum fraction	0,06	0,007/0,003	0,86	No data
Operating period	Tail pit	Area, hectare	Volume of tailing pits, mln. t/mln. m ³	Total activity, 10 ¹² Bq	Uranium content, mg/kg